



**NROC**  
Northeast Regional  
Ocean Council

## **SUMMARY - AQUACULTURE SECTOR WORKING SESSIONS**

### **Northeast Regional Ocean Council (NROC)**

**November – December 2012**

#### **1. Executive Summary**

##### *1.1. Overview*

In November and December 2012, the Northeast Regional Ocean Council (NROC) organized a series of three working sessions for members of the aquaculture sector in New England as part of the regional ocean planning effort in the region. These working sessions were held in Barnstable, MA, Walpole, ME and Groton, CT and were attended by a total of 68 participants. The purpose of the working sessions was to learn more about the key issues being faced by the aquaculture sector in New England, anticipated changes in coming years, and the potential role of regional ocean planning to address issues and opportunities. In addition to the participants, NROC members attended to participate in the discussions.

The working sessions had identical agendas focused on three main topics:

1. aquaculture permitting and leasing,
2. current and future space needs and compatibilities for aquaculture, and
3. aquaculture sector data.

This meeting summary contains a synthesis of comments made and questions raised during the working sessions; it should be clarified that not all aquaculture growers or developers were represented. The meeting summary captures those themes that were voiced most frequently or most strongly. It was written by the facilitation team from the Consensus Building Institute & Kearns and West.

NROC does not endorse the views in this summary document. The summary is intended to capture key themes and ideas expressed during the sharing of participants' ideas, questions, suggestions, and comments. There are times when these comments contradict one another or are stated as a certainty but may not be fully accurate. Additionally, certain points provide important context but may not necessarily lead to specific regional ocean planning tasks. Participants' points and perspectives have not been fact checked. The statements in the document are not the views of NROC or the authors of this document. In addition, in some cases, it was hard to know whether a statement applied to all of New England or to a particular state or to a much smaller area; this summary tries to be clear about this when possible.

### *1.2. Themes About Aquaculture Permitting and Leasing*

The following were some of the most extensively discussed points about permitting and leasing of aquaculture and topics for regional ocean planning to consider:

- Permitting and leasing remain major challenges for aquaculture developers. Developers would like additional certainty around permitting and leasing processes.
- There have been recent nearshore permitting improvements that can be built on, shared as best practices, and be used to inform permitting as aquaculture moves offshore.
- Participants generally did not see a clear role for regional ocean planning in near-shore permitting. However, participants did view regional ocean planning, with clearly designated roles and responsibilities among agencies and departments at various scales, as promising for coordinating and advancing aquaculture permitting offshore in federal waters.
- Aquaculturists generally seek certainty about where aquaculture is and is not welcome and would like that information as early as possible.
- On the whole, participants viewed federal agencies as not being sufficiently supportive of aquaculture development. They would like clarity on whether they have the federal support as they seek to grow their industry that they see providing essential food, domestically, while cleaning coastal waters.
- Communication with other ocean users is key to reducing conflict between aquaculture and others, and planning and regulatory processes should support improved communication and coordination between aquaculturalists and other interests.
- On-site monitoring (not just modeling) is important for appropriate aquaculture siting and operations and should be carried out at a scale directly related to the scale of operation. These considerations should be included in regulations for permits or leases.
- Permitting and leasing of aquaculture is easiest when the installation is out of sight (submerged or far enough offshore so it isn't easily visible).

### *1.3. Themes About Current and Future Space Needs and Compatibilities*

Participants highlighted the following primary trends for aquaculture (primarily offshore) and described associated implications for space needs:

- Participants expect an increase in offshore aquaculture development and described some of the anticipated challenges this trend may bring, including stronger physical forces and storms, and the need for larger boats and more substantial and expensive equipment.
- Long-line blue mussel farming technology is being deployed in a few areas and may soon be ready for larger commercial-scale deployment.
- Developers would be interested to have even general maps of areas that meet the required conditions for current technologies (i.e. areas that are suitable for locating projects).
- Growers are investigating co-location of multiple species (or integrated, multi-trophic co-location) to decrease business risk and environmental harm while increasing product diversification.

- Growers are interested in co-location opportunities with wind or other offshore installations, and are hopeful that siting regulations will be sufficiently flexible to support or even encourage future co-location opportunities.
- Participants predicted a likely increase in demand for aquatic plants that serve multiple purposes (e.g., restoration, food, finfish feed, biofuel, pharmaceuticals, and even as a carbon sink.)
- There is not a single set of trends toward particular species or types of offshore technologies, but there are various species people are trying to cultivate or thinking of cultivating in the future (including blue mussels offshore, oysters and clams inshore, interest in seaweed, etc.). There are likely to be opportunities for transient aquaculture gear that can be moved between sites and raised and lowered in and out of the water.
- Participants mentioned likely increasing opportunities to grow sea urchins, scallops, lobster, crab, and finfish.
- If aquaculture moves offshore, there will need to be a regional protocol for tracking red tide and water quality to ensure food/safety standards are met.

#### *1.4. Themes About Aquaculture Sector Data*

When reviewing the Northeast Ocean Data Portal, participants shared the following key thoughts:

- NROC's data collection effort provides opportunities to make it easier to identify possible aquaculture sites by providing screening, habitat mapping, and maps of hydrology and physical forces (wave height, temperature, currents, storm tracks) important for siting potential facilities. Participants asked NROC for hydrology modeling at a scale useful for siting.
- It would be useful to have data on the industry as a whole, possibly mapped. This could include trends over time in acreage, locations, and species types, as well as size of operations.
- Participants expressed strong concerns about the limited resources available to keep maps updated and the possibility that data could become outdated yet still be used in permitting to inform leasing or related decisions. Participants discussed the need for data to be credible and updated regularly.
- There is a big difference between data that are self reported by users and data collected automatically. Many participants asked NROC to clarify this for each data set in the portal, since there are quality control issues for the former.
- Participants also generated a list of what components they believed ought to be included in maps of current aquaculture operations: bacterial and PSP closures, disease prevalence, water quality information, point and non-point source discharge sites, water temperatures over time, currents, concentrations of marine mammals, bottom types, hazards to avoid, fishery closure areas, military operations, SAV, mooring fields, shallow sub-tidal habitats, mooring data, and overall, on the robustness of the industry.

