Maryland Shellfish Aquaculture Industry Roundtable Workshop

November 29, 2017

Sea Grant
Maryland

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This report summarizes presentations, discussions, and results from the Maryland Shellfish Aquaculture Industry Roundtable, held November 29, 2017 in Annapolis, Maryland. The workshop, sponsored by Maryland Sea Grant, was to provide industry the opportunity to identify key topics and research questions needed to allow for growth in their industry in Maryland. The workshop agenda and select handouts are included in the appendices.

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A pdf of the report can be downloaded from the web at: http://www.mdsg.umd.edu/

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Introduction

Maryland Sea Grant has long supported aquaculture in Maryland. As part of our continuing engagement with the industry, Maryland Sea Grant hosted two paired roundtable workshops: 1) the Maryland Shellfish Aquaculture Industry Roundtable, held on November 29, 2017; and 2) the Maryland Sea Grant Aquaculture Researcher Roundtable, held on January 10, 2018. The first forum was designed to provide industry the opportunity to identify key topics and research questions needed to allow for growth in their industry in Maryland. The second roundtable workshop brought together researchers and industry to begin to develop research projects using the results of the first roundtable as starting points. In particular, these projects targeted federal aquaculture funding opportunities. This report provides information on the first Maryland Shellfish Aquaculture Industry Roundtable workshop. A subsequent report will summarize the second Maryland Sea Grant Aquaculture Researcher Roundtable workshop.

At the November 29, 2017 Maryland Shellfish Aquaculture Industry Roundtable workshop, Maryland Sea Grant met with local shellfish growers in Annapolis, Maryland to discuss potential research areas that could benefit and improve the aquaculture industry in Maryland. The workshop provided a forum for industry partners to voice their interest in participating and working with researchers to test and implement new innovations and technologies aimed at improving sustainable aquaculture in Maryland. Through this early engagement with key aquaculture industry experts, Maryland Sea Grant hopes to facilitate the building of industry and researcher partnerships leading to novel projects that can have immediate applied results to aquaculture.

Workshop Process

The workshop was planned by a steering committee comprised of representatives from Maryland Sea Grant (MDSG) and the Maryland Sea Grant Extension Program (MSGEP) with significant input from the aquaculture shellfish industry participants. A pre-workshop survey was sent to the roundtable invitees to gauge their interest in possible research topics to pursue. These topics were then synthesized into eight major topics that served as a focal point for small group discussions. In order to ensure that all participants understood the goals and purpose of the meeting, members of the steering committee gave brief introductory talks. Participants also received briefing books with materials outlining the background of the eight topics, the meeting purpose, contact information for the steering committee members, and two post-meeting surveys (Appendix I).

Participants were in groups of four to six at one of six roundtables. One or two facilitators were stationed at each table and helped participants discuss the eight major topics and identify problems they were experiencing and/or research needs in their businesses relative to each major topic. Participants were encouraged to frame their problems as research questions that would be more easily understood by researchers at a later date. Facilitators then reported out the key ideas/topics from each table, and these ideas were transcribed onto large posters. At the end of the workshop, participants selected the three topics on the posters that were most important to them. Following the meeting, these results were tabulated and redistributed to participants and interested parties. These topics were also used to generate discussion topics for a follow up workshop, the Maryland Sea Grant Aquaculture Researcher Roundtable held in January 2018. Participants were also encouraged to fill out two post-meeting surveys to capture their impression of the meeting and to assess their interest in further engagement with MDSG and researchers.

Welcome and Introduction Highlights

Dr. Fredrika Moser, Maryland Sea Grant Director

Dr. Fredrika Moser's introduction outlined the purpose of the evening's workshop and the role of MDSG to help connect industry to the research community. Dr. Moser emphasized the importance of early engagement with stakeholders

in scientific research and the need for innovative team building to address some of the complex problems facing the growth of sustainable aquaculture in Maryland, and more specifically, how researchers could help solve the problems participants were encountering that inhibited success in their businesses.

