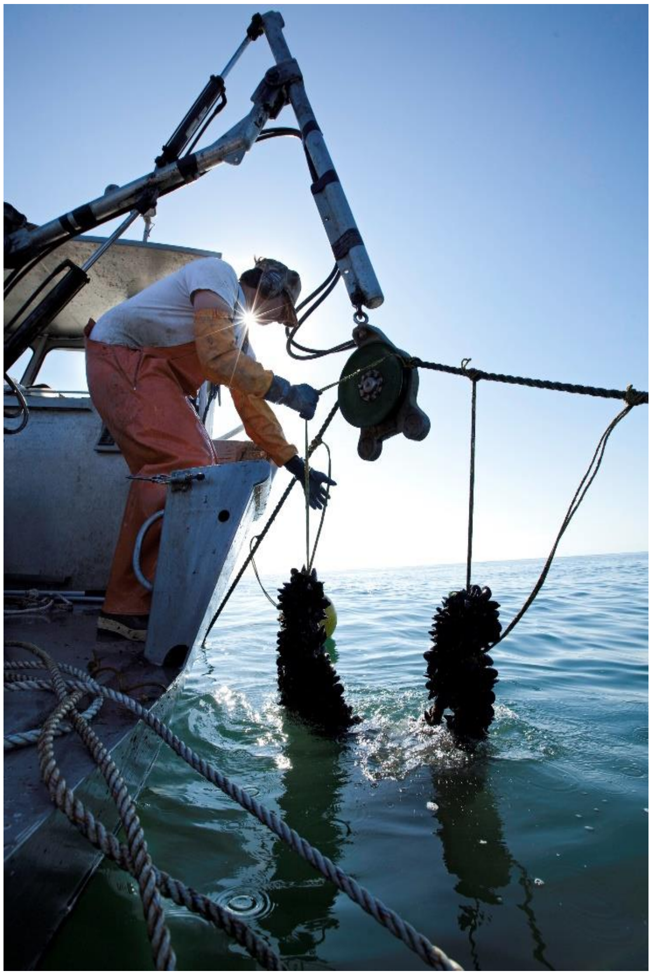

FREQUENTLY ASKED QUESTIONS

Marine Aquaculture in California and the U.S.

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Cover image: Santa Barbara Mariculture

Contents

WHAT IS MARINE AQUACULTURE?

Marine aquaculture, sometimes referred to as mariculture, is the farming – the seeding, breeding, raising, and harvesting – of ocean species including fish, mollusks, crustaceans, and aquatic plants (1). This practice can take place onshore with tanks and ponds or in the open ocean with cages and longlines along the seafloor or suspended in the water column (2).

HOW DOES MARINE AQUACULTURE IN THE UNITED STATES COMPARE TO THE REST OF THE WORLD?

Originally practiced in Roman and Chinese civilizations to maintain a reliable supply of seafood, aquaculture has been practiced around the world for centuries. Today there are a number of regions producing a variety of seafood products through aquaculture which contribute to more than 50 percent of the global seafood supply (Figure 1). Most aquaculture is produced in fresh water systems, but farming in the marine environment is becoming a more attractive option as competition for land and fresh water resources increases. Finfish from fresh water sources, such as carp, pangasius, and tilapia (104 billion pounds in 2016), dominate the global aquaculture market, but mollusks (oysters, clams and mussels) are the primary form of marine aquaculture production in the U.S. (48 million pounds in 2016) and globally (37 million pounds in 2016) (3; 4).

The desire to produce finfish is growing, and countries like China, Norway, and Chile are investing in the development of the sector, despite the fact that some of them may not have adequate governance or ecological capacity to do so at scale sustainably (5). The U.S. has the ecological, technical, and governance capacity to expand marine aquaculture sustainably, yet it contributes less than 1 percent to the world's total aquaculture production (Table 1). Visit our marine aquaculture story map to learn more about where and what types of farms are in the U.S.