## **2. Aquaculture Sector Working Session Introduction**

### *2.1. Project and Process Overview*

NROC is a state and federal partnership that facilitates the New England states, federal agencies, regional organizations, and other interested groups in addressing ocean and coastal issues that benefit from a regional response. Formed in 2005, NROC's mission is to provide a voluntary forum for New England states and federal partners to coordinate and collaborate on regional approaches to support balanced uses and conservation of the Northeast region's ocean and coastal resources. One of NROC's core focal areas is regional ocean planning, and several supporting projects are underway. For more on NROC, see: <http://northeastoceancouncil.org>

In 2012, as part of its ocean planning work plan, NROC set out to build stronger connections with key ocean users to begin discussing potential regional ocean planning topics and develop useful data products. A core component of this work involved reaching out to marine industries (the aquaculture, maritime commerce, and energy sectors) as well as to the commercial fishing community, recreational boaters, and the natural resource community. In November and December 2013, NROC convened a suite of working sessions with representatives from the three marine industry sectors. This summary captures key outcomes from the maritime commerce working sessions.

The aquaculture working sessions were preceded by several months of preparation and initial outreach to the sector. To support these outreach efforts, NROC hired a facilitation team composed of staff from the Consensus Building Institute and Kearns and West (neutral facilitation firms with a focus on natural resources and public policy). Over the summer of 2012, the facilitation team reached out to key leaders from the aquaculture sector. The facilitation team conducted confidential phone interviews, sometimes attended by NROC staff, to better understand the state of the industry, key industry participants, and to learn how best to engage the sector. In parallel with these interviews, the facilitation team sent out an online survey to a larger group of representatives from within the industry. A total of 20 representatives from the aquaculture sector participated in either the interview or the online survey. Finally, NROC hired an aquaculture expert to prepare a white paper summarizing the state of the industry in New England today. The aquaculture white paper can be found at [northeastoceancouncil.org](http://northeastoceancouncil.org). The interview and survey results and white papers helped identify the key issues that were discussed at the aquaculture working sessions. The locations for the aquaculture working sessions were identified with input from the interviews as well as advice from the white paper author and NROC members. The intent was to locate the events strategically so as to capture the geographic differences in interests and issues and to minimize travel time for attendees.

Three working sessions were held for members of the aquaculture sector in New England. These working sessions were held in Barnstable, MA, Walpole, ME, and Groton, CT and were attended by a total of 68 participants. The sessions in Massachusetts and Maine were each five hours, while the session in Groton was three hours as it was held in conjunction with the Northeast Aquaculture Conference & Exposition (NACE). Working session participants came from industry, academia, and municipal and state government, including some NROC members. Please see Appendix A for a full list of participants. Modest stipends were offered to growers to help defray the costs of participating (travel). A list of working session participants is found in Appendix 1, and a copy of the working session agenda is in Appendix 2.

The stated objectives of the working sessions were to:

- Provide an update on recent regional ocean planning efforts in New England.
- Increase clarity and understanding around key issues facing the aquaculture sector.
- Explore the role that regional ocean planning can play in addressing these issues, and identify specific next steps to doing so.
- Discuss the current status of data characterizing aquaculture in New England, and explore the role that regional ocean planning can play in improving and expanding this information base.

Discussions from all three of the aquaculture working sessions are synthesized in this summary, as there were many similarities across the working sessions. This summary will be shared with everyone who attended or was invited to the working sessions and with members of NROC and the newly formed New England Regional Planning Body (RPB). It will also be posted on the NROC website.

## *2.2. NROC Plans for 2013*

In 2013, NROC plans to continue to reach out to the aquaculture sector through ongoing communications with sector leaders and participants, and further development of the Northeast Data Portal (see the last section of this summary for more on the data portal). As part of the overall regional ocean planning process, there will be additional opportunities to specifically engage the aquaculture industry, as well as the energy industry, maritime commerce and commercial fishing industries, recreational boating, and natural resource conservation organizations in similar processes in 2013. Ultimately, the foundational information (maps, data sets, and white papers) created during this process will feed into regional ocean planning processes that will be implemented by the Regional Planning Body.

## *2.3. Context: Aquaculture Issues and Trends from NROC Introduction*

The first part of each working session was a brief overview of regional ocean planning activities and of what the Project Team learned during the interviews and surveys of the sector, to frame the discussion and explain the source of the focus issues being addressed. Importantly, participants used this discussion to clarify their understandings of NROC and regional ocean planning.

Currently, marine aquaculture in New England occurs only in state waters, and at relatively modest scales, though many are interested in expanding to better contribute local seafood to the US. Municipalities and states have different rules and regulations for permitting or leasing space and for monitoring require by developers. There are more than 1500 leases, permits and licenses for place-based aquaculture in New England today, and the estimated value of production is \$45-50M annually. The species raised include American and European oyster, quahog, blue mussels, softshell clams, green sea urchin, Atlantic sea scallop and bay scallop. Most shellfish aquaculture in New England is carried out by small businesses. There is growing interest in growing aquatic plants and diversifying products while bringing ecosystem and food benefits to New England.<sup>1</sup>

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<sup>1</sup> This information comes from the white paper on aquaculture written by George Lapointe.

## 2.4. Meeting Summary

This meeting summary, drafted by the facilitation team<sup>2</sup>, is organized into the following main sections:

Section 3: Aquaculture permitting and leasing

Section 4: Current and future space needs and compatibilities for aquaculture

Section 5: Aquaculture sector data

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## **3. Aquaculture Permitting and Leasing**

NROC was interested in learning lessons from current permitting and leasing practices, anticipating that there may be future proposals for aquaculture in new locations (e.g., further offshore) and for new types of technologies/species. Participants were asked several related key questions and shared the following thoughts and insights. These questions, and a synthesis of participants' responses, are listed below.

3.1. What are the primary permitting issues, and how are they being addressed? What lessons can the existing, near-shore permitting experience offer?

- *Complex Permitting Processes* – In Massachusetts, the Board of Selectmen first grant a license, then there is a public hearing. The Conservation Commission may have to approve the permit, which can then be appealed at the state level. The complexity of aquaculture permitting has been streamlined for growers in MA towns such as Barnstable and Truro. In New Hampshire, permitting control sits with the Department of Fish and Game, which coordinates with other agencies and is seen as a great model of coordination. Maine's one-stop shop for a permit, where a single federal agency coordinates all federal and state agencies concerns, was cited as a great example for federal waters. There are numerous opportunities in Massachusetts for someone who wants to block aquaculture development to slow or prevent it from happening. There are many points in the permitting process where approval of an aquaculture operation can be challenged. Participants recommended developing a clear, bounded appeals process, so there aren't multiple times to appeal, and long-term designation of areas for aquaculture (though some said this could stymie change when technology and uses change).