Mr. Matt Parker, Aquaculture Business Specialist

Mr. Matt Parker discussed what participants could expect if they were to partner in a research project. He gave an example of his work, in collaboration with Suzanne Bricker from NOAA/NOS, to test water quality parameters at oyster aquaculture facilities. Mr. Parker emphasized the rights and expectations that industry members should have when partnering with researchers on a project. For example, researchers should pay for product used during the research and reimburse participants for their time. He elaborated that industry members should be clear on their needs in a project's proposal process, so the researchers can include these items in project budgets. Mr. Parker also outlined that industry members should be clear on how much time they can afford to dedicate to a research project and not to let it infringe on their business. Strong communication across the team is critical for success with lines of communication established at the start of a project. Finally, he spoke about his extension role in helping industry develop their aquaculture business plans and submit permit applications.

Mr. Don Webster, Regional Extension Specialist

Mr. Don Webster gave a brief overview of the work he and his colleagues have done over the last couple of decades in support of Maryland's shellfish aquaculture industry. He also outlined University of Maryland Sea Grant Extension's role in assisting businesses in succeeding and connecting them with researchers. He encouraged participants to reach out to him and his colleagues with questions and continue to use him as a resource for aquaculture issues including remote setting, spat access, aquaculture gear testing, and both on-bottom and water column aquaculture.

Roundtable Discussions

Facilitators directed participants in discussions of research areas in eight major topics:

- Theft
- Permitting
- Shell, larvae, and seed availability/production
- Increased production
- Business, marketing, and sales
- Mechanization
- Post-harvest processing
- Other

Participants discussed possible solutions to each topic and researchers' efforts that might help solve these problems. As a result of the discussions, the participants came up with a valuable list of research topics (Appendix II). After the discussion, the facilitators at each table synthesized the research topic ideas for all the participants. All topics were then transcribed onto large posters positioned around the room so that all participants could see what their fellow industry members viewed as important problems. Many participants identified similar problems and potential research topic ideas. Participants then selected the top three research topics listed on the posters that were most important to them. These votes were tabulated and the results provided to participants and interested parties after the meeting.

Scott Budden, of Orchard Point Oysters in Rock Hall, makes a point. Behind him are Steve and Christie Gordon, oyster and clam farmers in Public Landing. *Photo by Rona Kobell, Maryland Sea Grant*

Post-Meeting Surveys

All meeting participants received two surveys (see Survey Results section). The first survey (anonymous) was designed to capture the participant's' perceptions about the meeting and their interest in taking part in similar meetings in the future. The second survey captured the participants' interest in continued engagement in research projects and with MDSG. The survey asked if they would like to participate in the upcoming Maryland Sea Grant Aquaculture Researcher Roundtable in January 2018, noting that the list of priorities generated during their roundtable meeting would be used as a starting point to jumpstart research initiatives at the January meeting. Finally, we invited participants to accompany MDSG to visit their congressional representatives to speak about industry needs.

Roundtable Summaries

The specific research topics generated at the tables are in Appendix II. Below are brief summaries of the eight major topics.

Theft

The participants stressed that theft of aquaculture products is a major concern for the shellfish aquaculture industry. The research topics they subsequently identified focused on two major components: 1) technology to prevent or improve monitoring of their leases; and 2) improve laws and penalties of theft. Suggestions of technologies included monitoring phone applications with real-time data capabilities that would notify lease owners of trespassers on their lease. They also suggested the need to improve relations and training for law enforcement to improve protection of their leases. Further, participants noted the need for strengthening laws and subsequent theft prosecution suggesting a need for stiffer fines and punishment.

Shell, Larvae, and Seed Availability/Production

The leading concerns were: 1) shell availability for planting new oysters; and 2) development of robust oyster strains to improve their survival across varying environmental conditions. Due to the high price of shell, participants were also interested in finding alternative substrates for bottom hardening to allow for successful growth of on-bottom aquaculture products. Another suggested solution for high shell prices and low availability of recycled shell was additional shucking houses in Maryland rather than sending product to Virginia for shucking. In order to address variable environmental conditions, farmers noted the need for a "super" oyster that could survive in various conditions, grow quickly, and taste good, or, alternatively, the development of multiple strains of oysters adapted for growth in specific regions of the Chesapeake and coastal bays.

Increased Production

One of the major production problems faced by the industry is the management of pests and predators on their product, specifically mudworms, cliona, flatworms, and sea squirts. There is also a need to reduce oyster mortality rates. In particular, the industry encouraged research to address early mortality in triploids and to reduce oyster disease.

Farm Optimization

Participants sought solutions to labor availability issues and the processing cost of their products. Suggestions included mechanized shucking, data collection on system optimization and mechanization in terms of farm size, and alternative technologies or solutions to final processing (i.e. grading, counting, washing, and packaging).

