

FORUM ON OFFSHORE AQUACULTURE IN THE PACIFIC NORTHWEST

ABSTRACTS

KEYNOTE ADDRESS

Realizing the vision for open ocean aquaculture

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It is widely acknowledged that future increases in seafood production will likely come from farming, not fishing. The growth of land-based and nearshore marine aquaculture in many developed countries is constrained by space, economics, and environmental concerns. For aquaculture production to expand, alternative approaches must be explored. Farming in open ocean waters has been a topic of great interest internationally, and is emerging as a sector with enormous potential for expansion. Wind and wave conditions in exposed oceanic environments pose significant challenges; however, technological advances over the past two decades have demonstrated that offshore farming of both finfish and molluscan shellfish is indeed possible, and that with further development, large-scale production can be achieved. This presentation will discuss the current status of offshore farming, the opportunities and constraints on growth of this sector, and international efforts toward realizing the full potential of open ocean farming. The potential for farming in waters off the Oregon coast will also be discussed.

REGULATORY, BUSINESS AND COMMUNITY PERSPECTIVES

The Federal Perspective: NOAA's Role in Developing U.S. Marine Aquaculture

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A federal agency under the U.S. Department of Commerce, the National Oceanic and Atmospheric Administration (NOAA) is focused on creating domestic seafood supply to meet the growing consumer demand for all seafood products. Domestic aquaculture can be an effective option to reduce dependence on seafood imports, provide jobs for coastal communities, maintain working waterfronts, complement wild catch, and increase regional food supply and security. The U.S. aquaculture industry has been held back by a lack of clear rules and regulations, particularly for federal ocean waters. Those interested in exploring the potential for aquaculture in federal waters have been unwilling to invest in operations until the government establishes ground rules for participants. In addition to regulatory certainty, participants in the 2007 National Marine Aquaculture Summit also recommended that the federal government support research and provide assistance to public-private partnerships to expand domestic marine aquaculture. Driven by the National Aquaculture Act of 1980, NOAA has a strong

mandate to enable additional marine aquaculture within the framework of its responsibilities to manage marine resources. NOAA's broad approach to aquaculture is reflected in a 2007 policy document, *A 10-Year Plan for Marine Aquaculture*. As part of the plan, NOAA is working to improve processes for reviewing aquaculture permit applications under existing laws and regulations and to enact national offshore aquaculture legislation that would set up a regulatory framework for aquaculture in federal waters. Growing interest in expanding marine aquaculture, including establishing aquaculture in U.S. federal waters, raises basic questions regarding the implications of marine aquaculture. Findings from a recent NOAA report highlight the economic opportunities and challenges associated with aquaculture. Other NOAA-led or funded research had addressed many facets of private and government aquaculture, including the aquaculture-based rebuilding of depleted finfish and shellfish stocks.

Offshore Aquaculture – California Perspective

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Aquaculture has become the fastest growing food producing sector globally and nearly half of all fish consumed now originates from aquaculture. The contribution of aquaculture to world food supplies is expected to increase as the human population increases, the nutritional advantages of seafood are being realized, and as capture fisheries reach their biological limits of production. Although California has the largest ocean economy in the nation and a coast-line covering 1100 miles, marine aquaculture in the state has not shown the same growth as it has elsewhere.

However, there is interest in developing sustainable offshore aquaculture. To do so will require aquaculturists to navigate the highly regulated California marine environments. In 2006, the California Sustainable Oceans Act was passed and has outlined rigorous requirements for marine aquaculture operations. Aquaculture in federal waters must be consistent with California regulations as prescribed under the California Coastal Act.

Aquaculturists need to have a clear regulatory environment in which to operate. In light of the potential gains from offshore aquaculture in the state, the absence of a coordinated federal regulatory system, the state's existing legislative and regulatory structures, and the interest in assessing commercial viability and environmental sustainability of offshore aquaculture, the California Department of Fish and Game is considering whether to assume regulatory oversight of prospective offshore aquaculture facilities in federal waters adjacent to state waters. This would include state registration of aquaculture facilities in federal waters, permitting appropriate species to be farmed, and compliance with California rules and regulations. Department of Fish and Game staff would assume regulatory duties and assist the farms, e.g. in health management, as they would any other California aquaculture facility. It is acknowledged that this is a new and complicated area of governance that will require cooperation amongst numerous stakeholders.

