

Food From the Sea Workshop Report June 2019



Courtesy of Oregon Sea Grant

Workshop to Design an Oregon State University
Center for Seafood Systems and Innovation
May 14-16, 2018
Newport, OR

Workshop Proceedings and Final Report

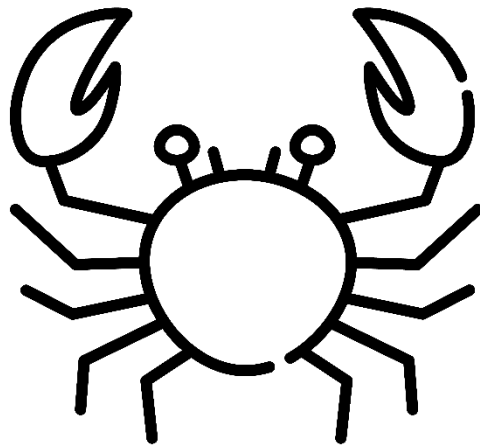
This Food From the Sea Workshop Report summarizes the activities, outcomes, and recommendations of the Food From the Sea Workshop. Gil Sylvia and Alison Storms were the lead writers, and Shelby Walker and Kristen Milligan provided editorial assistance. Alicia Lyman-Holt and Madison Delgado did the report layout and formatting. This report can be used as a guiding document for discussions and activities regarding the development of further Food From the Sea activities. For more information please contact marinestudies@oregonstate.edu.

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Executive Summary

Workshop to Design an Oregon State University Center for Seafood Systems and Innovation

May 14-16, 2018

Newport, OR

Oregon State University (OSU), together with industry, agency, and community partners, conducted a three day workshop May 14-16, 2018 in Newport, Oregon. More than 110 participants considered the future of seafood and ideas for developing a new OSU center focused on innovations in seafood systems research, education, and partnerships.

The concept of a center of excellence focused on seafood systems arose from four emerging and intersecting forces: 1) the creation of the OSU [Marine Studies Initiative](#)¹ and its focus on student experiential education, transdisciplinary approaches to marine research, and community engagement; 2) growing demand for seafood due to the rapid growth of the global human population; 3) the diverse and unique set of physical and human seafood “assets” at OSU, including industry and community partnerships; and 4) the recognition that a U.S. university-based seafood systems center of expertise did not presently exist.

This workshop was designed to advance planning, development, and implementation of a “*Food From the Sea*” center of excellence. Workshop objectives and principles included: 1) developing bold and innovative ideas for a center consistent with the MSI mission and objectives; 2) embracing entrepreneurship and systems thinking — from ecosystems to consumers; 3) creating value for industry, community, and state, national, and international partners; 4) improving the benefits, efficiency, and profitability of seafood value chains; and 5) being interactive, stimulating, encouraging networking, and featuring seafood whenever possible. The workshop included interactive “Ignite Sessions” and discussions, motivational panels and keynote speakers, culinary demonstrations, and tours of local seafood-related businesses and resources.

A *Seafood Systems Thinking* panel helped to motivate participants in understanding major drivers of regional, national, and international food and seafood systems and fundamental concepts vital for developing a successful center. Ignite Sessions focused on presentations on a current and provocative seafood systems issue or case study, and then a half-hour discussion by the workshop participants. Keynote speakers challenged the audience to think broadly and creatively and avoid using constructs that limit creative thinking and organizational possibilities, described the Iceland Ocean Cluster, which is dedicated to improving connections between companies and entrepreneurs in the marine industry sector, and

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emphasized 1) the “Blue” information-based economy, 2) rapidly advancing technologies (e.g., autonomous vehicles, sensors, acoustics, e-DNA), and 3) key OSU resources that can help support marine-related entrepreneurship (e.g., Advantage Accelerator, the OSU Entrepreneurship Center). A “world cafe” session allowed workshop participants to develop ideas for structuring, governing, and funding a seafood systems center.

Several overarching ideas from the workshop include: 1) it is important to integrate education/training, research, and partnerships consistent with MSI principles and Land Grant and Sea Grant missions; 2) industry and community partners must be authentically engaged in center design, governance, and activities; 3) an OSU seafood systems center should function as a trusted nexus and convener; 4) student education should focus on attracting, training, and supporting the next “generation” of seafood business, policy, and management entrepreneurs; and, 5) there is a need to expand beyond the traditional concept of an academic “center,” which may prove too limiting in terms of structure given the emerging ideas for organizing and managing the “center”.

Next steps include 1) synthesizing the workshop information 2) using that information to develop and finalize the design of the “center”, and 3) moving forward with implementation.



Acknowledgments:

Sponsors



Marine Studies Initiative

AquaFish Innovation Lab

College of Agricultural Sciences

Coastal Oregon Marine Experiment Station

This workshop was a convergence of many efforts to strategically scope and organize this three-day workshop. Sponsors, listed on the next page, were instrumental in helping to attract broad participation and provide essential financial support.

Workshop Organizing Committee

The “Food From the Sea Workshop Organizing Committee” worked for nearly a year to plan this workshop. The multi-sector membership was key to a successful event; for example, bringing dynamic discussion-based approaches to the agenda and diversity of participant perspectives. Since the workshop, we have received much positive feedback and thank all members for their dedication to the ‘Food from the Sea’ vision.

Gil Sylvia, [Oregon State University Coastal Oregon Marine Experiment Station](#) (Chair)

Laura Anderson, [Local Ocean Restaurant and Market](#)

Ed Backus, [Collaborative Fisheries Associates](#)

Caren Braby, [Oregon Department of Fish and Wildlife Marine Resources Program](#)

Christina Dewitt, [Oregon State University Coastal Oregon Marine Experiment Station - Astoria Seafood Lab](#)

Michele Longo Eder, *Commercial fishing business owner*

Chris Langdon, [Oregon State University](#)

Michele McClure, [National Oceanic Atmospheric Administration Fisheries](#)

Kristen Milligan, [Oregon State University Marine Studies Initiative](#)

Mike Okoniewski, [Pacific Seafood](#)

Aaron Shonk, [OSU Foundation](#)

Maggie Sommer, [Oregon Department of Fish and Wildlife Marine Resources Program](#)

Shelby Walker, [Oregon Sea Grant](#)

The Workshop Organizing Committee extends special thanks to the many individuals who contributed time and expertise during the workshop:

Chefs and culinary research faculty: Jason Ball (OSU Food Innovation Center), Angela Hunt (OSU Seafood Lab), Enrique Sanchez Rodriguez (Local Ocean Seafood), Enrique Garcia (Local Ocean Seafood)

Tour Leaders: Kaety Jacobson (Newport Dock Walk), John Moody (Pacific Shrimp Company), Tim Miller-Morgan (OSU Aquarium Science Program), Blaine Schoolfield (Molluscan Broodstock/Dulse Programs at HMSC), Liu Xin (Oregon Oyster Farms), Fran Matthews (Marine Discovery Tours)

Speakers: Carol Sanford, Thor Sigfusson, Rick Spinrad, Jack Barth, Gil Sylvia

Seafood Panel: Jeanne McKnight, Daniel Occhipinti, Katy Pelissier, Jim Anderson

Ignite Session Participants: Mike Okoniewski, Shems Jud, Jana Hennig, Tyson Yeck, Michele Longo Eder, Maggie Sommer, John Corbin, Gil Sylvia, Troy Buell, Laura Anderson, Sherry Flumerfelt, Thor Sigfusson, John Moehl, Tom Calvanese, Terry Thompson

Note-takers: Christian J. C. Commander, Sheanna Steingass, Tori Bohlen, Karen Law

Staff: Virginia Neylon, Sara Heimlich, Kristen Milligan

Logistics Assistants: Samantha DeVore, Renee Doran, Christian J. C. Commander, Sheanna Steingass, Michael Fernandez, Victoria Kee, Virginia Neylon, Marianne Stites, Maddie Delgado, Tori Bohlen, Dave Hansen

Facilitator: Jane Brass Barth

Food from the Sea Organizing Committee

The workshop built on strategic planning and scoping by a “Food From the Sea Organizing Committee”, whose efforts over the last few years helped to identify needs and opportunities for OSU leadership and partnerships to advance seafood systems work. Members noted with an asterisk () continue as the core committee to transform workshop results into concrete actions.*

*Gil Sylvia, Oregon State University Coastal Oregon Marine Experiment Station (chair)

Jerri Bartholomew, Oregon State University Department of Microbiology

Lorenzo Ciannelli, Oregon State University College of Earth, Ocean, and Atmospheric Sciences

*Christina DeWitt, Oregon State University Coastal Oregon Marine Experiment Station- Astoria Seafood Lab

*Michael Harte, Oregon State University College of Earth, Ocean, and Atmospheric Sciences

*Scott Heppell, Oregon State University Department of Fisheries and Wildlife

*Selina Heppell, Oregon State University Department of Fisheries and Wildlife

Chris Langdon, Oregon State University Coastal Oregon Marine Experiment Station

Robert McGorin, Oregon State University Department of Food Science and Technology

Michael Morrissey, Oregon State University Food Innovation Center

Dave Stone, Oregon State University Food Innovation Center

*Shelby Walker, Oregon Sea Grant

Introduction and Background

The globe, the nation, and the Pacific Northwest are facing extraordinary opportunities and challenges with respect to all aspects of food and agriculture, including the class of food known as “seafood.” The rapid growth of the globe’s population will add an additional 2.4 billion individuals and exceed 9.8 billion people by the year 2050. Feeding this growing population requires improving or changing production, distribution, and marketing systems to meet those needs at costs and prices that can provide global consumers with consistent food supplies that are high quality, nutritious, safe, and sustainable. Reflecting these needs is the rapid increase in global food production and international trade fueled by growing demand, improved production efficiencies and trade policies, industry consolidation, and rapidly evolving technologies.

These forces are impacting the rapidly expanding \$150 billion global seafood industry. Worldwide per capita seafood consumption has more than doubled in the past 50 years to approximately 15-20% of human-ingested protein; today, more than 55 million people are directly employed in seafood production. Although many fisheries are described as fully or overly utilized, improving resource management, addressing illegal, unreported, and unregulated (IUU) fishing, and reducing waste in production and within supply chains could increase the amount of primary production and marketed products by more than 20% (about 20 million metric tons). In addition, aquaculture, which is the fastest growing animal protein industry in the world, supplies more than half of all seafood consumed by humans, and by 2050 is expected to supply 75% of seafood globally.