Pat Hudson Sr., an oyster farmer and Chesapeake Bay pilot, talks to University of Maryland Ph.D. student and Maryland Sea Grant Coastal Resilience and Sustainability Research Fellow Adriane Michaelis about the oyster business. *Photo by Rona Kobell, Maryland Sea Grant*

Permitting

Most of the research topics in this category dealt with modifying the current permitting process which can be arduous to navigate. Participants suggested research be done to determine ways to improve the permitting process. The sense among the participants was that a major permitting bottleneck exists with the U.S. Army Corps of Engineers. Additionally, permit modification often have a long waiting period, and the industry felt an important research topic was investigating improvement of permitting modifications for gear changes, transferring seed, and harvest methods. Other permitting problems that participants thought should be addressed included investigating interactions with wildlife and paired approved mitigation approaches, as well as improving ways to mitigate user-conflict for multiple uses of the same environment. Participants suggested some approaches to pursue included developing a positive aquaculture campaign and a more transparent protest process.

Post-Harvesting Processing

Participants expressed interest in research to improve cage effectiveness and longevity, including studies to develop better anti-fouling paints and investigate alternative cage materials. In addition, due to the wide variety of aquaculture gear available to farmers, participants were interested in research to help industry select the best gear for their farm size and type. Another research topic mentioned was for studies to be done on potential ways to modify oyster taste after harvesting by either adding flavor or salting the oysters.

Business, Marketing, and Sales

Participants identified the need for a marketing initiative to improve the perceptions of consumers toward Maryland-grown aquaculture products, with special emphasis on the values of aquaculture grown products versus wild ones. Also, since many participants have small operations, they were interested in better access to training on marketing, record keeping, and good business practices to improve their sales and requested help to develop such an effort. They also thought the formation of a Maryland Grower's Association could be a possible venue for these trainings and group marketing campaigns. Lastly, they requested the improvement of funding opportunities and insurance, especially with regard to the availability of aquaculture tailored products.

Other

Many of the topics were very specific and could not be captured in the above seven topics. Some of these topics included: the implementation of nutrient credits and a credit-trading program; development of a user-friendly mapping program for farms to use within their operations; development of an oyster information clearinghouse which could improve communication between growers, resource managers, and policy makers; and diversification of Maryland aquaculture products.

Survey Results

All participants, 24 industry members, were encouraged to fill out an anonymous post meeting survey to help evaluate the success and outcomes of the meeting. We received sixteen completed surveys. When asked what new information they learned at the meeting, 43% responded that they learned that their fellow industry members had similar issues that they did and that they weren't unique in experiencing these issues (n=14). 14% of participants said they learned about the engagement of industry and research (n=14). 100% of the survey responses said that they thought the meeting was well organized and that the speakers and facilitator were prepared (n=16). Most of the participants felt that the meeting was of value, and a few mentioned that they thought the meeting should be longer in order to facilitate longer discussions. 100% of the survey responses said that they would like to participate in this type of meeting again and would like to have it at least every two years (n=16).

Participants were also asked to fill out a separate survey to provide their contact information for future engagement (n=16). From the survey responses, we had 14 individuals interested in participating in a research project on their farm and 14 individuals interested in attending the Maryland Sea Grant Aquaculture Researcher Roundtable in January. Ten participants expressed interested in accompanying Maryland Sea Grant to visit their Congressional representatives and talk about the industry's needs.

Conclusions and Next Steps

From the survey results and anecdotal responses from participants, it is clear that the participants felt this was a successful engagement and they appreciated the opportunity to discuss their concerns. All of the research topics and priorities were sent to the participants and made available online on Maryland Sea Grant's website (www.mdsg.umd.edu).

In addition, the research topics were used to help generate some of the topics for discussion in the Maryland Sea Grant Aquaculture Researcher Roundtable held January 2018. At that meeting, researchers were encouraged to contact and work with interested industry partners to develop research projects aimed at solving some of the outlined issues. Additionally, participants were encouraged to contact Maryland Sea Grant and/or University of Maryland Sea Grant Extension for any additional questions or concerns.