Aquaculture Industry Perspectives

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Offshore aquaculture will not develop as a significant business in the Pacific NW unless there is broad public acceptance that it is wise and necessary use of the resource. To develop this, states must provide leadership by, for example, creating aquaculture zones or supporting demonstration projects. Legislatively, states and the federal government must untangle the present permitting process. The artificial barrier between state and federal waters should not be allowed to impede progress. Coastal communities and the fishing community will be affected by large-scale offshore aquaculture development, which may be perceived as positive or negative. It is a dilemma common to all resource development and can only be resolved by balancing local versus regional and national interests.

For its part, the aquaculture industry must seek to develop and use aquaculture systems that limit environmental impacts as far as possible. But to expect zero impact is unrealistic. In fact, positive impacts of aquaculture such, as habitat creation and contribution to the Nation's seafood supply, must be weighed in any overall assessment.

As a primary production industry, aquaculture creates opportunities for a wide range of supply and service businesses. These include feed milling, equipment supply and servicing, processing and transportation. However, offshore farming is unlikely to be attractive to small businesses due to its specialized nature and requirements for capital, especially working capital, which is hard to finance. Moreover, as markets seek ever greater efficiency through consolidation and scale, high cost niche players will be squeezed. Niches will remain but it would be misleading to represent offshore aquaculture as a regional economic opportunity by suggesting that its practitioners can all be niche players. Having said that, today's increasing awareness of the cost of 'air food miles', supports the case that fresh seafood, at least, should be produced locally.

Fishing Industry Perspectives

Panel discussion – moderator Kaety Hildenbrand

TECHNICAL AND SCIENTIFIC ISSUES

Site and engineering issues

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Great advances have occurred in the development and commercialization of systems suitable for offshore aquaculture. The selection and effective use of these technologies depends heavily on the site, its exposure, the species, the scale of operation, and the available infrastructure. This presentation will cover a range of topics including cage size, cage type, mooring systems, feeding systems, cage maintenance, and other logistics issues related to fish farming in exposed locations.

Few practices common in sheltered-water fish farming can be applied offshore. Instead, submerged cage technologies offer a practical solution to working in high-energy environments. As a result of these new solutions an industry is emerging that can avoid some of the pitfalls normally associated with pen culture.

Motivated by the vast opportunities for seafood production in our EEZ, the US has emerged as the world leader in the development of the technologies needed for economically viable offshore aquaculture. Through the adoption of the right species, hardware, and husbandry strategies, profitable offshore aquaculture can emerge to supplement seafood production and it can occur in a way that does not harm the existing fisheries or the environment that sustains them.

Biological and husbandry issues

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Beyond the engineering and site selection models required to maximize benefits and minimize impacts, the development of a complete culture system for a new species requires the development of a sustainable source of seed (hatcheries), sustainable feeds and health management strategies. The Pacific Northwest is blessed with numerous native species that could be developed for offshore aquaculture. The relative ease of culture of a species is a function of its biology and physiology and how much research has already been applied to the species or group of interest or its close relatives. However, selection of a species for culture is not made just on the basis of ease of culture. Economics, social appropriateness and risk are also key parts of the decision. I ranked several native species or species groups that may be appropriate for offshore aquaculture in the Pacific Northwest. Each of five criteria will be rated on a 1-5 scale. The ratings are based on my own professional judgment but were guided by information published or generated by others. Therefore, these rankings are my own and should not be considered to be official or anything more than a way to begin discussions. The first two criteria are assessments of the maturity and technical

difficulty of the husbandry needed for each species in the areas of seed production and feeds. The third criterion is an economic rating based on the average price paid as listed from published sources. The fourth criterion is social. Species that are subjected to an existing commercial fishery will be rated low while species that are not will be rated high. The final criterion is a subjective measure of uncertainty where species that have more information about their aquaculture performance rate higher than species never reared in captivity. Species rated include various flatfish, rockfish, halibut, lingcod, wolfish, sablefish, marine algae and shellfish.