The United States is one of the world’s major seafood nations and is a top five producer, a major international trader (ranking fifth in both imports and exports), and a global leader in fishery policy and management. However, there are major issues and challenges. For example, the U.S. may run a large seafood trade deficit of up to \$15 billion annually, and somewhere between 65%-90% of U.S. seafood consumption may be derived from imported products (the exact amount depends on whether twice processed products originally harvested in the U.S. but imported from Asia are included in the calculation).² Some of the underlying reasons for the deficit make sense: for example, that the U.S., as a wealthy country, imports high valued products (e.g. shrimp) and exports lower valued products (e.g., pollock). However, the fact that half of all U.S. imports are derived from aquaculture, combined with the fact that the U.S



² Opinion: To create sustainable seafood industries, the United States needs a better accounting of imports and exports; PNAS May 7, 2019 (<https://www.pnas.org/content/116/19/9142>)

ranks only 15th in global aquaculture production (even though the U.S. has one of the largest coastlines in the world, is endowed with significant water resources, and is a global leader in developing aquaculture technologies), has raised serious questions about U.S. aquaculture economics and policies. A second key issue is that over the last four decades the level of U.S. per capita seafood consumption (approximately 16 pounds per capita) has remained basically unchanged after rising steadily in the previous four decades (1940-1980).

The Pacific Northwest and Alaska support the most valuable commercial fisheries in the United States and are home to most of the U.S.'s largest seafood companies. Federal fisheries

are managed by the North Pacific and Pacific Fishery Management Councils. State fisheries are managed by Fish and Wildlife state agencies. The Pacific Northwest is also home to relatively large private shellfish and public salmonid hatcheries and ranching operations. Oregon's fisheries are supported by a number of private and/or public non-profit organizations including four seafood commodity commissions (Albacore, Dungeness Crab, Trawl, and Salmon). Most of



these commissions have made major efforts to achieve third party sustainability certification for their respective fisheries. The Oregon fishing and aquaculture industries have a reputation for innovation collaboration, and support of marine research and science-based management. Overall, Oregon has well-managed and sustainable fishery resources and seafood industries but faces unique challenges associated with resource management, changing market conditions, industry consolidation, enabling infrastructure, changes in ocean conditions, underutilized fishery stocks, endangered species listings, and an underdeveloped aquaculture sector. These industries also face growing competition for ocean space and other policy and resource allocation issues.

Setting the Stage

More than two years ago, a group of faculty at OSU began discussing ideas revolving around creating a Fisheries Center at OSU. These conversations were extensions of broader discussions to create “centers of excellence” as part of the developing [Marine Studies Initiative](#) (MSI).³ The group (the committee) agreed that the MSI provided a unique opportunity to develop a world class program encompassing a 21st Century “Food From the Sea” concept integrating natural science, ecosystem science, social science, policy/management, and “food systems” approaches consistent with MSI themes and vision. The consensus was that few research and educational institutions in the United States or across the globe take a comprehensive and interdisciplinary approach consistent with the

³ <https://marinestudies.oregonstate.edu/>

complex 21st century challenges inherent in fisheries, aquaculture, and seafood, including management and production, technology, trade, and marketing. Few institutions in the nation are endowed with as many requisite attributes as those found at OSU, including a broad diversity of key research and educational programs, core infrastructure, geographic range, and stakeholder support and engagement. The core idea was to create a center consistent with the principles of the MSI including experiential education, transdisciplinary approaches in marine research, and community engagement.

The committee developed a white paper outlining the arguments and assets to create a “Food From the Sea” center at OSU based on a holistic seafood systems approach. These included:

- Increasing demand for seafood due to the rapid growth of the globe’s human population;
- The diverse and unique set of physical and human seafood system “assets” at OSU including industry and community partnerships;
- The University’s experience in developing programs that integrate freshwater, estuarine and marine systems – from “ridgetop to blue-ocean;”
- The recognition that a comprehensive University-based seafood systems center did not presently exist in the United States.

Particularly noteworthy was the importance of coastal and ocean research at OSU (e.g., more than 30% of extramural research grants at OSU are marine related), the wide range of physical and human assets at OSU (including the Hatfield Marine Science Center campus), eleven colleges, an Honor’s College, and hundreds of programs and departments that are engaged in marine research, education, and outreach. Some of the most prominent of these institutions included the College of Agricultural Sciences, the College of Earth, Ocean and, Atmospheric Sciences, Oregon Sea Grant, Department of Fisheries and Wildlife, Cooperative Institute of Marine Resource Studies, Astoria Seafood Laboratory, Food Innovation Center, Oregon



Courtesy of Lynn Ketchum, Extension and Experiment Station Communications

Hatchery Research Center, Marine Resource Management Program, School of Public Policy, Coastal Oregon Marine Experiment Station, MSI Port Orford Field Station, and a wide range of co-located federal and state partners at OSU facilities.

The committee recognized, however, that these programs are scattered across at least five locations in the state, all OSU colleges, and many departments, programs and institutes. OSU does not have a central location to house seafood related organizations such as a School or College of

Fisheries, similar to those found at other Universities. The committee believed that a center would act like a virtual “school” to bring faculty, students, and stakeholders together in research, education, and engagement – the three cornerstones of a Land Grant and Sea Grant University and an underlying principle of MSI.

Given all these assets, the committee believed that OSU and partners were best served by a comprehensive approach that would embrace the entire seafood system – from ecosystem to consumers. The committee also decided to engage with partners and stakeholders in designing the center by conducting a workshop that would include participants from industry, resource agencies, and coastal communities. A dedicated workshop volunteer committee made up of representatives from OSU, the seafood industry, marine resource agencies, and coastal communities then spent almost a year designing the workshop, including developing approaches for involving a broad network of participants, creating engaging interactive sessions, securing sponsorships, and supporting collaborative partnerships.

Workshop Goals and Objectives

The primary goal was to conduct a workshop that would advance planning, development, and implementation of a Food From the Sea seafood center. Workshop objectives and principles included:

1. Developing bold and innovative ideas for a center consistent with the MSI mission and objectives
2. Embracing entrepreneurship and systems thinking – from ecosystems to consumers
3. Creating value for industry, community, and state, national, and international partners
4. Improving the benefits, efficiency, and profitability of seafood value chains; and 5) being interactive and stimulating, encouraging networking, and featuring great seafood whenever possible

To achieve these objectives the workshop committee focused on four basic activities: interactive “Ignite Sessions” and discussions, motivational panels and keynote speakers, culinary demonstrations, and tours of local seafood-related businesses and resources.

Workshop Activities

The workshop began with a *Seafood Systems Thinking* panel that included Daniel Occhipinti (Pacific Seafood), Katy Pelissier (Ecotrust), Jeanne McKnight (McKnight Group), and Jim Anderson (University of Florida). The panelists, all experienced in various aspects of food and seafood

systems, helped to motivate participants in understanding major drivers of regional, national, and international food and seafood systems and fundamental concepts vital for developing a successful center. Day 1 then featured a presentation by OSU faculty including Culinary Research Chef Jason Ball and Astoria Seafood Laboratory researcher Angela Hunt of an innovative seafood design concept (in this case, noodles made from fish protein). The first



day's agenda also featured the first Ignite Session, focused on the topic of "West Coast Groundfish".

Two keynote speakers wrapped up the first day. The first was Carol Sanford, a leading author and strategist who helps companies and their employees become more innovative,

entrepreneurial, and responsible. She challenged the audience to think broadly and creatively and avoid using constructs that limit creative thinking and organizational possibilities. Thor Sigfusson described the Iceland Ocean Cluster, which is dedicated to improving connections between companies and entrepreneurs in the marine industry sector. He focused on how the Ocean Cluster was formed and operates, and detailed the extraordinary range of creative value-added products being produced by young entrepreneurs using commercial fisheries products that go beyond traditional seafood concepts.

Each Ignite Session was organized with a half-hour panel presentation on a current and provocative seafood systems issue or case study, and then a half-hour discussion by the workshop participants at their tables using guiding questions, sticky notes, and facilitators. A subset of tables was then asked to give a brief report to all of the workshop participants detailing their reactions, including ideas relevant to creating a center.

Three additional Ignite Sessions (Infrastructure, Bioeconomic Modeling, and Aquaculture) launched the second day. The last keynote, given by Rick Spinrad, formerly Chief Scientist of NOAA as well as Vice President for Research at OSU, emphasized 1) the "Blue" information-based economy, 2) rapidly advancing technologies (e.g., autonomous vehicles, sensors, acoustics, e-DNA), and 3) key OSU resources that can help support marine-related entrepreneurship (e.g., Advantage Accelerator, the OSU Entrepreneurship Center). A "world cafe" Session allowed workshop participants to develop ideas for structuring, governing, and funding a Seafood Systems Center. This session was facilitated by prompting questions on required resources and partners, key activities, mission and values, stakeholder engagement, and revenue sources and costs.

The day concluded with a culinary presentation by Local Ocean Seafoods chefs and a sampling of seafood products.

Day 3 centered on further reporting-out of initial summaries from the Ignite Sessions and the world café, discussing who may have been missing from the conversation, and engaging participants in a discussion regarding next steps.

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Workshop Summaries and Highlights

Panel on Seafood Systems Thinking

Key themes and highlights from the panel discussion included:

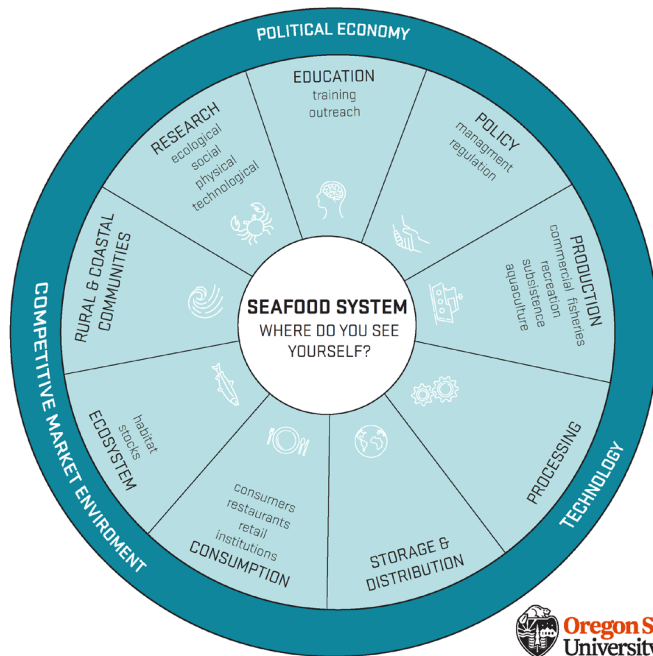
- Recognizing Local and Global Linkages: Seafood is the backbone of many coastal economies. However, the seafood industry participates in a global economy even while it works to help local seafood communities. America imports 90% of its seafood even though the U.S. is one of the globe's leading seafood producers. This is a challenge but also an opportunity, including increasing consumption of U.S. produced seafood products and/or increasing global consumption of American-caught products (e.g., Pacific whiting is now being marketed in developing countries).
- Understanding Consumer Needs: Consumers want predictability in seafood including consistent products and availability at the lowest cost.
- Improving Fishery Management Systems: Overall the United States has done a good job of developing management systems that conserve and protect resources but it often fails at developing systems that are economically efficient and nimble in responding to changes in the natural environment, and to changes in economic and political environments. Management solutions won't work if the behavior of the 'apex predator' is not thoughtfully incorporated, and humans are the apex predator. We need to understand humans to understand the overall economic-ecosystem connection.
- Recognize Contemporary Food and Seafood Issues: Noted issues include use of smart technology, food boxes, sustainability, organic and natural labels, food as medicine, and animal welfare.
- Support Industry Innovation: How can OSU help support industry innovation and generate greater value from seafood resources? This will require problem solving from students and employees from every discipline including food science, engineering, business, and marketing.
- Terrestrial Food and Seafood Systems are Inter-linked: Many parts of our food system are interrelated. Lessons learned from terrestrial food systems can be applied to seafood systems. Supporting infrastructure to understand and support 'farm (boat) to table' systems is complex and requires a networked approach. Major inefficiencies or inequities in food systems are often embedded within traditional systems developed over decades or even centuries. ***Intentional strategies are required to address food system problems: must think ridge-to-reef and sea-to-plate.***

Can OSU be a leader in developing science-based policy/management systems that are also efficient and nimble, based on actual human behavior?