Acknowledgments

Maryland Sea Grant and University of Maryland Sea Grant Extension would like to thank all of the following facilitators and organizers for their participation in the workshop:

- Suzanne Bricker, NOAA/NOS, facilitator/editor

- Catrise Cannady, organizer
- Jenna Clark, Maryland Sea Grant, organizer/editor
- Jeannette Connors, Maryland Sea Grant, editor
- Shannon Hood, University of Maryland Center for Environmental Science, Horn Point Laboratory, facilitator
- Rona Kobell, Maryland Sea Grant, facilitator
- Don Meritt, University of Maryland Center for Environmental Science, Horn Point Laboratory, facilitator
- Adriane Michaelis, University of Maryland College Park, Department of Anthropology, facilitator
- Fredrika Moser, Maryland Sea Grant, facilitator/editor
- Matt Parker, Maryland Sea Grant Extension, facilitator
- Don Webster, Maryland Sea Grant Extension, facilitator

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Appendix I: Briefing Materials, Agenda, and Surveys for the Shellfish Aquaculture Roundtable

Shellfish Aquaculture Roundtable
Wednesday, November 29, 2017
4:00 – 7:30 pm

Welcome to our shellfish aquaculture roundtable discussion. We hope this will be of interest to you. Our goal is to work with you to help us develop possible research projects to benefit your business and the aquaculture industry in Maryland. We hope to build Maryland aquaculture into the strongest in the nation.

As a Maryland shellfish grower, you are the most knowledgeable about current and future problems that could be helped by researchers to benefit your business. Farmer input for identifying needs is critical to build bridges between research and industry. Together we hope we can address some problems that could lead to more profitable production.

Many grant opportunities we could apply for are coming up in 2018 from federal and state agencies. Maryland Sea Grant has been active in aquaculture development for decades and wants to continue to see our industry thrive and grow. Many of you have worked with us through our extension and research components in the past and we want to continue to build that partnership into the future. Hearing directly from you today will allow us to communicate your needs to researchers and better direct funding for projects in the future. We believe this approach, with your help will make us more successful in winning grants and helping answer aquaculture profitability questions.

From this meeting, we will have a follow up meeting January 10th with researchers who have the knowledge to work on priority issues. We are inviting researchers with interests in such diverse disciplines as biology, engineering, business, law, which could be most appropriate for solving some of the industry's problems. We will work with them to understand how your priorities can be turned into grant proposals. We hope, if you are interested, to include you and other growers at the January research meeting to talk directly with researchers. After that, those interested may be able to work with our extension specialists to begin matching you and researchers to help develop strong proposals to seek funding and work together to help address industry questions.

Please feel free to contact any of today at the meeting or in the future. In particular, if you have questions about what it might involve to join a research team, we would be happy to answer your questions. Both Matt Parker and Don Webster will be engaged every step of the way to help with this!

Fredrika Moser	Matt Parker	Don Webster
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SHELLFISH AQUACULTURE ROUNDTABLE

Wednesday, November 29, 2017
Annapolis, MD

4:00 Welcome and Structure

- Fredrika Moser, *Maryland Sea Grant Director*
  - Introduction to Maryland Sea Grant
  - Meeting purpose
- Matt Parker, *Aquaculture Business Specialist*
  - Industry participation in research projects
- Don Webster, *Regional Extension Specialist*
  - Growth of the Maryland industry
  - How Extension assists with this meeting and follow up

4:30 Table Discussions

- Each table will work on identifying problems and discuss possible research questions and solutions for each of the topic areas (list in packet) which were generated from industry member's invitation responses.

5:15 Table Discussion Outcomes

- Facilitators will present the information generated by their tables.

5:45 Dinner

- Facilitators write the discussion points on charts around the room to be voted on.

6:30 Group Discussion of Outcomes

- Share major points from the meeting
- Instructions on the end of meeting priority voting

6:45 Closing Remarks

- Fredrika Moser, Matt Parker, Don Webster
  - Thanks to participants
  - Future information flow
  - Program evaluation (please complete survey)
  - Future participation (please complete survey)
    - Aquaculture researcher meeting on January 10th, 2018
    - Congressional visits

SHELLFISH AQUACULTURE ROUNDTABLE

Wednesday, November 29, 2017
Annapolis, MD

Welcome and thank you for attending our Shellfish Aquaculture Roundtable. Our priority this evening is to identify research topics that can benefit your business and the Maryland aquaculture industry. Our goal is to form a team to make Maryland aquaculture become the strongest in the nation.