Environmental issues

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Marine aquaculture is inextricably intertwined with its impacts on fisheries and marine ecosystems. Although aquaculture offers a means to increase seafood supplies in a world with limited or declining fisheries, pursuing offshore aquaculture development without adequate safeguards for marine ecosystems could detract from seafood supplies more than not pursuing aquaculture at all.

Offshore aquaculture is patterned after salmon aquaculture in coastal waters, and can be expected to have similar, although not identical, impacts. Like farmed salmon, finfish raised offshore will be housed in netcages, which are vulnerable to at least four distinct and relatively well documented types of environmental problems:

- Escapes of farmed fish
- Magnification and spread of pathogens
- Water pollution and benthic impacts
- Substantial use of wild fish as feed inputs

The extent of these impacts in offshore aquaculture will vary with species raised, farm management, location, and other factors. Moreover, cumulative effects may be significant, even if those of individual farms are not. Offshore aquaculture impacts may be of particular consequence in areas such as the Pacific Northwest, with a number of relatively healthy and commercially valuable marine fisheries.

Effective government oversight of any offshore aquaculture development is essential to prevent harm to marine fisheries and ecosystems. At least two recent reports, U.S. General Accounting Office (2008) and Marine Aquaculture Task force (2007), recommended elements of an effective oversight system. These include: legislation mandating strong environmental standards for the siting and conduct of offshore aquaculture; a regulatory process for reviewing, monitoring, and responding to the impacts of aquaculture facilities; and a fully transparent regulatory process.

SOCIAL AND ECONOMIC ASPECTS

Business case study

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I will make a presentation that will cover the history and lessons learned from my experience of the past 10 years of owning and operating an offshore fish farm. I will discuss how to get permission and acceptance from the community, as well as operational concerns, site surveys and general equipment and labor needs.

I will also discuss what a business needs plan for about once its in operation, the challenges of being a part of a growing Industry, marketing, and most importantly it's role and responsibilities of being a part of the seafood Industry. I will also touch on the ever changing seafood industry and how petroleum fuel prices are affecting the industry, and more importantly aquaculture.

Economic Opportunities and Strategies for Developing Offshore Aquaculture in the Pacific Northwest

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There are only three fundamental sources for increasing seafood supply: 1) better management and utilization of wild fish stocks, 2) aquaculture and 3) aquaculture-enhanced 'wild' fisheries. However, nearly all significant growth in global seafood harvest and international trade over the past two decades has, and in the future will, come from aquaculture. This has important implications for fisheries management and the international marketplace. Offshore aquaculture in the US has the potential to substantially contribute to this growth.

The potential for growth and improved efficiency in the offshore aquaculture sector is tremendous. This is just the beginning. As the aquaculture industry grows, uncertainty in quantity and price will likely decline relative to that found in the wild fishery sector – aquaculture will gain market share. However, poorly defined property rights and the

legacy of inefficient governance associated with fisheries and the coastal zone are undermining the development of the offshore aquaculture sector in the US. Regions that address these management issues will gain market share and benefit from potential new sources of sustainable wealth for those dependent on seafood industries.

The Pacific Northwest confronts major economic challenges in evaluating and developing offshore aquaculture. Besides effective governance and sharing ocean space, challenges include developing technologies for rugged ocean environments and understanding and managing possible adverse environmental impacts. But the greatest challenge may be the willingness of the region's citizens to maintain an open mind about the possibilities of offshore aquaculture. The region's comparative advantages for commercial fishing -- productive and dynamic oceans, innovative fleets and seafood businesses, and sophisticated and accessible port infrastructure -- may also be key advantages for offshore aquaculture. Rather than direct competition, creative technologies and business strategies may reveal opportunities that complement traditional uses of the ocean. Fishing firms, seafood processors, marine service industries, and recreational fisheries may partner with offshore aquaculture in ways that substantially increase benefits to businesses, households, and coastal communities. The key to realizing opportunities, however, will be the intellectual and political courage of our citizens and leaders to develop effective ocean governance, creatively explore innovative possibilities, and support development that sustains and strengthens our industries, communities, and ecosystems.