- Food is the Indispensable Cornerstone of Human Well-Being: When food systems collapse, “human-beings stop acting civilized.” Food systems are dynamic and increasingly complex due to globalization. Analysis and understanding in support of functional, efficient food systems require comprehensive approaches that can look at the whole system. Minimalist or reductionist thinking will result in failure, if not tragedy.
- The Globe’s Growing Population: The planet will be inhabited by more than 9 billion people by 2050 and varied food production strategies will be increasingly important. Increasing global development and wealth will also affect food and seafood demand. For example, China’s rapid growth has resulted in their increasing role in both seafood production and consumption.
- Aquaculture’s Growing Importance: Aquaculture is the world’s fastest growing animal protein industry. By 2030, two thirds of all seafood consumed will be derived from aquaculture. Improving aquaculture technologies have led to rapidly decreasing costs as well as adoption of scale economies. Today there are many innovative operations considered improbable even a decade ago — for example, production of 10,000 MT of Atlantic salmon in land based systems outside of Miami, Florida (with the possibility of 90,000 MT when the system is fully built out).⁴

Seafood is now the most traded class of food commodities in the world.

FOOD FROM THE SEA



This is an example of a worksheet used in the workshop to illustrate a seafood system. See appendix III for a full size version.

⁴ <https://www.miamiherald.com/news/business/biz-monday/article205736704.html>

Keynote Speakers

***Living Systems Thinking for Innovation*⁵ – Carol Sanford:** This presentation challenged the audience to think broadly and creatively and to avoid using paradigms that limit creative thinking and organizational possibilities. “Centers” are collecting points for energies on a subject or field and should function as a healthy living system. She emphasized the need to develop approaches that allow a center to continually evolve in a process she termed “systems actualization.” These systems build force by placing all intersecting and opposing energies into the same process and act as a “cyclone” to attract ideas, concepts, and energies. Successful centers create unique perspectives and shine a light on essential characteristics.

To help the audience develop concepts for a center she provided slides and a handout on “living systems” and assigned the following questions:

- What is significant and needs to be remembered?
- What are the restraints to vitality and viability at each phase of the stream in the value-adding process?
- What are the challenges at each ring of the system beyond the actual ‘fooding’ process?
- What are the systemic considerations for the center?

***A New Way of Thinking in Seafood*⁶ - Thor Sigfusson:** This presentation focused on how the Iceland Ocean Cluster was formed and operates, including innovative value-added products produced by start-up companies using byproducts from commercial fisheries. Highlights of his talk included:

- IOC was set-up at time of financial crisis when fish landings and commodity revenues were decreasing.
- The goal was to support a mix of established companies as well as start-ups and very young entrepreneurs, including those straight out of school.
- From the beginning, IOC always had a positive income stream. Today there are 65 paying customers occupying the business space that are supported through networking and marketing. The largest companies pay \$20K per year; smallest companies pay \$1K per year; and start-ups pay nothing.
- The IOC pays the Port Authority \$500K per year in rent and charges \$600K per year to their tenants. Other IOC income includes guided tours which generates \$150K annually in income. The tours include discussions on both contemporary issues as well as emerging opportunities.
- There are no government grants or subsidies; however there are grants from the private sector (\$25K) that catalyze new companies.

⁵ Presentation slides available at

https://marinestudies.oregonstate.edu/sites/marinestudies.oregonstate.edu/files/carol_sanford_presentation.pdf

⁶ More on the Iceland Ocean Cluster here: <http://www.sjavarklasinn.is/en/>

- Finances and leadership are provided entirely by the business community.
- A venture capital fund also invests in start-ups and has sold interest in successful firms. The fund currently owns eight of the start-ups.
- Iceland now produces scores of non-traditional products produced from species such as Atlantic cod including clothing, bandages, furniture, and skin creams.
- Fishing companies do not necessarily receive higher prices for the products they provide to the IOC companies. However, in some cases they become investors in the start-ups they supply.
- As a result of value-added companies, Iceland generates 40% greater fishery/seafood revenue with 40% fewer landings compared to 20 years ago.
- IOC has informally franchised its concept to other countries including the United States (e.g., Maine (including a partnership with University of Maine) and Seattle, WA).

Food From the Sea: the Pull and the Push⁷ - *Rick Spinrad*: This presentation

highlighted that creating a powerful and successful center will require disruptive thinking, a technology focus, and a mission based on exciting and ambitious goals. Key points include:

- The “pull” of a Food From the Sea center includes pressures from global and national perspectives, including policies focused on ecosystem-based management, rights based management, community-based management systems, and federal support for advancing marine aquaculture development.
- Economic pulls include the U.S.’s \$14B seafood trade deficit and \$6.98B seafood industry trade with East Asia.
- Oregon is well positioned to advance seafood development – e.g., Astoria and Newport rank in the top fifteen ports in the country in volume of seafood.
- The “Blue Economy” will be defined by geographic advantage – in the Pacific Northwest fisheries is a key defining sector.
- Beyond extractive industries, marine environmental and biological information will be packaged into products supporting ‘seafood futures’, ocean catastrophe bonds, ocean energy products, ocean forecast derivatives, and national infrastructure management.



⁷ Presentation slides available at https://marinestudies.oregonstate.edu/sites/marinestudies.oregonstate.edu/files/rick_spinrad_presentation.pdf

- OSU is well-positioned to support a seafood center due to its numerous and diverse marine and agricultural programs, world-class facilities, faculty who are leaders in their fields, and its rich heritage of research, outreach, education, and service. OSU has been a center for developing strong national marine-related leadership including within NOAA and NMFS. OSU has also been a national leader in developing transdisciplinary approaches in marine education and research.
- The ‘push’ includes key technological opportunities for fisheries and seafood applications including dynamic vessel positioning, autonomous service vehicles, compressed remote sensing, environmental DNA, Ecological Marine Units (EMU’s), and blockchain and crypto-token currencies.
- A strengths/weaknesses/opportunities/threats (SWOT) analysis suggests:
 - A strength for developing a center at OSU is the “nimbleness” of the Oregon coastal innovation ‘ecosystem,’ and engagement of the fishing industry, processors, and coastal communities.
 - A challenge will be contracting with the full spectrum of required expertise, balancing specificity (local needs) with applicability (global attention); and finding an ideal model for structure and operations.
 - An opportunity is that there is no real competition in the US.
 - A threat is overseas competition in other regions including Northern Asia and Europe.
- Engagement strategies must go beyond the obvious to include organizations such as the Marine Technology Society, Amazon Web Services, Google, and Microsoft, etc., and conversations with national leaders such as Kathy Sullivan (former astronaut, geologist, and Board Member of the National Audubon Society) and Norm Augustine (U.S. aerospace businessman, former U.S. Under Secretary of the Army (1975-1977), National Medal of Honor for Technology and Innovation (1997)).
- The end game will mean that processors will have: 1) new production and market opportunities, 2) major engagement with different disciplines including computer science, business, and biology, 3) new applications for fisheries operations, and 4) partnerships with state and national politicians within a Blue Economy framework.
- The center’s operating and guiding principles must recognize that fishermen and scientists both share pride and passion for their work, commitment to sustainable marine resources, trust and support for coastal communities, and dedication to making research relevant to industry and society.

Ignite Sessions: Four Case Studies

Four “Ignite Sessions” were designed to encourage ideas and creative thinking to help in the focus and design of a Food From the Sea center. Each Session was organized around a current and provocative seafood systems issue or case study. Each Session began with a half hour panel case discussion. The panel presentation was then followed with a half hour discussion by workshop participants at their individual tables using guiding questions, and facilitators. A subset of tables was then asked to give a brief report to the other workshop participants, with particular focus under four topic areas: 1) Seafood System Issues; 2) Research Topics, 3) Education and Curriculum Needs, and 4) Stakeholder Training and Outreach. The detailed bulleted lists of the table and audience discussions for all four Ignite Sessions can be found in Appendix IV. The summaries that follow overview the discussions and opinions expressed by speakers and participants.

Ignite Session #1: 100,000 Metric Tons (MT) of Unharvested West Coast Trawl Groundfish: The Challenge and Opportunity

This Session focused on the challenge and opportunity associated with more than 100,000 MT of annually available groundfish off the West coast that remains unharvested. The panel was moderated by Mike Okoniewski, (Senior Advisor, Processing Operations and Fisheries Policy and Management, Pacific Seafood), who presented the broad issues associated with the case. Panel members included Shems Jud (Pacific Regional Director, U.S. Oceans Program, Environmental Defense Fund), Jana Hennig (Executive Director, Positively Groundfish), and Tyson Yeck (Vice President of Domestic Sales and Marketing, North American Sales Diamond Team, Pacific Seafood).

The Case: Over the last fifteen years, the West coast groundfish fishery has faced dramatic changes including: 1) major reductions in harvests of selected species including creation of no-harvest Rockfish Conservation Zones; 2) an industry funded buyout that reduced fleet size by almost 50% but left the remaining fleet with significant loan repayments; 3) implementing an Individual Transferable Quota (ITQ) program that capped individual ownership quota levels at approximately 2.5%; and, 4) successfully rebuilding most stocks and reopening most Rockfish Conservation Zones. Despite these successes and the major efforts to reorganize and



Courtesy of Oregon Sea Grant

strengthen the fishery there are major challenges limiting production and leaving approximately 100,000 MT unharvested. These challenges are multifaceted including loss of markets and competition from farmed and wild whitefish species, constraining caps on critical bycatch or “choke” species, and in some cases management of product quality along the supply chain. The challenge for the panel was how can universities such as OSU, the

Pacific Fishery Management Council, NGO’s, and the industry can help address these challenges and increase economic benefits to industry and coastal communities.