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<sup>2</sup> The facilitation team that worked on aquaculture sector engagement and these working sessions included, from the Consensus Building Institute, Ona Ferguson, Patrick Field, Stacie Smith, and Sara Cohen, and from Kearns & West, Eric Poncelet.

- *Reduce Use Conflicts Through Communication and Coordination with Neighbors* – Conflicts with other users and industries can be dramatically reduced prior to siting of aquaculture operations by early discussions with neighbors to identify areas already in use and to identify and resolve possible future conflicts. Other potential users include state agencies, people with other gear in the water, people with shorefront properties, those working on marine mammal issues and others. In Martha’s Vineyard, there are good relations between growers and others in the community, likely because of significant communication among groups. Problems such as entanglement issues with whales, preparation for big storms, and concerns about raising exotic species that could escape should be anticipated so they can be minimized.
- *Local Objections to Seeing Aquaculture* – Some shoreline property owners do not want to see working aquaculture sites from their property. This has been a significant challenge in some places for aquaculturists seeking permits. Setting up aquaculture operations that are offshore, out of view, or submerged underwater might avoid this issue. If neighbors don’t want aquaculture present, it can be difficult to get a permit. In New Hampshire, there is a perception that there is no process to get a project approved if neighbors object to it.
- *Local Politics* – Because landowners, often including wealthy shoreline landowners, donate money to the campaigns of local elected officials, and because aquaculture permits are decided at a local level, opinions about aquaculture development can vary significantly town by town. The aquaculture community doesn’t have a lobbying budget as other ocean industries do and is very influenced by these different political contexts.
- *Permitting Processes that Effectively Engage Stakeholders* – Participants mentioned several places where the permitting process is viewed as working relatively well, including the states of Maine and Connecticut. Maine and Connecticut both have scoping sessions where they bring stakeholders together at one table as one of the first steps of the permitting process. In the preliminary Maine discussion, anyone can participate; participants then decide if they want to serve as interveners in the leasing process. Rhode Island was also mentioned as a state with an effective permitting process (one-stop permitting with a coordinator who collects state and federal comments, a pre-permit hearing step to identify issues, and an experimental permitting system).
- *Impacts on Nutrients* – Because shellfish clean the water, neighbors and the community may support shellfish growing. However, as finfish rearing can result in concerns about potential water quality issues, it can be a challenge to get finfish aquaculture established in areas with nutrient problems. Nutrient issues are felt by many aquaculturists to be exaggerated, who feel that proper siting to ensure adequate flushing can resolve such concerns.
- *Established Working Waterfronts* – It is easier to get permits in communities that already have established aquaculture sites, where people understand working waterfronts, than in places where it is entirely new. One suggestion was to enable waterfront communities to establish up-front a desired amount of aquaculture in their waters and articulate a vision for such projects, prior to permitting.
- *Lease Lengths* – Some participants said lease lengths are too short (e.g. 10 years in Maine) and leases should be granted for at least 20-50 years, in part because other types of development obtain longer leases. Lease length should be linked to the lifespan of a particular species and the business model of a particular operation, as investors will be dissuaded if the company can get only produce a few cycles within the permit duration.

- *Modeling versus Monitoring* – Participants discussed whether aquaculture sites should be modeled or monitored when granting leases. Some said that, to date, modeling has not always accurately predicted how a site will react to aquaculture farming practices, yet in some places it is required. These participants said that they strongly believe that site-specific monitoring ensures the best environmental outcomes. For example, Maine’s program was given as a good example of site-specific monitoring: when you apply for a 10-year lease, Division of Marine Resources biologists inspect the site, scuba divers take underwater video, and they produce a site report summarizing what was found, as a result of which the state now has a good sense of the characteristics of different bodies of water.
- *Appropriately Scaled Leases* – Monitoring requirements should be related to the scale of operations. Participants appreciate Maine’s work on modeling and monitoring in which people apply first for a limited purpose aquaculture license, then an experimental lease, then a standard lease. This allows people to learn something by starting small; it is a pathway for experimentation. It was noted that scaling up gradually may not work economically in federal waters.
- *Diversification* - If aquaculturists thought of themselves as farmers who grow many different things, they could increase their opportunities and reduce risks. Permitting and regulations should not unintentionally constrain or prevent cross-species work (e.g., New Brunswick has a regulation preventing location of a finfish farm beside a shellfish farm).
- *Recycling Nutrients* - If nutrients can be recycled on site through integrated aquaculture systems, permitting hurdles should decrease.

3.2. How might regional ocean planning help with permitting and leasing issues without being redundant? That is, are there ways that regional ocean planning could support aquaculture permitting and leasing issues without duplicating services already provided at a state or other level?

Participants shared the following ideas about a potential role for regional ocean planning, with “NROC” used often as shorthand for regional ocean planning:

- *Provide Advanced Warning of Potential Use Conflicts* – Prevent aquaculture from getting established in areas where other uses such as cables will be installed to avoid wasting effort in siting at locations where there are certain to be conflicts.
- *Provide Consistency in Site-Based Permits Across Federal Units* – Federal agency property owners such as the US Fish and Wildlife Service and the National Parks Service decide independently whether to allow aquaculture off their coastal property. It would be good to synchronize the permitting and requirements on federal agency lands and with the requirements of the coastal community in which they reside. Regional ocean planning could help agencies better define how they determine whether aquaculture will be allowed within their boundaries.
- *Share Best Practices* – NROC could share permitting process and lessons from current efforts including those described in section 3.1 among member states.
- *Address Consistency Implications of the Clean Water Act (CWA) and the Coastal Zone Management Act (CZMA)* – Both the CWA and the CZMA have consistency provisions. The CWA contains provisions enabling the US Environmental Protection Agency (EPA) to override state decisions that are considered inconsistent with the CWA, whereas the CZMA says federal activities in the coastal zone must comply with federally-approved state coastal policies.



Participants asked for clarity on how these pieces of federal legislation will work with regional ocean planning.