You know the most about problems you encounter that could be solved by research. Farmer input is critical to building bridges between research and industry. It has led to our nation becoming a world leader in agriculture and we can do the same for aquaculture by addressing problems that can lead to more profitable production.

Federal and state aquaculture research grants will be available in 2018. Maryland Sea Grant has supported aquaculture for decades and wants our industry to thrive and grow. Many of you have worked with our extension and research programs and we want to make that partnership stronger. This Roundtable will generate information to communicate to researchers, allowing them to compete for funding directed at projects generating results to respond to your needs.

After this, we will hold a meeting on January 10th for researchers who can work on your issues. We will invite members from diverse disciplines including biology, chemistry, engineering, business, and law who can address your problems. We will educate them about your priorities and work with them to turn those priorities into grant proposals. If interested, you can attend the research meeting to talk directly with researchers and afterwards, work with our extension specialists to interact with the researchers to develop strong proposals and work together to address industry needs.

If you have questions about the process or would like to attend the research meeting or become part of a proposal team, we would be pleased to work with you. Please contact any us and we will look forward to generating results that can build our industry and make it more profitable each year.

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TABLE DISCUSSION

Each table will come up with solutions or develop key questions that research can help solve for each priority. We would like the tables to:

Step 1. Identify the Problem. You are familiar with some priorities (e.g. theft, permitting) since they have been concerns for some time. During discussions at your table, the facilitator will help your group identify some specific problems associated with each of the draft priorities that you think might be solved through research. For example, if 'theft' is a concern, what part(s) of the problem are critical to solve? Is the solution based on government response alone? Are multiple parts of the legal system problematic? Are there potential technological solutions that you know of or can envision that can be developed to assist? For another example, if your priority is to 'increase production,' does that mean better surviving or faster growing animals? Would more efficient methods of planting, managing and harvesting be required? Are there problems with identifying or getting products to markets?

Step 2. Suggest a Solution to the Problem. Once problems have been identified, what would you suggest as ways to address them? Develop specific questions that need answers while the facilitator records your suggested fixes and research questions.

GROUP DISCUSSION

Facilitators will summarize what your table identifies as problems within priority areas and potential fixes and questions needing answers to solve them and provide the information to the full Roundtable. You will be able to agree or clarify the summaries as they are given.

END OF MEETING PRIORITY VOTING

Facilitators will place the priority information on flip charts during dinner. At the completion of dinner, please complete the post-meeting surveys and using the stickers provided in your packet identify on the flip charts the solution/question in each priority most important to you. This information will be used to inform scientists at the meeting on January 10th, 2018 about your problems and priorities. If you would like to attend the meeting, please fill out the Continued Engagement Interest Survey.

DRAFT PRIORITIES

This information was provided by industry invited to this meeting. Please note that these are not in any priority order and are recognized as not being a comprehensive list. We encourage you to add topics during our discussions.

- Theft
    - Increasing security of investments
    - Prevention of poaching
    - Lease security
    - Increased fines and policies regarding oyster poaching

- Permitting
    - Prolonged lease application process
    - Rule changes to support production

- Shell, larvae, and seed availability/production
    - Access/availability of quality larvae and seed stock
    - Shell availability

- Increased production
    - Increased market size survival
    - Increased harvest/profitability
    - Planting more oysters than can be harvested
    - Reducing agricultural risk

- Business, marketing, and sales
    - Creating campaigns for smaller farms to compete with large scale farms
    - Marketing and sales training
    - Assistance with business model creation
    - Legal assistance
    - Shipping/Direct retail logistics
    - Cash funding for farmers
    - Cost/benefit analysis of total oyster operation
    - Safety
    - Recordkeeping protocol and training

- Mechanization
    - Labor saving mechanization to keep cost down

- Post-harvest processing
    - Fouling of cages
    - Wash down/salt conditioning

- Other
    - Increased visibility into research
    - Increased public understanding of benefits (user conflicts?)