Panel Issues and Response:

- Failure to Proactively Plan and Understand Regulatory Impacts: There have been few fisheries in the United States that have done more to restructure themselves to improve conservation, harvests, and industry/community benefits than the West Coast trawl groundfish fishery – one of the most complex U.S. fisheries. Consistent with contemporary research, such fishery reform should lead to higher productivity and profit. In particular IFQ's should lead to "market" innovation and surgical strategies to create higher productivity/output and profit. Industry in many ways is now leading the way in gear research and managing spatial harvest strategies to reduce catch of "choke species." Despite adoption of IFQ's, old regulations still hamper efficiency and the adoption of a new and complex management regime has not yet lead to solutions – in fact they have created new problems. There remains a lack of understanding of how regulatory change and restructuring of fisheries impacts profits and industry success. Greater knowledge, proactive planning, and flexibility in adapting to change will be critical to addressing ongoing and future groundfish industry challenges.
- Need for Product, Market, and Food Systems Innovation: The West Coast seafood industry has tremendous passion and knowledge for their products and industry. However, most of their personnel have grown up in the seafood industry and may not understand the innovations occurring in the broader food industry. The seafood industry demonstrates innovation in harvest and production facilities but not products and markets. For example, today Pacific whiting is being sold in the same packaging and product forms as 35 years ago. Do we really understand what creates differential demand for black cod versus arrowtooth flounder? What types of innovation are required to improve production and marketing of dover sole or rockfish? There is a great need for more interdisciplinary thinking and transfer of food system knowledge across all types of food – especially seafood.
- Seafood is Focused on Production Rather than Consumers: Where in fisheries council meetings do consumers get represented? Seafood is treated primarily as a commodity. Contrast that to coffee, which is not commoditized – coffee stories are attached to most products, and consumers become committed to specialized brands. We have very little knowledge and data about seafood consumers. Trust is the single most important attribute of a product – what information is needed for consumers to gain trust in West Coast groundfish? Industry needs to go beyond concepts such as "local" and "traceable" and dig deeper to understand what a consumer wants in order to successfully market concepts such as "fresh" or "sustainable." There are also major differences between what a consumer says is important and how they actually behave when buying and consuming. We need to encourage industry to understand how consumers think and react to seafood characteristics and values, and to use that knowledge to improve the success of the entire seafood value chain.

Audience Response

- Seafood Systems Issues: The audience discussion focused on both the management and regulatory issues as well as market and consumer demand. The case suggested that seafood is not considered part of a food system, and that management decisions are made in absence of market knowledge. Many comments focused on the need for greater flexibility in management systems. Other comments focused on the greater need to understand seafood demand and consumer behavior as part of the system. A few comments noted the importance of understanding aquaculture markets (e.g., tilapia) and its competitive effect (or potential complimentary effect) on wild fish markets.
- Research Topics: Not surprisingly, there were more than 50 research topics listed by the audience that a center could tackle. Topics included every aspect of a seafood system including gear research and bycatch avoidance, seafood science technologies/innovation, economic research to maximize yield and value, and market and consumer research. A number of topics linked to needed research across the entire West Coast groundfishery as part of the seafood system.
- Education and Curriculum Needs: Similar to the research topics, there were numerous suggestions for education and curriculum. Many focused on the need for transdisciplinary courses that include policy, ecology, food science, business, and marketing. Fisheries and economic modeling courses were highlighted as were fishery policy and management courses linked to fishery and seafood businesses.
- Stakeholder Outreach and Training: Most outreach and training ideas focused on market issues. For example establishing training programs that included developing practices, standards, promotion, brands, and labeling emphasizing 1) wild caught and sustainable, 2) nutrition and quality, and 3) the West Coast groundfish story. There was significant emphasis on working with chefs and consumers. There were proportionately fewer comments on training associated with the policy and management side of the supply chain or outreach to address discarding or managing choke species.



Ignite Session #2: The Challenge of Developing Policy-Relevant Models for Fishery, Aquaculture, and Seafood Management: The Case of Dungeness Crab

The second Ignite Session focused on a recent effort to develop a bioeconomic model of the Oregon Dungeness crab fishery that could be used by industry and agencies to explore the fishery and improve resource management – specifically with respect to managing harvest of molted crab. Maggie Sommer (Marine Fisheries Section Manager, Oregon Department of Fish and Wildlife) presented the case and moderated the Session. Panelists included John Corbin (Chairman and Fisherman, Oregon Dungeness Crab Commission), Gil Sylvia (Economist and Director, Coastal Oregon Marine Experiment Station), and Troy Buell (Oregon State Fishery Manager, Oregon Department of Fish and Wildlife, ODFW). All three panelists had participated in the process to develop the model. The audience was asked to consider what a seafood center could have done differently in this situation: possible examples include managing the process, improving stakeholder interactions, and developing educational programs.

The Case: For a number of years the Oregon Dungeness Crab Commission had been focusing on concerns related to handling of newly molted crab by fishermen and the potential for significant mortality. The issue was highlighted during the process of obtaining Marine Stewardship Council (MSC) certification. The Commission initially sponsored research to investigate the extent of mortality of softshell crab due to handling during normal fishing operations. Based on the results of this research, the Commission contracted with OSU to develop policy-relevant bioeconomic analysis exploring the economic impacts of reducing harvest mortality of molted crabs with particular focus on reducing season length when softshell crabs are vulnerable. A major question was whether limiting the season would increase overall profitability in the fishery in the subsequent season. The research team developed two models. One model was statistically sophisticated and only used for academic research. The second model was an Excel-based tool for managers and industry. The model was flexible and interactive, with numerous graphs and tables, and included effects of policy actions on a range of possible management goals including profitability and fleet diversity. The model was intended to be valuable for policy analysis as well as an educational tool. The modeling team put together an advisory group of industry and ODFW personnel. Given the strong interest of the Commission, the advisory group included all Dungeness Crab Commissioners. Because the Crab Commission attended the advisory meetings and met quorum rules, the meetings fell under Oregon public meeting laws, which allowed the industry



and general public to attend the meetings. Some segments of the industry voiced strong concerns that the model would be used to limit industry participation through enacting earlier than normal season closures. With respect to the primary objective for the project, the model demonstrated, for example, that closing the fishery season eight weeks early (mid-June compared to mid-August) would generate a tradeoff of 2.5% reduction in fishing mortality (which included a 69% decrease in handling mortality) compared to a 1.0% reduction in annual profits (\$250K). After the final model and report were completed, the report was made available to the public. The Commission, however, made the decision to embargo the model due to concerns about selected modelling issues, and uncertainty over who could gain access to the model and how the model might be used.

Panel Issues and Response

- The Challenge of Engendering Trust: The Commissioners and ODFW had every expectation that OSU would be an unbiased source of research knowledge and policy relevant ideas. However, the original decision to finance the model was not without debate by the Commissioners who recognized that the crab fleet had different views about using season closures as a policy tool for management. The model itself revealed the extent of fleet heterogeneity – the fishery was not composed of a single crab fleet with respect to when vessels voluntarily exit the fishery, but between 5-8 fleets depending on vessel size and their portfolio of fisheries. The rationale for the model created distrust by those fleets that exited the fishery late in the season and would be most hurt by early closures. This potential reallocation of access and harvest rights stemming from regulatory change is a common policy problem in fisheries. The reallocation problem, however, was not the only source of mistrust. The model itself was built on a number of simplifying assumptions including a rate of natural mortality that was modeled as a constant during the entire life history of post-juvenile crab. Although the rate was consistent with the scientific research, both industry and agency folks believed the assumptions were inaccurate which raised questions about model results (“the Achilles heel of the model”). A third source of mistrust was with respect to industry’s relationship with larger institutions including the Crab Commission, ODFW, and Oregon State University. Although many industry leaders had general trust in these institutions, others in the industry voiced less overall trust in these supporting institutions which created concerns about the model and its intended purpose. The entire effort revealed a major irony – that a model intended to provide transparency and help demystify bioeconomic-based management contributed to reinforcing the lack of trust in institutions, models, and regulatory management.
- Layers of Risk and Uncertainty in Building Policy Models: Associated with the idea of trust are the concepts of risk and uncertainty, which operate at different levels of the research and policy problem. The bioeconomic model included a number of “uncertain” parameters and relationships. The research team tried to address these issues in a direct way including developing a manual, discussing parameter uncertainties, and creating flexibility in running the model to test parameter sensitivities. In addition, the complexities of the policy problem were reflected in the model design, which raised uncertainties about model inputs and outputs and what the

model might reveal under different model runs. And finally there was “policy uncertainty” about how the model might be used to influence future policy changes in the fishery. These uncertainties were intertwined and self-reinforcing, creating greater risk and reducing industry confidence in the value of the model for improving the fishery.

- Models as Research and Educational Tools: Although the lack of trust and uncertainties surrounding the model limited its application for improving management of the fishery, the model proved to be a valuable educational tool. For example, developing the model revealed the structure and behavior of the fleet and linkages with other Oregon fisheries. The model revealed the critical importance of natural mortality, that it “swamped” fishing mortality, and that research was needed to determine how natural mortality actually changes across the life cycle of the organism. The model was useful in helping the agency understand the relevance of fishery policies and the linkages between biology, fleet behavior, markets, and policy. Similar models would be valuable to the agency for helping to understand and manage other fisheries. The model could also be useful for exploring impacts of other issues (e.g., ocean acidification, climate change, domoic acid, cannibalism, and marine mammal and gear interactions).

Audience Response:

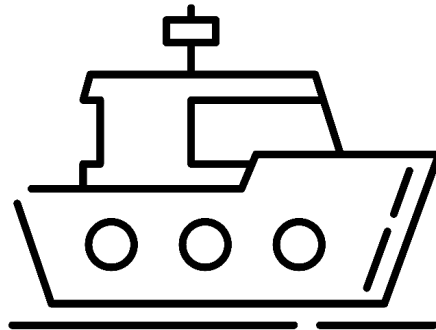
- Seafood System Issues: Not surprisingly, a core systems issue included the concept of “trust” among partners and stakeholders – especially given complex issues around policy, equity, and resource allocation. System concepts oriented around the idea that effective models must be placed within a broader policy and community setting – communication and transparency then become critical. Some suggested that the transdisciplinary process itself could be used to build trust. Other concepts touched on designing systems models that not only have strong predictive capabilities, but also have adaptive capabilities. Some questioned whether any model or system can truly be “policy neutral”. One comment noted that as a public resource, wild-harvest fisheries “food systems” operate with much stronger conservation mandates than land-based agricultural food systems.



Courtesy of Oregon Sea Grant

- Research Topics: Research topics reflected the issues raised by the panelists, including biological issues such as natural mortality across the life stages of Dungeness crab. Although not discussed as part of the case, environmental research issues related to Dungeness crab were noted including ocean acidification, hypoxia, and harmful algal blooms including domoic acid. Other research focused on designing effective bioeconomic models, developing strong communication and cooperative research programs, and integrating social science more broadly into modelling processes.