- *Increase Certainty for Developers* – Aquaculturists are seeking increased clarity about where aquaculture is and is not welcome. Participants discussed the potential role that ocean planning could play to help provide that clarity, and the role that academic institutions could play in identifying areas for development. People expressed varied opinions about whether doing this would reduce conflict among users. Some argued that regional ocean planning could encourage states to identify a certain number of best management practices (BMPs) that, if included in a proposal, would lead to permitting to begin an aquaculture operation. Regulators could identify BMPs to reduce conflicts or environmental impacts and encourage people to implement them by enabling those who do to more easily get permitted. For example, in New South Wales, Australia, aquaculture zones have been identified where sustainable expansion is allowed if you meet certain guidelines. In New England, a particular area could be designated a priority to enhance shellfish aquaculture if aquaculturists adhere to BMP practices.
- *Use SeaGrant as a Liaison* – The SeaGrant programs have many cooperative extension people throughout New England. NROC should share information through that existing channel, using SeaGrant as a liaison with the industry rather than communicating directly with the industry.
- *Determine and Coordinate Federal Support* - In other countries, federal land owning agencies are very supportive of aquaculture. In Australia, almost all of the oyster aquaculture operations are adjacent to National Parks. In the US, federal agencies and existing policies send mixed messages. Regional ocean planning could identify and seize opportunities to coordinate federal agency mandates and programs. For example, regional ocean planning could develop draft language for federal agencies that allows experimental aquaculture in federal waters or could encourage federal agencies to achieve expressed goals and targets for aquaculture development.
- *Develop a Federal Permitting Protocol* – Permitting is already challenging in state waters, and in federal waters would likely be more challenging due to the various authorities involved. The US Army Corps of Engineers (USACE) or another federal agency could coordinate all aquaculture permitting, setting out a protocol for how agencies should work together. A single coordinator in each region could be designated to organize agencies with permitting responsibilities.
- *Coordinate Multi-State Agreements for Fishery Management Plan (FMP) Species* – Shipping aquaculture products raised under an FMP between states requires enforcement compliance. Each state has its own agreement with growers on the documentation required to prove that products are farmed (not illegally wild caught), which results in a complex compliance issue for growers. There may be an opportunity to develop a multi-state approach to resolve this issue, or an exemption on a species-specific basis, especially related to aquaculture in federal waters. One suggestion was also for NOAA to create an overall FMP specific to aquaculture.
- *Determine Federal or State Law Precedence* – Regional ocean planning could provide needed clarification as to whether federal or state laws would take precedence in state waters once a regional ocean plan was established, if the two sets of laws did not align.
- *Facilitating Leases in Federal Waters* – Regional ocean planning could clarify how aquaculturists can get leases in federal waters, given that NOAA has a national aquaculture plan and is in charge of aquaculture in federal waters, but is without the authority to lease the ocean bottom.

- *Monitor Habitat Restoration* – There should be coordination among states on permitting aquaculture projects which have a habitat restoration component. The burden of monitoring habitat restoration may be heavy and could be shared regionally.
- *Accelerate the Social Contract* – Regional ocean planning could help raise awareness of aquaculture’s numerous benefits in order to advance public acceptance. One comment also suggested the need for additional educational (including work-force) opportunities.
- *Address Landside Activities* – The coasts and many coastal issues are enormously affected by landward activity and runoff, so regional ocean planning could include recommendations to the agricultural industry and other sources of coastal water degradation.
- *Help protect waterfront infrastructure needed to support aquaculture* – Preservation of working waterfronts and shoreline access is becoming increasingly important as other types of development compete for space, remove docking and berthing areas, etc.
- *Monitor Algal Blooms* – Federal agencies don’t monitor harmful algal blooms, though these eventually move into state waters. This becomes a food safety issue for aquaculture. Regional ocean planning should develop a uniform monitoring protocol among states to handle this sampling appropriately.
- *Promote the Industry* – Some participants noted continued public resistance to the development of the aquaculture industry, saying the industry will grow only when there are federal leaders who insist that aquaculture be supported. A regional scale might be the right one for discussions of shared goals and priorities across ocean users such as defense, energy, food security, and natural resource interests.
- *Jointly Consider Ocean Food Providers* – Regional ocean planning should break down barriers between fisheries and aquaculture, and consider these uses of the ocean as food production in a unified way, as people have done with respect to ocean energy. Together these industries have job and economic implications as well as sustainability opportunities.
- *Research International Examples* - It would be useful for NROC to develop a summary document of offshore aquaculture technologies being used, species being grown, harvest technologies, costs and marketing from other countries that might be transferrable to New England, such as Norwegian scallop aquaculture (which uses fixed areas on the sea floor).
- *Frame Permits Positively* – Regional ocean planning should focus on telling people what they can do (not what they cannot do). In that framework, ocean planning should consider thoughtfully how industries might be able to co-locate and work together more effectively, then support regulatory frameworks to achieve this goal.

### 3.3. Other Comments related to Permitting and Leasing

- *Rebuilding Fisheries* - Federal waters could be used in the future to rebuild collapsed fisheries with nurseries or sanctuaries, though these should not be too far offshore.
- *Competition with the Commercial Fishing Industry* – There is competition between aquaculture and those who harvest wild stocks, with very divergent price points and differing views of what particular geographic areas should be closed to fishing or aquaculture.
- *Scale* – Participants want the opportunity to grow sufficient populations of a species to develop a market and demand.

- *Supportive Regulations* – Growers need opportunities to experiment and learn lessons and have those inform more substantial regulations for larger operations. Yet they also need government regulations to prevent environmentally harmful activity that might cause poor public relations.
- *In-river Boundaries* – In MA, many towns are divided by rivers, in which case a certain point in the channel is the town boundary. It isn't always clear which town the permitted area is in. Participants asked to have this boundary issue clarified.
- *Habitats* - It is difficult to do research and development for offshore species in shoreside laboratories, since the habitats are different and some species live in one of these habitats but not in both.
- *Support Viable Species* - Grants and subsidies should support only species with market demand and that can flourish in New England. Using these criteria will help ensure that funding goes towards projects that are likely to become viable.

### *3.4. Regional Working Session Nuances*

While there were many similarities in comments made across the three aquaculture working sessions, each meeting had different emphasis and key points.

At the working session in Barnstable, MA, participants focused their discussion of leasing, permitting and coordination on opportunities and examples of agencies coordinating permitting decisions smoothly, and on the importance of early and frequent discussion with neighbors of aquaculture sites in order to identify and prevent conflict. They also noted that operational costs offshore will be higher than they are near-shore, which has implications for the size and resources needed to successfully establish and operate an offshore project.