SHELLFISH AQUACULTURE ROUNDTABLE

Post Meeting Survey

1. What, if anything, did you learn new at this meeting? _____
_____
_____

2. Was the meeting well organized? _____
_____
_____

3. Were the speakers and facilitators prepared? _____
_____
_____

4. Did you think this meeting was of value? What, if anything, would you do differently? _____
_____
_____
_____

5. What is the one specific research project or idea you discussed today that most interested you? _____
_____

6. Would you like to participate in this type of meeting again? ☐ Yes ☐ No

7. If yes, how frequently?

☐ Every 2 years ☐ Every 3 years ☐ Every 4 years ☐ Other _____

8. Do you have any other comments to share with us? _____
_____
_____
_____

SHELLFISH AQUACULTURE ROUNDTABLE

Continued Engagement Interest Survey

1. Would you be interested in participating in a research project that directly involved your farm?

☐ Yes ☐ No

2. If Yes, what priorities would you be interested in being involved with?

_____
_____
_____
_____
_____

3. Would you be interested in attending the aquaculture researcher meeting (on January 10th, 10 am-3 pm)?

☐ Yes ☐ No

3. Would you be interested in accompanying Fredrika Moser (MDSG) to visit your Congressional representatives on Capitol Hill in January or February?

☐ Yes ☐ No

Name _____

Company _____

Email _____

Telephone _____

Best method of contact: ☐ Email ☐ Phone

Appendix II: Shellfish Aquaculture Industry Potential Research Interests

Below, we summarize eight potential aquaculture research topics generated by industry from the Maryland Shellfish Aquaculture Industry Roundtable meeting on November 29, 2017. Under each general topic is a list of specific research interests. Specific research interests ranked as a top priority by more than three industry participants are highlighted in bold and listed in order of priority (some research interests were ranked as a priority by up to 9 participants out of the 24 industry members attending). The list presented below is in alphabetical order and not by any priority ranking.

Business, Marketing, and Sales

- Improving chef-perception of wild versus aquaculture products
- Subsides including cash funding
- Personal marketing
- Temperature control in shipping
- Identifying key data points that are the most important to track
- Create Maryland Grower's Association
- Improve record keeping and training
- Better marketing of Chesapeake Bay oyster (statewide oyster trail)
- Price of MD oysters versus VA oysters (VA bushels are cheaper so shucking houses buy from VA, shells stay in VA and supply to MD is restricted)
- Insurance that is more realistic, better-suited/tailored to aquaculture
- Improved access and use of Maryland Agricultural and Resource-Based Industry Development Corporation (MARBIDCO)

Farm Optimization

- Systems optimization/mechanization relative to cost and farm scale
- Improved efficiency to address labor availability issues (e.g. counting/washing/boxing) and size grading
- Shucking mechanization

Increased Production

- Management of pests and predators (mudworms, cliona, flatworms, sea squirts, etc.)
- Alternative substrate for bottom stabilization
- Suffocation from siltation
- Early mortality in triploids
- Reducing oyster disease
- Mixing fines with cement to make artificial shell substrate
- Reasons for slow growth of some oysters under different estuary and grow out conditions

Other

- Nitrogen credits/Nutrient credit trading
- User friendly mapping/lease tracking (within farm activity)
- Oyster information clearinghouse (e.g. a news report of oyster happenings, calls for proposals, etc.)
- Diversification of what's grown in Maryland aquaculture
- Transparency in and timeliness of closures; improved communication among growers, resource managers, policy makers

Permitting

- Wildlife (including plants) interactions with gear and harvest methods (e.g. SAV, waterfowl, endangered species [sea turtle, sturgeon])
- Time: U.S. Army Corps of Engineers (USACE) needs more employees to reduce wait
- User-conflict for multiple uses
- Improved, transparent protest process for resolving permitting/legal issues
- Aquaculture enterprise zones
- Modifying leases to adapt to new gear
- Permits for transferring seed from one bottom lease to another

Post-Harvesting Processing

- Research on how to reduce fouling; conditions of cages
- Gear selection: optimizing gear for a given farm
- How to flavor/salt oysters
- Improved anti-fouling paints

Shell, Larvae, and Seed Availability/Production

- Alternative substrate
- Make a "super" oyster (e.g. low mortality, fast growing, good taste)
- Shell access and availability
- Remote setting on lease using shell from one's own lease
- Seed and larvae supply

- Creating a seed catalog for oysters (“Burpee Model”)
- Demand exceeds availability
- Economics of supply and demand issues

Theft

- Technology to improve monitoring of poaching (e.g. surveillance app that alerts by phone, real-time monitoring)
- Strengthen laws, prosecution, penalties for theft
- Improving relations with the Maryland Natural Resources Police (NRP) (better communication; better training for NRP officers)
- Better use of Maritime Law Enforcement Information Network (MLEIN)