- Education and Curriculum Needs: More than 30 ideas were generated across a wide range of disciplines, education and curriculum ideas focused on social science (e.g., science and “model” communication, facilitation, ethics, psychology), business, public policy, and model building and quantitative training. One idea suggested creating experiential fishery internships for students on commercial crab vessels. A second idea was creation of “fish hackathons” to cross pollinate modelling with computer science, engineering and IT. A third idea was to build fishery and seafood courses around the concept of “life cycle”.
- Stakeholder Training and Outreach: Training and outreach suggestions focused on how to build trust through understanding and building cultural bridges, co-organizing workshops to demystify tools, developing creative graphics, conducting stakeholder field trips, and incorporating equity and inclusion in outreach activities. There were many suggestions to reach out to the fleet beyond the traditional fleet leaders, especially with younger fishermen, and engage them in professional development in research and leadership training. These were considered key ideas for building the center’s reputation as an “honest broker”.



Ignite Session #3: Innovation on Working Waterfronts: Developing Creative “Infrastructure” to Support Diverse Seafood Industries

The third Ignite Session focused on the importance of “infrastructure” (including physical infrastructure such as docks, jetties, and processing plants as well as financial infrastructure and human infrastructure that drives collaboration and innovation), and working waterfronts in supporting fishery development and entrepreneurship. Laura Anderson (Owner, Local Ocean Seafoods) introduced and moderated the Session which featured two examples of concepts for strengthening human, physical, and financial capital in working waterfronts to support fishery and seafood development. The panelists included Sherry Flumerfelt (Executive Director, Monterey Bay Fisheries Trust) and Thor Sigfusson (Founder and Chairman, Iceland Ocean Cluster).

The Case: Infrastructure is critical in supporting successful working waterfronts and driving innovation and entrepreneurship in fisheries and seafood development. The variety of infrastructure can vary significantly, cutting across human, financial, and physical dimensions. Lack of critical infrastructure will significantly impede development. Conversely, innovative and intelligent infrastructure can drive successful fishery and seafood value-related growth. The specific needs of the fishing communities and their geography, culture, fishery governance, and business climate will shape infrastructure design and investment and its success, as well as its challenges.

Panel Issues and Response:

- **Rebuilding Infrastructure in Small West Coast Fishing Communities:** Fishery infrastructure is composed of numerous elements that support and drive successful working waterfronts. Small ports in Northern and Central California, such as Santa Cruz, Monterey, and Moss Landing have been facing major challenges due to the West Coast Groundfish Disaster and subsequent loss of fishing vessels and processing plants. By 2014, these communities were at risk of losing access to the groundfish fishery. In response, community members worked together to ensure that remaining groundfish quota rights would remain in their communities by forming a community quota fund. With the support of the Nature Conservancy, Monterey Bay obtained 6 million pounds of groundfish quota worth \$2.5 million and formed a partnership with fishermen and the City of Monterey Bay. However, the local groundfish fleet and supporting community continue to struggle due to inadequate infrastructure, loss of markets, and competition



Courtesy of Lynn Ketchum, Extension and Experiment Station Communications

with foreign products. Obtaining quotas, while important, was only one element of critical infrastructure necessary to support a thriving fishing community. In response to these continuing challenges – the community looked to agricultural marketing models and created the idea of a local food hub to increase total seafood sales out of Monterey Bay. The Seafood Hub’s goal is to rebuild supply chains, connect buyers and sellers, and differentiate the Monterey Bay fishery through stories, messaging, and community outreach. The Seafood Hub together with the community quota funds, provides a broad range of business support including loans to fishermen and other seafood operations.

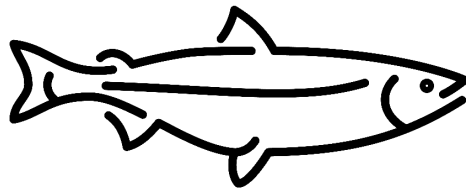
- Driving Value-Added Production through Clustering, Venture Capital, and Start Up Support: In a time of financial crisis Thor Sigfusson created the “Icelandic Ocean Cluster” – an organized “cluster” of individual companies located in the same physical complex in the port city of Reykjavik. The idea was that by bringing start-ups into the same space they could network for common benefit, attract investment funds, and be marketed and promoted under a collective brand. Many of the firms focused on creating innovative “value-added” products from seafood, seafood waste, and other marine resources. The companies pay differential rents depending on their status (e.g., largest companies pay \$20K, new start-ups pay nothing). Leadership for the Cluster comes from industry—not government or NGO’s. In exchange the companies get networking support for marketing and public relations. Rental income generates approximately \$600K per year. There are no government grants but other revenue includes income from tourism-based activity. A venture capital fund invests in promising companies and the fund now owns eight of the Cluster companies. The idea for the Cluster is spreading, and new Cluster Houses are being established in Portland, Maine and Seattle, Washington.



Audience Response:

- Seafood System Issues: Audience ideas indicated that infrastructure is a critical component of seafood systems and is a complex concept given its dimensions. Reflecting the themes of the two presentations, the audience recognized the need to retain vital infrastructure to support fisheries and fisheries development, as well as to commercialize good ideas and connect entrepreneurs with investment. They also noted the greying of the fleet and its potential connection with disinvestment at the port level. One broader strategy was to create brands and a narrative that connects to community and place. A key question was whether extra value generated by seafood innovations can make it back to fishermen to support fishery production and port infrastructure.

- Research Topics: Two sets of research issues were generated by the audience. One set focused on fishery community and port infrastructure. For example, do we understand the benefits and tradeoffs of a community holding quota versus an individual fisherman? Second, are we able to analyze macro versus micro drivers in fishery economic systems in order to make rational infrastructure investments? When is it best to invest in infrastructure to support a local and regional seafood system versus a national or international system? The second set of issues focused on the question of how to encourage an “entrepreneurial seafood culture.” How do we take advantage of byproducts and waste, identify emerging markets, and create greater value from fishery resources?
- Education and Curriculum Needs: Similar to the research topics, education focused around the same set of issues. The first issue focused around the concept that fisheries and seafood education should include courses, a degree, and/or certificate program on entrepreneurship and innovation. This could be an element of a transdisciplinary degree program in fisheries and seafood innovation. The second set of issues focused around building courses or programs around the concept of port and community sustainability and building vibrant working waterfronts.
- Stakeholder Training and Outreach: An underlying theme of the stakeholder outreach concepts was the idea that the center should be a bridge to facilitate connections between scientists, technologists, investors, and entrepreneurs to advance fisheries and seafood development. The center would be a one stop shop for students and stakeholders, it would provide training and expertise in entrepreneurship, and it would advance innovations and investment in creative concepts, including connection to financial resources such as banks, credit unions, and venture capital. The training would provide exposure to new technologies and “cross-fertilize” with other industries.



Ignite Session #4: Aquaculture: Opportunity or “Wicked” Challenge? Local, National, and International Perspectives

The fourth Ignite Session focused on aquaculture and the opportunities as well as the challenges for advancing aquaculture development regionally and nationally. Gil Sylvia, Director of OSU’s Coastal Oregon Marine Experiment Station moderated the Session. Panelists included John Moehl (Aquaculture Consultant), Tom Calvanese (Manager, OSU Port Orford Field Station), and Terry Thompson, (County Commissioner and Fisherman).

The Case: Aquaculture is the world’s fastest growing animal protein industry and today makes up more than 50% of global seafood consumption. The United States ranks in the top five in wild fisheries production and trade but only 15th in aquaculture production. The U.S. also imports more than 90% of its seafood, and at least half of that seafood is derived from



aquaculture production. Ironically, Oregon is a major aquaculture state but most aquaculture is managed by publicly owned salmonid hatcheries via ocean ranching (i.e., the release of juvenile salmon into the ocean and their harvest during their ocean phase or in the course of their migration back to the hatchery). Oregon has an estuarine shellfish aquaculture industry and a small set of inland trout hatcheries, but has the smallest private aquaculture footprint of any Pacific Northwest state. U.S. aquaculture is often perceived as

an industry with lots of intriguing ideas, but incapable of financial success. The panel and audience were asked to evaluate what strategies are needed to advance aquaculture success in Oregon, the Pacific Northwest, and the Nation.

Panel Issues and Response:

- Aquaculture as a Branch of Agriculture: For 140 years, U.S. aquaculture has primarily been driven by the need to enhance fishery resources – as a result it has been managed through public fishery agencies and considered a branch of fishery science and management. In reality, however, aquaculture is a unique form of animal/plant husbandry and has much more in common with agriculture than fisheries. This tension between aquaculture as either fisheries or agriculture has led to significant problems in advancing aquaculture development, especially in the marine environment where challenges around property rights and supporting governance has limited industry development. In Oregon, there have been recent discussions to legislatively consider

aquaculture as a branch of agriculture (under the auspices and coordination of the Oregon Department of Agriculture), with state agencies such as Fisheries and Wildlife playing important regulatory roles.

- Aquaculture Requires Systems Thinking: Successful economic development and business planning requires the ability to integrate across elements at a macro level (e.g., policy, regulation, business environment) and at a micro level (e.g., markets, technology, inputs, costs). Product markets are critically important (emphasis on a “market-first” approach), as is financing, transportation, processing, energy, disease management, geography, climate, etc. Aquaculture can be a ruthlessly challenging industry and the landscape and seascape are littered with failures. By their very nature, systems approaches require learning, failing, and adaptation. Aquaculture requires research and education – in and across – many disciplines. Like many agricultural and natural resource industries, it is a transdisciplinary industry and activity.
- Advancing Aquaculture in Oregon: Oregon has a complex relationship with aquaculture and there are ambivalent, if not negative, attitudes about the industry in government, communities, and the general public. These attitudes have developed against the backdrop of Oregon’s challenges to recover wild salmon and concerns about hatchery salmon, as well as broader national perception that aquaculture generates significant negative environmental impacts. In addition, some of the major investments (e.g., private salmon ranching) have proven to be major financial failures—as well as a politically challenging investment. More recently there has been a growing perception that aquaculture can be a sustainable industry and actually have positive effects on the environment (e.g., via filter feeding, oysters improving water quality in the estuaries). Recent research has shown that aquaculture has a relatively low carbon and ecological footprint if done correctly, relative to traditional agriculture. In general, there has been little effort to advance aquaculture in Oregon besides some recent nascent efforts by the Oregon Department of Agriculture and the Oregon Aquaculture Association to develop new investment strategies. There is, however, major new funding for aquaculture research and development from the federal government, and aquaculture development is a key objective in the Department of Commerce’s Strategic Plan for U.S. Economic Development.
- Importance of Community and Public Support: Major education and public relations efforts will be required to change public opinion and gain public and community support for aquaculture. The very word “aquaculture” is laden with misperceptions and confusion. This will require an honest and science-based discussion about both the benefits and challenges around aquaculture. It will also require “low hanging fruit” strategies (e.g., shellfish, seaweeds, self-contained recirculating systems) to develop aquaculture with carefully selected species in environments where there is positive or neutral environmental impact. Developing aquaculture strategies consistent with the state’s sustainable and “green image” will be vital. Community support and partnerships may be critical in order to get political and regulatory support if using publicly managed aquatic resources and environments. Because there is not currently

a large- or even moderate-sized private aquaculture industry in Oregon – with the possible exception of estuarine shellfish – the state has a relatively clean slate for developing an industry with a responsible footprint.