At the meeting in Walpole, ME, participants focused on different ways to resolve the monitoring/modeling divide, giving examples of monitoring success in Maine, and on Maine's one-stop-shop for aquaculture leases as a good example of an efficient regulatory system. They also talked about offshore aquaculture as being at an early phase and the need to first learn more in exposed areas near to shore. Finally, participants discussed ways to support the growth of the industry by providing permits for different scales of operations and the need to learn as we go while preventing environmental damage.

At the Groton, CT meeting, participants talked about water quality and land-based activities that regional ocean planning could address, cultural resources, and water quality testing protocols that growers can use.

## **4. Current and Future Space Needs and Compatibilities for Aquaculture**

Participants were asked what trends they anticipate in the near and longer-term for aquaculture in New England. As part of this discussion, they were also asked to consider: What current and future technologies, particularly for offshore or open waters, should regional ocean planning consider? What general conditions or site characteristics would be needed for these technologies? And what should those involved in regional ocean planning be aware of as a possibility for the future?

4.1. The following comments were made with various levels of certainty about potential future trends in the aquaculture industry.

#### 4.1.1. General Trends

- *Increased Offshore Aquaculture Development* – Participants predicted a general increase in offshore finfish and shellfish aquaculture in the near term and longer term future. They also saw key challenges along the way:
  - *Physical Challenges* - Putting fish pens on open waters will require a stable working structure in the face of substantial wind, storms and physical forces. Issues such as an appropriately substantial anchoring system, use of radar detectors to assist with navigational safety, and other security and safety concerns are key for offshore sites. Getting to an offshore site in bad weather to monitor and maintain stock would be difficult, labor intensive, and costly. Participants identified the University of New Hampshire’s offshore demonstration site as an example that showed how the technology for siting structures in a high-energy environment for finfish (summer flounder, cod, black sea bass) and mussels could work.
  - *Costs and Scale* – Offshore aquaculture will require significant investment in gear and boats, and will likely attract bigger companies. In that respect, there may be more parallels with big agriculture than small farms. Current aquaculture tends to be relatively small-scale and is operated by individuals or small groups. Costs offshore will be higher than in near-shore areas: lines have to be thicker, boats travel further, and physical forces will be more intense. Those who successfully establish aquaculture offshore will need the knowledge, the boats and the money to do work under those conditions. If a salmon farm were proposed offshore, it would likely be a huge company proposing it due to high costs. The greater the distance from shore, the more sophistication and money is needed to raise product in a cost-efficient way in a high-energy environment. That said, some suggested that current offshore commercial fishing boats and crew could adapt to tend offshore aquaculture operations.
  - *Need for Early Development* – Offshore aquaculture is new, and no one understands it well enough today to select best practices. Some participants said the international aquaculture community isn’t ready to move offshore, and is instead focused on efforts to grow stock in challenging, exposed areas. Most aquaculture in New England is in the intertidal zone and involves a limited number of species. Moving offshore will involve technology that hasn’t yet been developed, so any guidelines developed now would need to be very general (preventing invasive species or significant pollution).
- *Conflicts with Commercial Fishing and Protected Areas* – There are likely to be increasing conflicts between aquaculture developers, commercial fishing interests, and proponents of marine protected areas over the same locations in the ocean. One suggestion was that shellfish aquaculture may be compatible with marine protected areas.
- *Increasing Restoration/Enhancement/Environmental Aquaculture* – A growing segment of aquaculture is focused on growing plant and other species for restoration projects.
- *Increased Submergence* – In the past 15 years, there has been a trend towards submerged aquaculture. Participants predicted this trend will increase, since it reduces conflicts with neighbors and other ocean users. Aquapods that can be brought up to harvest, clean or move

to a different site but are otherwise submerged are increasingly popular. Such innovations are catching on in Europe, where fishermen put live catch into offshore tanks to ensure a high quality product; these structures could enhance the value of fishing.

- *More Transient Aquaculture Gear* – Another opportunity may be to keep wild fish in pens that can be towed by a vessel, so fish can be harvested when the market is right. There may also be a way to engineer lobster gear so other species can be co-located with lobster pots. However, some noted that gear preventing fish from migrating when water temperatures change could be problematic for survival across seasons.
- *More Community Supported Fisheries* – Community supported fisheries, modeled on community supported agriculture, may enhance local market viability of grown species.
- *More Land-based Facilities* – A few participants predicted there will be more land-based culturing or hatchery facilities that use water from the ocean and then transfer species out into the ocean. This will require consideration by and connection with the aquaculture community.

#### 4.1.2 Trends for Specific Species

- *Long Line Blue Mussel Farming* – This type of aquaculture will likely be in production in the near future. It uses longlines attached to buoys and is appropriate for depths of 20 meters or more (10 meters to avoid conflicts with surface uses, then 20 feet or more for the socks to be suspended), in areas without water quality concerns, appropriate temperatures, and that lack concerns regarding red tide events. Lines can be up to a kilometer long, buoyed at each end and anchored. Cable lengths are an economic limiting factor at this time. Long-line farms need to be sited to minimize conflicts with deep draft vessels, fishing, or existing underwater cables or other infrastructure. Participants described longlines as an efficient way to produce mussels that takes more space than is available in nearshore areas. Some asked about whether there is a red tide monitoring protocol for federal waters and indicated a need for such a protocol and testing (noting paralytic shellfish poisoning closures off Rockport MA since 2005). They also raised concern about potential whale entanglement, but some suggested that there is expert opinion in the region and 25 years of data in New Zealand that entanglement is not an issue. Such technology is being pursued in Vineyard Sound and east of Cape Anne. Participants expressed hope that permitting will take less time once the protocol is developed.
- *Sea Urchin* – There is a substantial market for sea urchin, and some aquaculturalists are growing urchins off the coast of Maine to test viability. Sea urchins are grown on the seafloor in clean, cool water in appropriate depths with existing food sources (kelp, algae). In Maine, siting constraints include water depth and access.
- *Sea and Bay Scallops* – A few New England growers have gotten permits to grow scallops. There is a group of commercial fishermen and shellfish growers in Maine working with the Division of Marine Resources on a sea scallop pilot project, which will consist of cages on the sea floor or moored in the bottom third of the water column. The seed is currently caught in the wild, where there is an abundant supply, but this raises the issue of privatizing a public resource. Some prior scallop hatchery experiments have failed. There could also be whale entanglement issues, especially offshore.
- *Lobster* – Hatcheries in deep waters in New England might be appropriate.
- *Crab* – Crab aquaculture might be possible if they are grown in deep water.

