February 2019

The California State University
COUNCIL ON OCEAN AFFAIRS, SCIENCE & TECHNOLOGY (COAST)

Marine Aquaculture Along California's Coast

Unmet Seafood Demand

Between 85-95% of seafood consumed in the United States is imported, with roughly 50% of those imports being seafood raised in aquaculture facilities[i]. In the next 30 years, global seafood demand is expected to grow 30%; aquaculture is expected to meet nearly all the increased global demand[ii].

Trade-Offs in Filling this Unmet Demand

Considerations about filling this unmet demand should consider trade-offs associated with all potential sources of seafood and protein more generally. Aquaculture of all types causes environmental impacts to varying degrees[iii], the extent of which depends on the species raised, the design and choice of cultivation methods, the locations of projects, and the operational practices of each enterprise. On the other hand, aquaculture can provide beneficial ecosystem services[iv] and is as efficient as poultry in converting feed into edible protein[v]. Lastly, the reduction of global greenhouse gas emissions, reduction of the seafood trade deficit, and local economic opportunities are additional positive outcomes of domestic seafood production. *Balancing the benefits of local aquaculture development while minimizing its negative impacts is key to California's path toward responsible aquaculture.*

Status of Marine Aquaculture in California

Today, some nine companies operate shellfish culture operations on sixteen state-issued leases, with additional operations in Humboldt Bay and Carlsbad under lease from local entities. An additional offshore mussel farm operates in federal waters (beyond three nautical miles) and is based near Long Beach. One experimental seaweed culture facility near Santa Barbara operates on a state-issued lease and there is strong interest within the industry to expand seaweed production. Expansion onto new leases, for either seaweed or shellfish slowed in the 1990s, in part from a decrease in suitable sites, competition with other coastal uses, compromised water quality, and the high costs and uncertainty of navigating the regulatory and environmental compliance processes. Overcoming these obstacles has been called for by the California Shellfish Initiative and a unanimously-supported legislative resolution[vi].

Marine finfish aquaculture has not developed in California state waters to date. Like shellfish, state law requires a lease for marine finfish aquaculture in state ocean waters under its jurisdiction.

Select Experts: please feel free to contact the following CSU experts.

Jeremy Claisse, PhD
Assistant Professor, Biology
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Development of aquaculture protocols for species that may be more easily cultivated under predicted temperature increases.

Rafael Cuevas Uribe, PhD
Assistant Professor, Fisheries Biology Humboldt State
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Reproductive biology of aquaculture species, integrated multi-trophic aquaculture systems, and aquaponics.

Matt Edwards, PhD
Professor, Biology
San Diego State
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Seaweed aquaculture and use of farm-raised abalone to replenish wild populations.

Luke Gardner, PhD
Sea Grant Extension Specialist and Research Faculty, Moss Landing Marine Laboratories
San Jose State
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Use of technologies to help solve issues limiting aquaculture growth.

Michael Graham, PhD
Professor, Moss Landing Marine Laboratories
San Jose State
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Cultured seaweeds as a food source for humans and aquaculture operations.

Scott Hamilton, PhD
Associate Professor, Moss Landing Marine Laboratories
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Mitigating the effects of climate change on fish and shellfish aquaculture.

However, the issuance of such a lease is prohibited until new regulations governing the activity are established by the Fish and Game Commission. Specific regulations making up this new regulatory framework have not yet been proposed, but legislation requires at least the consideration of a number of specific factors[vii]. The broader environmental impacts of offshore marine aquaculture activity authorized under a proposed new regulatory framework are being considered in a programmatic environmental impact report (PEIR) that is anticipated for release in draft form by the California Department of Fish and Wildlife in late 2018/early 2019[viii]. It is also important to note that state law prohibits the rearing of transgenic, exotic, or salmonid finfish species[ix].

CSU Aquaculture Resources

Researchers throughout CSU are working in a variety of disciplines to fill gaps in the scientific understanding of culture technology and interactions with the environment and the economy. In addition to the experts listed on this sheet, there is a dedicated aquaculture facility at Moss Landing Marine Laboratories and additional space for aquaculture related research at the Humboldt, Pomona and San Diego campuses. The CSU is committed to training the future workforce and leaders in sustainable aquaculture in California, the United States, and worldwide.

Michael Lee, PhD
Professor, Anthropology, Geography & Environmental Studies
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Aquaculture sustainability issues, sustainability certification, and sustainable seafood.

G. Jason Smith, PhD
Research Faculty, Moss Landing Marine Laboratories
San Jose State
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Use of genetic marker assays for strain identification and tracking during aquaculture production cycles.

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[i] By edible weight, NOAA. 2016, Fisheries of the U.S. 2016 Report. NOAA notes a significant portion of this imported seafood is caught by American fishermen, exported overseas for processing, and then reimported to the United States.
[ii] World Resources Institute. 2014, WRI Report: Creating a Sustainable Food Future.
[iii] Transfer of disease from farmed to wild stocks, the release of and interaction with non-native species that compete with native species, displacement of critical habitat, the use of chemicals and antibiotics to treat disease and parasites, excess nutrients that can impact the biodiversity of benthic habitats, and overfishing of wild fish required to feed the farmed fish. Troell et al. 2014 (http://www.pnas.org/content/pnas/111/37/13257.full.pdf).
[iv] Water quality improvement, protection of shorelines, habitat provision for other species, and ocean acidification amelioration (Troell et al.; further information regarding ocean acidification at Nielsen et al. 2018 (http://www.oceansciencetrust.org/projects/sav/).
[v] Costa-Pierce, et al. 2012. (http://www.fao.org/docrep/015/i2734e/i2734e.pdf)
[vi] Assembly Joint Resolution 43 (Chesbro 2014)
[vii] CA Fish and Game Code §15400
[viii] CA Fish and Game Code §15008
[ix] CA Fish and Game Code §15007