Audience Response:

- Seafood System Issues: Audience comments indicated that the negative perception of aquaculture and the associated lack of public support and political will have created an aquaculture business environment that has inhibited critical infrastructure, capital, labor and development of a supporting regulatory environment. A number of comments suggested the need to find approaches that would connect wild caught fisheries and aquaculture development in complimentary and mutually supporting strategies.
- Research Topics: More than 50 potential research projects were suggested by the audience. Many of the ideas focused on ways to advance aquaculture development by conducting research providing scientific data that demonstrates aquaculture’s potentially relatively low ecological footprint and identifies viable ecologically sound solutions. Other types of research should help identify opportunities across Oregon’s diverse land and seascape including location scouting, regulatory needs, resources, production options, processing, transportation, and markets. Research should identify viable species (including production methods, costs, and market demand) in marine, estuarine, and freshwater habitats.
- Education and Curriculum Needs: Many of the education topics focused on overcoming aquaculture’s poor reputation by developing aquaculture pilot projects in high schools, and by focusing on aquaculture systems as consistent with Oregon’s positive agriculture reputation. Aquaponics was noted as a system that, besides teaching aquaculture principles, could also be used to teach STEM principles. A second idea was to establish an aquaculture test facility to develop technologies and production systems for various species, and to use the facility for R&D as well as education and outreach.
- Stakeholder Training and Outreach: Most of the stakeholder training and outreach concepts focused on altering perceptions held by the general public and consumers through training that demonstrates how aquaculture can beneficially impact their communities. A second training concept focused around developing aquaculture incubators to support new aquaculture entrepreneurs.



The World Café Session: Exploring a Business Model for an OSU Center for Seafood Systems and Innovation

The “World Café” allowed workshop participants to develop ideas for structuring, governing, and funding a seafood systems center. The “World Café” approach is designed to increase networking and allow participants to rotate through subjects of their choice. The interaction was facilitated by core topics that included 1) key resources and partners, 2) key activities, 3) mission and value proposition, 4) stakeholder customer segments, 5) stakeholder engagement/customer relations and channels, and 6) revenue streams and cost structures. Each table was given one of these core topics and a set of four questions to prompt ideas that were written on sticky notes and posted. After 20 minutes participants, from each table rotated to another topic-table, reviewed the existing notes, and added any new ideas or concepts. Brief reports from each table were then presented to the rest of the participants. The activities at each table generated ideas for funding, governing, and structuring the center. These results are presented in the summary below and Appendix IV.

Key resources and partners

Physical Assets: A wide range of key resources were described to support the center’s services. Support from the University was considered key, as was physical space such as offices, meeting rooms, laboratories, and possibly housed in its own building. The center would need to be supported with effective connectivity (e.g., fiber for IT, telecommunications) and be designed to support growth over time. The center should have access to most University resources including research vessels and incubator space.

Human Resources: The center should include a diverse set of human resources consistent with the transdisciplinary themes of MSI and general principles of a Food From the Sea center. This would include a strong set of collaborators and groups dedicated to systems approaches. The center may also include a social media expert. One would anticipate up to 80 or more individuals directly connected to the center.

Partners: The workshop participants identified a wide range of potential partners including the fishing and processing industries, non-seafood industries, agencies and government institutions, community colleges, and consumers. Partners would assist in securing funding support and provide key skills, knowledge, technology, and values. They would also be valuable in supporting students and broadening their horizons. Partner organizations would play key roles in networking and participating in multidisciplinary and transdisciplinary projects and activities.

Today’s Participants and Non-Participants: The major workshop participants included the commercial seafood industry, government agencies, seafood commodity commissions, faculty, and some students. However, there were many groups that could participate with the center who were absent from the workshop including tribes, the recreational fishing industry, faculty from the College of Business, K-12 teachers, restaurateurs, the ecotourism industry, and major foundations.

Key Activities

Research Projects: A diverse set of research projects were listed and discussed including policy, management, and regulation (e.g., distributional effects of fishery management, land/ocean use conflicts, aquaculture policy and regulation), applied biology (e.g., stock assessments), seafood research (e.g., effective use of seafood byproducts, markets for underutilized species), technology (e.g., fishing gear research), and aquaculture (e.g., polyculture research, impediments to aquaculture). Research to evaluate ideas from other food systems and from other countries should also be included.

Education and Curriculum: There was strong emphasis on innovation, experiential and transdisciplinary education, and partnerships with Community Colleges and K-12. The center's position as an education and science "broker" was also stressed. Diverse ideas for training were considered, ranging from developing a Seafood Systems Curriculum and BS degree, to two-year apprenticeship programs, to aquaculture projects (e.g., STEM training in K-12). To enhance training at any level, the center must provide boats and access to the coast and ocean.



Courtesy of Coastal Oregon
Marine Experiment Station

Outreach and Engagement: A broad range of ideas for outreach and engagement were shared. Collaboration with industry and need for some type of governance or advisory board represented by key stakeholders was strongly emphasized. The group also underscored the role of the center as a broker and convener in regulation, management, and policy. It was expected that the center would provide accessible information to industry and the public.

Business Development and Workforce Training: The results re-emphasized the need for supporting concept-incubation and accelerating new seafood businesses. Some suggested that the center should provide access to business and legal skills for industry, including the fishing industry. The concept

of apprenticeships was reinforced. Training in aquaculture concepts (e.g., aquaponics), as well as utilizing wastes were also discussed.

Mission/Value Proposition

Activities to Support Stakeholders: Partnering with and engaging industry in applied but innovative ways was emphasized. Outreach should focus on the concept of seafood systems from "boat to plate." Financial resources were expected to incentivize engagement with the industry and community.

Specific and Targeted Ideas: The center should:

- Educate students so they are "industry-ready"

- Be a synthesizer of critical and systems-based information
- Utilize expertise, including from outside the United States, to strengthen education and research
- Focus on technology fields as well as approaches to innovate and commercialize new ideas.

Headlines Describing the Center’s Success: One of the prompting questions asked the participants to write a headline about the center’s future success. The responses emphasize both industry success and benefits for consumers. Examples include:

- *Oregonians live longer because of healthy seafood consumption*
- *Aquaculture keeps seafood plants open and maximizes economic and health benefits*
- *OSU center streamlines seafood from boat to plate*
- *OSU seafood center lays out strategy for 50 by 50 (50% of U.S. seafood consumption is met by domestic suppliers by 2050)*

Value to Communities (including those underserved/underrepresented): The center should provide accurate, usable, and well-communicated information. The center should be future-focused, using historical perspectives as an educational tool to avoid repeating past mistakes.

Stakeholder Engagement/Customer Relationships and Channels

Desired Approaches for Engagement: When considering engagement, the group suggested that:

- The center should go into communities and engage rather than expect communities to always travel to the center
- Use a broad set of tools including social media
- Host events and forums but make sure they are based on conversations and dialogues
- There was a strong emphasis on a facilitator and broker role for the center
- The center should help to revitalize the Astoria Consumer Seafood Center.

Best Practices: This question generated a broad range of ideas. For example, the center should:

- Function as a brain-trust hub for developing and communicating ideas
- Collaborate in research and education and in communicating and applying ideas
- Empower students as ambassadors by engaging them in courses with industry, as contributors to coastal communities, and as participants in commission and management meetings
- Develop online tools, forums, and webinars.

Stakeholder/Customer Segments

Who Should the Center Serve: The consensus was that the center should serve all groups. Groups should include students, faculty, the fishing and seafood industries, aquaculturists, coastal communities, resource agencies, all value chain sectors, consumers, trade associations,

recreational fishermen, entrepreneurs, pharmaceutical community, pet food community, etc. These stakeholder groups would best be served by focusing on research and education that is relevant, impactful, and produces real value.

What “Jobs” Could the Center Help with: This question generated a wide variety of responses that ranged from creating infrastructure to resource policy. Communication with the University and other stakeholders was critical, and the group emphasized that the center should act as a communication hub. The center should provide meetings rooms and connectivity to facilitate communication, discussion, and brainstorming across networks and among stakeholders. It should also provide space to incubate new ideas and technologies. The Food From the Sea center could also provide an opportunity for “reverse sabbaticals” for industry and stakeholders to work on projects, take classes, and receive specialized training.

Underserved Stakeholders: Participants discussed a range of underserved stakeholders that the center could serve directly or indirectly. For example, the center could directly help meet the needs of deckhands, the tribes, Latinx communities, seafood processing workers, and municipalities. Indirectly, the center could also help homeless children by improving local community seafood systems and community food banks.

Needed or Underrepresented OSU Relationships: The responses to this topic was similar to those regarding underserved stakeholders. However, it also reflected the earlier responses about who was missing from the workshop, which included downstream value chain members (retailers, restaurants), the culinary community, and the investment community. The center also needs to connect with the broader agricultural community to share educational ideas, research needs, and innovative and complementary concepts.

Revenue Streams/Cost Structure

This topic generated only a few ideas. Ideas included private partnerships to support targeted research, special student fees, and revenue from a seafood-oriented version of the Tillamook Cheese operation.

Other ideas included generating revenue by leasing space for research and product development, and by providing consulting services. Other major sources for funding included state dollars, federal dollars, and foundation funding, especially given the strong intention of the center to support community development. One question asked during this discussion focused on what participants would focus on if they had \$5M in new revenue to spend on the center. Two ideas were to invest most of these dollars in an endowment or invest in an aquaculture park.



Workshop “Wrap-Up” Session Summary

The third day of the workshop provided an opportunity to discuss the summaries of the Ignite Sessions and World Café as well as to “wrap-up” and discuss major issues, concepts, and questions. The reports from the Ignite Sessions and World Café are reflected in the respective summaries in previous sections of this report. The summary below highlights only those questions and issues raised in the “wrap-up” session that had not been highlighted elsewhere (See Appendix IV for details).

Major Questions

There were major questions about the ultimate mission, structure and activities of the center. These questions are consistent with questions raised by the Food From the Sea organizing committees. For example:

- Will the center be physically centralized, decentralized, or virtual?
- How will it fit within MSI and what resources will MSI and OSU provide?
- Is the geographic orientation primarily Oregon, regional, national, or international?
- What is the center’s temporal focus as well as its scale and scope?