- *Finfish* – Fish will likely be in cages, either visible or submersible. Participants identified a number of possible constraints. One is over the question of substitutability: can one white fish substitute for another? This is important as species preferences are hard to predict and influence profitability. Another constraint is that the cost of feed can be up to 60% of the cost of production, which can make this only marginally economically viable. Cages offshore would have to be visible to reduce collisions. Any governmental policies need to prepare for species preferences and dominance to change over the decades. Some participants suggested the potential for farming salmon and bluefin tuna (the latter being farmed in Japan). But there are many outstanding questions about the tuna reproductive cycle that make farming tuna difficult; aquaculturalists take hatched fish from the wild and grow them in cultures, which raises concern about impact on wild stock with any escapees.
- *Aquatic Plants* – Participants anticipate increasing aquaculture of aquatic plants of various kinds for various reasons. They said it is currently one of the top one or two organisms produced in the world, describing huge seaweed farms in Asia. People may choose to grow aquatic plants as finfish feed, fertilizer, biofuel (which would generate huge demand), a source of carbon in carbon trading initiatives, food for humans, and pharmaceuticals and nutraceuticals. In discussions about aquatic plants, participants flagged the following:
  - To make a profit, seaweed projects offshore would need high volume.
  - There are currently permitting challenges, for example in MA licenses are not granted for growing aquatic plants.
  - Participants wondered whether kelp could be raised in marine protected areas to entice fish to those areas.
  - Seaweeds may be wintertime crops with no mess or fuss, which will help in open ocean farming and might appeal as an off-season crop for some aquaculturists.

#### 4.1.3 Co-location

Participants said that integrated aquaculture (fish/seaweed or multi-trophic co-location) is likely in the future because businesses will be able to save money on their moorings, get a diversity of product, spread risks, and take advantage of metabolic waste products that can be used as to support growth of other species. One participant mentioned work in Canada and Maine to create a self-contained ecosystem (finfish produced, waste picked up by bivalves, dissolved organics picked up by algae with benthic organisms underneath that). Working session participants offered the following additional comments on possible co-locations:

- *Shellfish and Finfish* – In the future, co-location of shell and finfish might be possible.
- *Aquaculture and Wind Turbines* – Turbines will have solid anchors, power and boats traveling to them regularly. They will act as a breakwater and will provide an obvious place for shellfish to grow. Participants noted it is difficult to see the benefit to the wind developer of such co-location. Some participants felt that the licensing and regulations of energy platforms should be flexible enough to allow aquaculture to benefit. Participants stated that it is important that regulations on energy moorings not prevent the use of the structures for food/fishing in non-disruptive ways. They recommended that co-location of aquaculture with wind turbines be allowed as long as it doesn't compromise safety, noting that such co-location will also help concentrate ocean

development instead of allowing it to sprawl. Some noted examples where such co-location is underway in other countries and recognized that if co-location is to occur turbines must be designed to enable this to happen

- *Shellfish with shellfish* – Participants mentioned the possibility of having lobster pots ballasted with bags of mussels instead of cement. (Mussels are sometimes by-catch today in lobster harvesting).
- *Current examples*: People cited the following examples of co-location occurring today: blue mussels and sugar kelp, mussels and finfish, oysters and sugar kelp, and kelp, mussels and salmon.

#### *4.2. Regional Working Session Nuances*

At the Barnstable meeting, participants focused on the challenge of operating aquaculture in a high physical force environment offshore. They described efforts to permit new initiatives that were held up in the permitting process, and described some species they think might be viable for aquaculture soon. They also discussed some co-location opportunities with offshore wind development and with fin and shellfish.

In Walpole, participants talked about similar species to those discussed in Barnstable, and explored the topic of whale entanglement and opportunities to give whales good acoustic feedback on any sub-surface installation. They discussed the need for aquaculture innovation centers where people in the industry work with researchers and ocean engineers to help advance the industry. They also discussed a range of aspects of growing aquatic plants.

In Groton, participants discussed the potential expansion of finfish and plant aquaculture in New England. They also discussed the idea of integrated multi-trophic aquaculture, which has a self contained ecosystem to increase profit and reduce ecological impacts from waste.

### **5. Aquaculture Sector Data**

NROC is compiling data from agencies, industry representatives, and other organizations to create data products for the Northeast Ocean Data Portal<sup>3</sup>, which will serve to document and characterize ocean use and resources off the coast of New England. Data priorities focus on four key areas: ocean use data, administrative and cultural areas data, habitat data, and physical and oceanographic data. Related to the aquaculture sector, NROC showed examples including the Shellfish Mapping Atlas from the University of Connecticut, Shellfish iMap from Suffolk County NY, and Maine DMR's map of aquaculture sites.

Working session participants were asked to share their thoughts on a few different questions about data and information. The questions and their answers are summarized here.

5.1. What are the challenges and opportunities associated with developing and maintaining a regional map of aquaculture operations?

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<sup>3</sup> [www.NortheastOceanData.org](http://www.NortheastOceanData.org)

- Opportunities
  - *Partner with States* – NROC should partner with state fisheries agencies to develop and maintain maps of permitted or leased areas. Participants also noted the challenge associated with maintaining a map of current operations and suggested that such a map be accompanied by language noting limitations and suggesting appropriate use.
  - *Overview of the Industry* – Some participants said that having mapped information about the industry over time (locations, footprints, types of species harvested) will improve understanding of the industry. They said if NROC improved the quality of the data collected on the industry, this would be a significant step forward. People thought that a comprehensive regional map of current aquaculture operations would demonstrate that activity is already widespread and might alter public opinion on the viability and importance of aquaculture.
  - *Enable Future Siting* – In places where aquaculture isn't specifically excluded, people in the industry would like the option to site efforts in the future. They recognize the fact that other ocean industry users are identifying future sites of interest, and they are concerned that if they don't do the same they might be left out. Participants were more interested in maps depicting conditions that might be conducive to future aquaculture than in maps showing current aquaculture sites. Participants pointed to the benefits of maps that identify general areas that are potentially suitable for aquaculture but that require specific additional review. Maps of offshore areas might also be helpful to state agency staff who know inshore areas well but don't know the offshore areas. Alternatively, some participants expressed concern about identifying areas suitable for aquaculture because technologies are evolving and they didn't want to eliminate locations that might be viable in the future.
  - *Screening and Habitat Mapping* – Maps can help identify "no-go" locations such as where there's a cable or shipping lane. Working session participants affirmed that the kinds of data NROC is collecting will be useful at a screening level until developers and regulators require site-specific information. It is valuable to map past and current habitats, despite the fact that habitats change over time. Aquaculturists can use descriptions of site conditions to identify possible sites.
  - *Invasive Species* – NROC should collect data on invasive species that are likely to impact aquaculture projects. Mapping these species might encourage people to spend money and effort to address issues associated with invasive species. Participants suggested linking to MIT's data on invasive species.
  - *Physical Forces* – Growers would like to have maps that show data related to wave height, temperature, currents, and 100-year storm tracks. All this should be at an embayment (not site-specific) scale. It would also be useful to know patterns of water movement between different water bodies. These factors all influence business decisions and risk levels. Most people in the industry don't know where to find these types of data.
- Challenges
  - *Limited Resources* – Working session participants acknowledged that it takes staff time and money to keep data layers updated. Individual towns and even states may have



difficulty keeping their own maps up to date. In the long-term, it needs to be clear who will be doing data input and maintaining the maps in the data portal.

- *Lack of GIS Placement* – Old leases for aquaculture may not be available in existing GIS layers.
- *Incorrectly Selecting Potential Sites* – Several participants said that, at most, NROC should identify commercially viable sites only at the broadest level, since incorrect identification of places that end up proving to be unviable may cause developers added work and problems.
- *QA/QC of Data Sources* – Participants expressed real concern about the fact that some data sets are self-reported (and therefore less trust-worthy) while others are based on neutral monitoring. They highlighted the importance of paying attention to the source of data and whether it has been ground-truthed. They noted that an incentive exists for people to report incorrectly if they think they can lay claim to an area by doing so.
- *Ensuring Credible, Up-to-Date Data* – Participants raised questions about how to ensure that data remain current. For example, if organisms are spotted somewhere once and mapped in that location, will they remain on that map a decade later? Eelgrass beds, for example, move over the years, and it could make getting permits more difficult than it needs to be if permittees use outdated maps. The system needs to include a commitment to regularly reexamine the quality of data sets. Participants linked this back to the modeling/monitoring question and the importance of making decisions based on real-time, on site monitoring. One participant suggested creating an indicator that shows how frequently a data set is updated or a sort of credibility ranking.

## 5.2. What common data are needed for aquaculture siting and a better understanding of the industry?

Participants identified the following as information needs for seaweed aquaculture siting: bottom types (for anchoring and to select species), location of sewage outfalls and wastewater treatment facilities, harmful algal blooms and their prevalence to identify hot spots, marginal zones and safe areas, primary productivity levels, and 3D mapping. Participants also wanted information on the thermocline, not just vertical depth, since some sources of protein travel horizontally.

Participants also asked for data on (a) plumes from rivers and how far out they go, (b) cultural resources and archaeological sites in the region which might be off-limits, and (c) social and economic benefits of aquaculture (e.g., number of people supported, number of towns that rely on aquaculture, etc.), and (d) biological and social carrying capacity (i.e., how much aquaculture is acceptable?).

Other types of information suggested for aquaculture siting include:

- Public health information – bacterial and PSP closures, disease prevalence
- Water quality information
- Point source discharge sites permitted by EPA
- Nonpoint source discharge sites, when available
- Water temperature, overlaid by month or as a temperature overlay
- Currents

- Concentrations of marine mammals
- Bottom type
- Hazards to avoid, including disposal sites, unexploded ordinance, wrecks, dumping grounds and what is in them (i.e., what was dumped)
- Fishery closure areas, special management areas
- Military operations
- Submerged aquatic vegetation (SAV)
- Mooring fields
- LIDAR surveys that delineate shallow sub-tidal habitats
- Mooring Data – Conflicts in some places are largely around mooring and intensity of types of activity (e.g., lobstering). Maps of intensity of lobster pots per year would help the restoration community on where to enhance habitats for eelgrass and shellfish.
- And, finally, participants asked for more information to be collected on the robustness of the aquaculture industry. They asked for data on the extent that fishermen shift to aquaculture. And they wanted to know whether young people are going into aquaculture and whether it is seen as a good way to make a living.

### *5.3. Regional Working Session Nuances*

The participants at the Barnstable, MA working session focused their data discussion on the usefulness of habitat mapping for siting, and some socio-economic trends they would like more information about (e.g., the scale of the industry's economic activity, data on people shifting from fishing to aquaculture). They also flagged the crucial issue of limited resources at local and state levels to maintain GIS databases; this raised concerns about how up-to-date maps in the data portal will be.

Participants in Walpole, ME spoke extensively on the challenges of ensuring high quality, current data in the data portal and the risks of sharing poor or outdated data and letting people base decisions on it. They talked about the opportunity of having data on currents and physical forces in the water, and of a desire for more information on plumes, wastewater treatment plants, and other systems that affect water quality.

Participants in Groton, CT asked about who was supporting the data portal financially, who was making decisions about what was included in it, and which agencies were involved. They raised questions about the trustworthiness of the data and flagged the need to be sure that the data lack biases. Finally, the Groton participants were interested in trends over time that a map could show (in gear, number of leases, acreage).

## **APPENDIX 1: Working Session Participants**

### **November 28 – Barnstable, MA**

Paul Bagnall, Martha's Vineyard Shellfish Group  
Jay Baker, Fat Dog Shellfish Co.  
Alex Boeri, Fat Dog Shellfish Co.  
Sean Bowen, Massachusetts Department of Agricultural Resources  
Ona Ferguson, Consensus Building Institute (facilitator)  
Patrick Field, Consensus Building Institute (facilitator)  
Renee Gagne, Town of Chatham  
Madeline Hall-Arber, Woods Hole Oceanographic Institute Sea Grant  
Rachel Hutchinson, Town of Chatham  
George LaPointe  
Katie Lund, National Oceanic and Atmospheric Administration  
Sandra Macfarlane  
John Milliken  
Diane Murphy, Wood Hole Sea Grant & Cape Cod Cooperative Extension  
Nick Napoli, NROC  
Eric Nelson, Environmental Protection Agency  
James Reardon, AquaEnergy, LLC  
Thomas Shields, Massachusetts Division of Marine Fisheries  
Bob Wallace, Billingsgate Shellfish