New Emergent Themes, Issues, and Challenges

Most of the emergent themes that were discussed in the wrap-up were similar to the themes developed and summarized in Ignite and World Café sessions of this report. However, a few over-arching emergent themes, issues, and questions arose that deserve highlighting. These include:

- Integration and Networking as Core Concepts: The center should act as a “transdisciplinary” nexus/hub within the university but also connect to external partners and stakeholders. The network must function on two levels: 1) research, education, and outreach conducted by the center must meet the needs of both the University and stakeholders, and 2) the contributions and collaborations of all partners are leveraged.
- Need for “Big Questions”: To generate critical funding the center will need to address not only local issues but ask “big questions” consistent with national and international challenges. For example, in what ways can the center address global food insecurity?
- Connecting to Institutions across States: The center should serve as a nexus with similar institutions in other states and act as a model a model for other states and countries. State Sea Grant programs might be logical partners and function as distributed hubs that could replicate key aspects of the center.
- Imagery as a key education and communication strategy: The center’s systems emphasis on interconnectivity requires that imagery, (static and dynamic visuals, videos, pictures, art, and diagrams) be critical tools and strategies for communicating

and educating. Creative visual tools would support the use of language that is meaningful for a wide range of audiences.

- Identify and Establish the Center’s Core Mission: The workshop covered tremendous ground across diverse and complex seafood system issues and identified hundreds of potential ideas, projects, and stakeholders. However, this deliberate lack of focus raised some concern that the center could fail due to overreach and attempt to do too much with too few resources. While some in the workshop embraced the diversity of ideas, others felt that a more focused workshop would have been more effective in developing a defined mission and strategic plan.
- Research the World for Center Models: Participants expressed concern that the center might be prematurely designed without first exploring a variety of models – whether, seafood, agriculture, or other products or services. Many universities have built successful centers and organizations based on similar themes as MSI and Food From the Sea. These should be explored before developing the center’s architecture, governance, strategies, and programs.
- Avoid Creating another Fisheries and Seafood “Echo-Chamber”: Some raised the concern that the center will get lost among the maze of other seafood organizations, and that besides some new classes and training programs, it will add very little value to advancing the University and seafood communities and industries. One idea to “stand out” was that the center should place seafood within the larger context of the national and international food system, as well as the local food system.
- Create Meaningful Language by First Defining Terms: If successful, the center will need to effectively communicate to a variety of audiences and stakeholders. A number of participants noted that the workshop did not do a good job of defining key terms (e.g., what is a “center”, “institution”, or “initiative”) which contributed to some confusion and misunderstandings.



Summary of Workshop Themes and Findings

The following section summarizes workshop themes and findings that may be particularly relevant for designing and managing the center. To avoid replication, this section adds to the results from the World Café and Wrap-Up sessions. This summary list of themes and findings is in alphabetical order and does not indicate relative importance.

Aquaculture: The Ignite Session on aquaculture, plus earlier panel presentations, highlighted the importance of aquaculture as a significant sector of the seafood industry. Aquaculture production represents more than 50% of seafood consumed by humans and that volume is expected to grow to 75% within the next 25 years. Finfish, shellfish, and seaweeds all offer opportunities, but aquaculture ventures in the United States and the Pacific Northwest face major challenges including scarce funding opportunities, a complex and costly regulatory environment, lack of political support, inadequate technical infrastructure, and ambivalent or negative public perceptions. Similar to traditional commercial fishing, aquaculture would be expected to play a major role in Food From the Sea activities. Finding approaches so that aquaculture and commercial fishing can complement each other was a recurring theme in the workshop.



Courtesy of Lynn Ketchum, Extension and Experiment Station Communications

“Center”: The name of the workshop and potential name for the center (Food From the Sea) may be too limiting given that many of the products derived from harvested fish, shellfish, and seaweeds would be non-food items. The idea of calling the organization a “Center” was also challenged as being too “institutional,” too limiting in design options, and lacking brand appeal.

Communities: The importance of fishing and seafood communities was highlighted in almost every session. Communities were considered a critical sector of the seafood system, and would be major participants in Food From the Sea activities in research, education, and especially outreach. Issues such as infrastructure, working waterfronts, tourism, and related Blue Economy initiatives provide major opportunities for community engagement.

Consumers: The critical importance of consumer research and education was noted in many of the workshop sessions. However, it was also noted there is no organization representing seafood consumers. Typically consumers are accessed via retailers, panels, or surveys. Consumer targeted approaches will be an important element in developing center strategies.

Education and Training: This topic was discussed in every session and generated more than 60 ideas for classes, curriculum, and internships for relevant topics and industry sectors (see Appendix IV). Major themes included experiential-based and transdisciplinary education,

seafood systems-based education, and entrepreneurship. Integration with industry, high schools, community colleges, and OSU's College of Business was emphasized. Other areas including training in "big data", marine technology, and modelling.

Entrepreneurship: Entrepreneurship was emphasized as a fundamental concept for Food From the Sea and was reflected in discussions in all the interactive sessions. The presentation by Thor Sigfusson describing the Iceland Ocean Cluster underscored the potential opportunities. There was particular interest in linking entrepreneurship with student training, as well as in supporting commercialization of new products that utilize seafood waste.

Global vs. Local: Participants were strongly interested in Food From the Sea supporting local products, communities, and food systems. However, they also emphasized that the center must be global in scope to take advantage of international sea food system challenges and attract requisite funding. A major challenge is whether local and global can be integrated together as complements or synergies, or whether the center will need to focus primarily at either a local or global level.

Incentives and Financing: Across sessions, speakers, and panels, a variety of ideas on how the center could generate incentives for underwriting and leveraging resources to support programs and projects were discussed. Ideas included rewards for competitions in key challenge areas involving seafood technology and engineering. Other ideas included targeted scholarships for seafood system students, providing opportunities for student "entrepreneurs," or supporting recent graduates starting new companies (similar to the Ocean Cluster strategy). The center could also focus on understanding how to create incentives across seafood value chains to generate greater product value and profitability. Connecting seafood industry members to investors, innovative business developers, scientists, technology experts, consumers, etc. was proposed as a role for the center. It could also function as a hub and interface between investors and clients and develop a portfolio of financiers, underwriters, banks, and venture capital firms to support new seafood related ventures.

Industry Challenges: Four industry challenges were noted that either were not discussed in detail or that deserve special focus. These challenges could be a special focus of the center across its primary mission(s). These include:

- Growing concern about animal welfare – This raises both science issues (e.g., do fish feel pain?) and questions and alternatives to traditional fishery/aquaculture management and production methods.



- Negative perception of aquaculture – Although highlighted in the aquaculture Ignite Session, the concern was emphasized throughout the workshop and considered a particularly problematic issue in Oregon.
- Fishery management and its impact on community and seafood systems – Workshop participants consistently emphasized the importance of fishery/aquaculture management and failures, inefficiencies, inequities, or unanticipated consequences.
- Changing ocean conditions – Changing ocean regimes, climate change, ocean acidification and ocean hypoxia were noted as being major challenges for industry and coastal communities including creating significant risks and uncertainties.

Infrastructure: The Ignite Session on seafood infrastructure illustrated the complex system of underlying issues and underscored the need for comprehensive approaches for understanding the relationships between physical, human, and financial capital assets. Infrastructure was perceived as a critical issue in understanding and addressing concepts such as community resilience and sustainability. The two examples from the Ignite Session demonstrated the linkages between production assets, incentives, finance, marketing and an entrepreneurial spirit. Addressing infrastructure issues will require transdisciplinary approaches and systems thinking.

Innovation: The concept of innovation was prevalent throughout the workshop, reflecting an expectation that a Food From the Sea center must be innovative in all its missions, including research, education, and outreach. Related ideas noted during the workshop included the “art of the possible,” “going beyond the obvious,” “creative futurism,” “transdisciplinary creativity,” and “disruptive thinking.” Developing a center that is founded on innovative thinking will require a creative plan and resourceful leadership.

Interdisciplinary/Transdisciplinary: Although there may not have been complete understanding about concepts such as interdisciplinary or transdisciplinary among the workshop participants, there was a general understanding that a Food From the Sea center would need to include many different disciplines working collaboratively across the center’s missions. There was also a sense that working on complex, real world issues would help drive interdisciplinary/transdisciplinary solutions.

Mission: The workshop was not structured to develop a refined center mission (that is, the center’s purpose), or a mission statement (purpose, methods, audience, value). In fact the workshop was designed to do the opposite – to generate multiple ideas for potential purposes, methods, audiences, and values. The workshop made no effort to integrate these ideas into a coherent plan. However, the workshop was designed with guidelines and principles in mind which were clearly articulated to the participants. They were: 1) developing bold and innovative ideas consistent with the MSI mission; 2) embracing entrepreneurship and systems thinking; 3) creating value for industry and community; and, 4) improving the collaboration and profitability of seafood value chains.

Although it is impossible for any center to address all the ideas from the workshop, a review of workshop results and findings reveals mission-related themes related to workshop principles that echo throughout the report. Some of these include:

...addressing global food insecurity...
...innovatively harnessing OSU resources...
...catalyzing a “tornado” of seafood system ideas...
...employing innovative incentives...
...developing industry-ready leaders and skilled employees...
...being a bold but trusted and neutral convener...
...bridging and facilitating connections...
...embracing challenging seafood system issues.

Modeling: Ignite Session #2 on Challenges of Developing Policy Relevant Models generated a broad range of issues around the idea of using and building models. Examples include: 1) model building as “trust building,” 2) building models that are policy relevant but not policy directed, 3) models as education tools for exploring policy tradeoffs and concepts of risk and uncertainty, and 4) integrated models founded on interdisciplinary and transdisciplinary concepts. Although a focus on modelling was primarily due to the interactive session topic, the concept of “seafood systems modelling” could be a center activity and focus area.

Outreach and Engagement: Consistent with the idea that the center would reflect OSU’s mission as a Land Grant and Sea Grant College, there was a common theme that the center should act as a seafood education and information hub to support seafood networking across



Courtesy of Angee Hunt, COMES

key stakeholders, industries, communities, and educational institutions. The center would be expected to adopt a broad strategy of collaboration and partnerships, and to develop a portfolio of strategies for communicating with and educating multiple constituencies. Developing formal arrangements with industry – for example, implementing a formal advisory board -- would ensure that outreach and engagement remain a fundamental part of the center’s mission.

Policy-Management and Regulatory Systems: Concepts linked to fishery/aquaculture/seafood policy, management, and regulatory processes were perceived as critical parts of seafood systems and as having a major impact on industry development and economic and social benefits. The idea that the center’s work must be policy relevant was emphasized throughout the workshop.

Research Projects: More than 60 research-related topics and concepts were raised during the workshop. These topics included potential research focus areas, as well as methodologies and ideas to facilitate research concepts. Topics touched on every segment of the seafood system, from biology and management to consumers and culinary-related sectors. Given the possibilities, a significant challenge for the center will be determining what core research areas and approaches it will focus on relative to all the possibilities.

Stakeholder Training: Numerous ideas for stakeholder training were discussed, reflecting the range of potential stakeholders across the entire seafood system as well as possible topics. Ideas included training in leadership and entrepreneurship skills (as noted earlier), management training, consumer training, and training programs in high schools and community colleges. Many ideas focused on training that linked seafood with other economic sectors, including food and tourism. In addition to training of traditional segments (managers or vessel owners), training for non-traditional segments including fishing crew and plant line-workers were discussed. There was interest in providing hands-on training for university students and involving non-university stakeholders as partners in this kind of training. Use of training in conjunction with business incubators was discussed. There was particular focus on the need for aquaculture training, given the lack of industry knowledge, skills, and experience,

Technology Leader: The center should play a pivotal role in advancing design and use of hardware and software technologies in fishing/aquaculture/seafood research, education, and training. The group suggested this could be accomplished within the larger framework of Blue Economy initiatives. Helping to transfer technology to industry and stakeholders was considered vital, as were partnerships with industry in design and application of new technologies.



Trust: The concept of “trust” was discussed across many of the sessions although it was a key focus in the Ignite Session on Bioeconomic Modelling. Overall, OSU is considered a trusted institution, but trust is hard to earn and easy to lose. This is particularly true in the areas of fisheries and seafood, given the number of complex and controversial issues that cut across the areas of utilization, conservation, and sustainability. The center will need to develop thoughtful strategies to build and maintain trust with a broad range of internal and external stakeholders. This trust must extend across programs and projects and include industry and coastal communities as partners from the outset. The workshop raised key questions about building trust, for example: 1) can “transdisciplinary” approaches be designed to incorporate trust as a foundational concept; 2) can concepts of trust not only be core to the center’s mission but be employed as a vital element in increasing benefits across seafood systems; and 3) how can the center facilitate entrepreneurship, innovation, and partnerships while also protecting trade secrets and intellectual property?

Potential Center Concepts

While it is premature to determine the final center concepts resulting from the workshop, there were overarching ideas that resonated across speakers, panels, and sessions. A few of these include: 1) the importance of integrating education/training, research, and partnerships consistent with MSI principles and Land Grant and Sea Grant missions; 2) industry and community partners must be authentically engaged in center design, governance, and activities; 3) while a seafood systems center should not try to do everything, it must function as a trusted nexus and convener; 4) while supporting student education would be a key mission, a more vital mission would be attracting, training, and supporting the next “generation” of seafood business, policy, and management leaders and entrepreneurs; and, 5) the traditional concept of an academic “center” may be too limiting given the emerging ideas for organizing and managing the “center”.

The following eight ideas are a first cut synthesis of possible areas of focus for the center, given workshop discussions and emerging concepts. These are only example. These types of concepts can help kick-start ideas and thinking for the next phase of center design and development.

1. **Catalyzing Seafood Systems Thinking:** This would be the first center in the United States devoted to “holistic” seafood systems thinking. Many of the challenges in seafood development cut across seafood sectors and seafood disciplines. Management agencies have very little understanding at what drives value in the market; conversely, many market players have little understanding about the origins of their seafood and how those origins affect product value, supply, quality, consistency, and sustainability. The center would integrate the concepts of the life cycle and ecology of marine organisms as a biological resource with the life cycle and ecology of seafood in supply chains. The center would emphasize integrated and trusted transdisciplinary approaches in research, policy, management, and outreach, including seafood system modeling as well as more traditional bioeconomic modeling. The center would develop innovative curriculum in education and training for students, industry, and communities based on systems thinking to solve fishery, aquaculture, and seafood issues.
2. **Developing a Bridge to Communities:** The center will be a bridge that reaches out to communities and facilitates connections between scientists, technologists, investors, entrepreneurs, ports, and government agencies to advance fisheries and seafood development in coastal communities. It would act as a trusted connector for “Seafood Hubs” across local, national, and international seafood systems. The center would assist seafood communities in developing strategic and coordinated plans for maximizing the potential value of fisheries and seafood. Those plans would integrate physical infrastructure and human capital with concepts such as fishery management, fishery property rights, entrepreneurship, value added products, venture capital, and marketing and branding strategies.

3. **Advancing an Entrepreneurial and Leadership Seafood Culture:** Entrepreneurship and leadership are critical values for seafood success – those values must be imbued in students, fishermen, processing staff, company CEO’s, and agency directors. Leaders from different sectors and disciplines need to work together to solve problems at the firm and agency levels as well as tackling problems in the fishery or seafood value chain. The center would develop parallel and intersecting paths in leadership and entrepreneurial training. These values and skills would be embedded in courses as well as targeted in specific trainings. Leadership trainings for individuals from industry and agencies – especially younger individuals – could be sponsored by scholarships and focus on specific challenges and opportunities, with their solutions presented to a university/industry leadership group for feedback. Grants could also be developed to catalyze new companies with young entrepreneurs developing value-added products. Development of these companies could also be assisted by the University Advantage Accelerator program and other entrepreneurship programs. The center, using the new MSI Education Center and its incubation spaces, would also support new businesses developed by students, faculty, and young entrepreneurs. Competitions, grants, and scholarships would incentivize entrepreneurial activities and be co-funded by the broader industry. Fishing and seafood firms would be encouraged to invest in value-added companies in order to share risk and generate greater value for their fishery products.



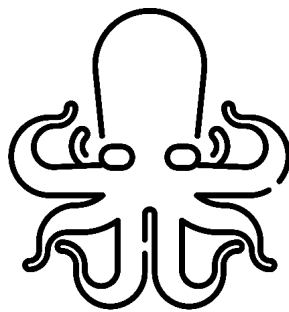
4. **Leading in Cooperative Seafood Education:** The center will develop and support a range of experiential and cooperative education programs in partnership with stakeholders. The center will work with industry, agencies, and NGO’s to improve experiential education that brings greater value to industry, students, and faculty. This may include developing internships (possibly tied to research projects) where students will work with fishing firms, aquaculture companies, seafood processors, fishery management agencies, and NGOs. Besides internships, the center will help develop formal “cooperative” education programs where students work for industry up to a year or longer as part of their educational experience. This could generate additional academic credits or certificates and masters level credit training.
5. **Designing a Fisheries and Seafood Technology Center:** Based on transdisciplinary and systems thinking, create a fisheries and seafood center with a prime focus on technology-based solutions. The center will develop partnerships among faculty, industry, and agencies to address technology issues in fisheries, aquaculture, processing, and related information systems. Projects will include undergraduate and graduate students and be collaborative with industry, agencies, and NGO’s. Awards and competitions will help drive creative solutions—for example a “fish hackathon” to cross pollinate modelling and technology with computer science, engineering, and IT.

6. **Fostering Collaborative Seafood Value Chains:** Recent research has demonstrated that seafood value chains classified as “highly collaborative” generate greater value and share product information at higher levels than chains that are dysfunctional or limited in their cooperation. Research has demonstrated that product information can produce a diverse array of benefits for each member of a value chain including product quality, inventory management, customer service, consumer relations, and dozens of other attributes. However, it is not well understood what conditions and dynamics lead value chains to be highly collaborative. There is also no existing institution that functions to bring value chain partners together and catalyzes activities, including sharing information, that bring greater value to firms – while also protecting privacy and intellectual property. Integrating research and outreach for supporting success along value chains can help build stronger seafood systems at local, national, and international levels.
7. **Catalyzing Value-Added Seafood Innovation:** Compared to other animal protein industries, seafood significantly lags behind in “high value” utilization of raw seafood byproducts – especially for value-added products. This includes intestines, skin, bones, and shells. In addition OSU has the only functional seafood laboratory remaining on the West Coast and a product design and development research station (the Food Innovation center) located in Portland. Together, these two organizations plus other departments at OSU create significant opportunities to drive innovative value-added production. Creating a collaboration with industry partners to drive value added production, together with other activities of the center including entrepreneurship and student engagement, could foster significant new value for industry and supporting communities.
8. **Developing Community Supported Aquaculture:** Like much of the U.S., Oregon has a complex relationship with aquaculture and there are ambivalent if not negative attitudes about the industry among government, local communities, and the general public. These attitudes have limited aquaculture’s development opportunities. Major education and public relations efforts are required to change public opinion and gain public and community support. This will require an honest, science-based discussion about the benefits, costs, and challenges of aquaculture. In partnership with local communities, it will also require smart strategies and species selection (e.g., shellfish, seaweeds, self-contained recirculating systems) that support aquaculture resulting in positive or neutral environmental impact. Developing aquaculture strategies consistent with the state’s sustainable and “green image” will be vital. It will also be important to develop strategies that connect wild caught fisheries and aquaculture development in complimentary and mutually supporting strategies. In addition, projects could be developed in conjunction with Community Colleges and High Schools by developing aquaculture pilot projects that focus on aquaculture systems. Aquaculture projects could also be used to teach STEM principles. Over the longer term a community supported aquaculture test facility could be developed for R&D based on systems approaches integrating production and marketing.

Conclusion

By all indicators, the workshop was a major success due to the commitment of more than 100 enthusiastic participants, as well as the hard work of the organizers, staff, and volunteers. Literally hundreds of ideas were generated to design, implement, and manage a Food From the Sea center as well as discuss possible projects and programs. The comparative strengths and assets of OSU to house such a center were reflected in the diversity of participants, their cooperative spirit, and their enthusiasm and support. While it is premature to determine any final Center concepts resulting from the workshop, there were overarching ideas that resonated across speakers, panels, and sessions including consistency with MSI principles, engagement with community partners, functioning as a trusted nexus and convener, supporting a culture of entrepreneurship, and looking beyond the governance structure and operations of a typical academic center.

The workshop organizers offer sincere thanks to the financial supporters and participants in making this workshop a success. The commitment, energy, and engagement of the participants was truly amazing. The next steps will be developing a cohesive set of center concepts and engaging the University – as well as industry, resource agencies, and community partners –in conversations and actions finalizing the design, implementation, participation, and support for the “center”.



Appendix

Please find our appendix files online by following the links

Appendix I- Participants⁸

Appendix II- Program Agenda⁹

Appendix III- Other Materials¹⁰

Appendix IV- Categorized Notes¹¹

⁸ Find at <https://marinestudies.oregonstate.edu/sites/marinestudies.oregonstate.edu/files/ffts-2018wsr-app1-participants.pdf>

⁹ Find at https://marinestudies.oregonstate.edu/sites/marinestudies.oregonstate.edu/files/ffts-2018wsr-app2-program_agenda.pdf

¹⁰ Find at https://marinestudies.oregonstate.edu/sites/marinestudies.oregonstate.edu/files/ffts-2018wsr-app3-other_materials.pdf

¹¹ Find at https://marinestudies.oregonstate.edu/sites/marinestudies.oregonstate.edu/files/ffts-2018wsr-app4-categorized_notes.pdf