### **December 10 – Walpole, ME**

Bob Albert, US Coast Guard  
Sebastian Belle, Maine Aquaculture Association  
Richard Clime, Coastal Enterprises, Inc.  
Barry Costa-Pierce, University of New England  
Ona Ferguson, Consensus Building Institute (facilitator)  
Erin Gott, Pope's Creek Oyster  
Jack Grundstrom, Ipswich Bay Cultured Clam Co-Op  
Ray Konisky, The Nature Conservancy  
George LaPointe  
Dana Morse, University of Maine  
Matthew Nixon, Maine State Planning Office/Maine Coastal Program  
Sarah Redmond, Maine Sea Grant  
Diantha Robinson, Maine Department of Marine Resources  
Stacie Smith, Consensus Building Institute (facilitator)  
Amber Tonry, Tonry Cove Seafood  
Chris Vonderweidt, Maine Department of Marine Resources  
John Weber, NROC

### **December 13 – Groton, CT**

David Alves, National Marine Fisheries Service  
Jim Arnoux, East Beach Farms, LLC

David Beutel, Rhode Island Coastal Resources Management Council  
Michael Bott, Delaware Shellfish & Recreational Water Program  
Joseph Buttner, Salem State University  
Lisa Calvo, Rutgers University, New Jersey Sea Grant  
Viola Cause, Shinnecock Shellfish Hatchery & Environmental Division  
Melissa Chalek, URI, Rhode Island Sea Grant  
Sara Cohen, Consensus Building Institute (facilitator)  
Azure Cygler, Coastal Resources Center, Rhode Island Sea Grant  
Tracey Dalton, University of Rhode Island  
Dennis Donnelly  
Ingvar Erlingson, Harbor, Ltd.  
Luke Fairbanks, Duke University  
Patrick Field, Consensus Building Institute (facilitator)  
Jeff Gardner, Shellfish For You, LLC, Watch Hill Oysters  
Seth Garfield, Cuttyhunk Shellfish Farms, Inc.  
Tessa Getchis, University of Connecticut Sea Grant  
Ray Grizzle, Granite State Shellfish  
Terry Hillery  
Rick Karney, Martha's Vineyard Shellfish Group, Inc.  
Shannon Kelly, State of Connecticut  
Jang Kim, University of Connecticut  
Ray Konisky, The Nature Conservancy  
John Kraueter, Haskin Shellfish Research Laboratory, Rutgers University  
Monique LaFrance, University of Rhode Island Coastal Resources Center  
George LaPointe  
Scott Lindell, Marine Biological Laboratory  
Andy Lipsky, EA Engineering, Science, and Technology, Inc.  
Kate Longley, SeaPlan  
Erich Luening, Aquaculture North America  
Steve Malinowski, Fishers Island Oyster Farm  
Jeff McKeen, Pemaquid Oyster Co.  
Ryan McPherson, Wild Fisheries  
Nick Napoli, NROC  
Aaron Reuben, Connecticut Sea Grant  
Robert Rheault, East Coast Shellfish Association  
Shawn Robinson  
Julie Rose, NOAA Milford Lab  
Debbie Rouse, Delaware Department of Natural Resources and Environmental Control  
John Scarpa, Florida Atlantic University's Harbor Branch Institute  
Chris Schillari, Division of Marine Fisheries & University of New Hampshire  
Bill Silkes, American Mussel  
Chuck Westfall, Thatch Island Farms

**APPENDIX 2: Working Session Agenda**

**AGENDA**

**AQUACULTURE SECTOR WORKING SESSIONS**

**Northeast Regional Ocean Council (NROC) Sector Outreach**

**WORKING SESSION OBJECTIVES**

- Provide an update on NROC and recent regional ocean planning efforts.
- Increase clarity and understanding around key issues facing aquaculture development in New England.
- Explore the role that regional ocean planning can play in addressing these issues from the growers’ perspective, and identify specific next steps to doing so.
- Discuss the current status of data and tools characterizing aquaculture in New England, and explore the role that regional ocean planning can play in improving and expanding this information base.

**AGENDA** (note: the agenda below was for the Barnstable and Walpole working sessions; the Groton session agenda was condensed to three hours total)

Time	Topic
9:30 AM	Arrival
10:00 AM	<p><b>Welcome</b></p> <ul style="list-style-type: none"> <li>• Welcome, introductions, and an overview of the day’s agenda – John Weber/Nick Napoli, Northeast Regional Ocean Council (NROC)</li> </ul>
10:15	<p><b>Overview of ocean planning and aquaculture activities in the northeast</b></p> <ul style="list-style-type: none"> <li>• Introduction to the Northeast Regional Ocean Council and Regional Ocean Planning – Nick Napoli/John Weber, NROC</li> <li>• Review of aquaculture activities in New England – George LaPointe, Consultant</li> </ul>
10:45	<p><b>Discussion of key sector issues and trends, and potential role for ocean planning</b></p> <p>Issue #1: Aquaculture Permitting and Leasing</p> <ul style="list-style-type: none"> <li>• Discussion               <ul style="list-style-type: none"> <li>○ What are the primary permitting issues and how are they being addressed?</li> <li>○ What lessons can be learned from the nearshore permitting experience?</li> <li>○ How can regional ocean planning help with permitting and leasing issues without being redundant?</li> </ul> </li> </ul>
12:00	Lunch (provided)
12:45	<p><b>(Cont.) Discussion of key sector issues and trends, and potential role for ocean planning</b></p> <p>Issue #2: Current and Future Space Needs and Compatibilities for Aquaculture</p> <ul style="list-style-type: none"> <li>• Discussion</li> </ul>

	<ul style="list-style-type: none"> <li>○ What current and future technologies, particularly for offshore/open waters, need to be considered for regional ocean planning?</li> <li>○ What general conditions or site characteristics are needed for these technologies?</li> </ul>
1:30	Break
1:45	<p><b>Discussion of aquaculture sector data</b></p> <ul style="list-style-type: none"> <li>• Overview of mapping and siting tools and regional data development efforts – Nick Napoli/John Weber, NROC</li> <li>• Discussion of data and tools <ul style="list-style-type: none"> <li>○ What are the challenges and opportunities associated with developing and maintaining a regional map of aquaculture operations?</li> <li>○ What common data are needed for shellfish, finfish and seaweed aquaculture siting?</li> <li>○ What online tools for siting are in development and how can regional ocean planning interact with these efforts?</li> </ul> </li> </ul>
3:15	<b>Recap and next steps</b>
3:30	Adjourn