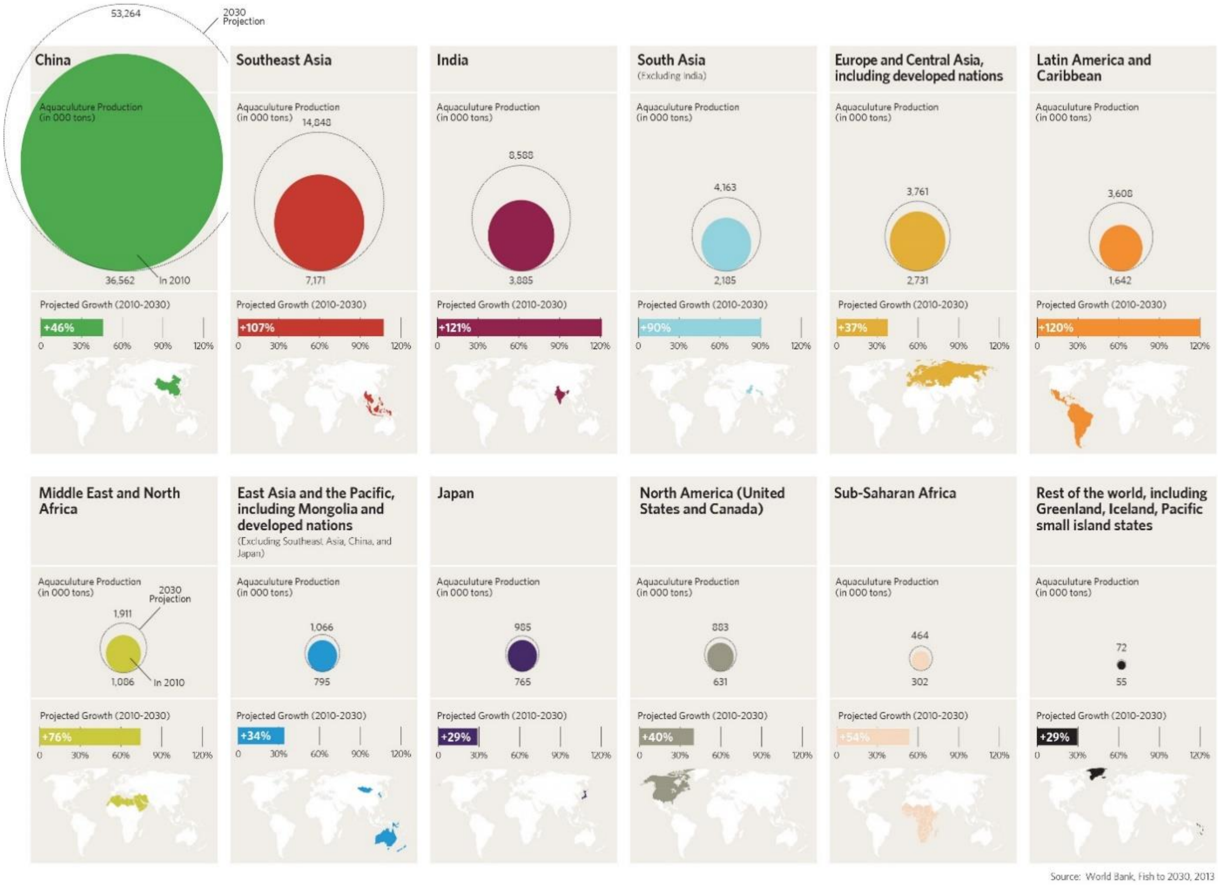

Figure 1. The Nature Conservancy. 2017. The Aquaculture Opportunity.

WHAT IS THE CURRENT STATE OF MARINE AQUACULTURE IN CALIFORNIA?

Most of the seafood farmed in California is in freshwater systems, but there are important marine aquaculture operations along the state's coast. According to the U.S. Department of Agriculture's (USDA) Census of Aquaculture (2012), California's aquaculture sector generated around $102 million is sales and distribution for the state and $1.55 billion in sales and distribution in the U.S. Visit our marine aquaculture story map to learn more about where and what types of farms are in California.

ARE THERE EXAMPLES WHERE FISHERIES AND FARMS COEXIST IN THE SAME WATERS? WHERE ARE THEY?

Marine aquaculture is not new to the United States. Maine, for example, is home to a historical working waterfront that supports a diverse portfolio of fisheries and marine aquaculture, including shellfish, seaweed, and finfish. There are examples throughout the U.S. and Canada of fishermen who have benefited from adding marine aquaculture to their portfolios, which can provide a more stable source of income year-round as wild fisheries become more unpredictable in the changing climate. A number of states, including California, also rely on fish hatcheries to sustain wild salmon populations for ecosystem and commercial purposes.

HOW ARE AQUACULTURE LOCATIONS CHOSEN?

Site location selection is essential to develop responsible marine aquaculture operations that support healthy ecosystems and economies. Through the use of marine spatial planning (MSP), it is possible to identify optimal locations for aquaculture sites and determine which species, quantities, and farming gear types are appropriate for a specific location. Scientists leverage rich and diverse data sets to develop tools to assess ecological and oceanographic conditions of local areas – maximizing production and potential environmental benefits while minimizing the risks to the surrounding environment. Scientific research and efforts in this area are strong and growing (6; 7). Some science-oriented organizations in the public and private sectors involved in this space include the National Oceanic and Atmospheric Administration's (NOAA) National Ocean Service, The Nature Conservancy, and University of California, Santa Barbara.

WHAT ARE MARINE AQUACULTURE ANIMALS FED?

Marine aquaculture species can be separated into unfed and fed livestock. Unfed species—like oysters, mussels, and seaweed—filter or absorb food and nutrients from the water column. Fed stocks consist of predatory fish and crustaceans that cannot hunt for their food and therefore must obtain necessary nutrients with feeds, mostly in the form of pellets. Historically, fed fish (such as salmon) have relied on fishmeal and fish oil made from small pelagic wild-caught fish (such as sardines, anchovies, and menhaden) to provide the high oil diet that gives fish protein the characteristic nutrients desired for human consumption, specifically long-chain Omega-3 fatty acids (8; 9). Research has shown that the nutrients required by finfish are not limited to fishmeal and fish oil so long as the animals obtain the necessary essential amino acids, vitamins, minerals, and fatty acids they need to be healthy.

Many advancements are underway to continue to reduce and even eliminate the need for wild fish. The Alternative Feeds Initiative, a collaboration between NOAA and the USDA, has set out to do just that (10). There are also a number of programs and initiatives that encourage the development of alternative feed ingredients by offering financial incentives (11). Despite having historically been reliant on wild fish, the most current formulations of feed for farmed fish have significantly reduced the fishmeal component through replacement with byproducts from wild-capture fisheries and plant material. Future innovations include the culture of bacteria, macro-algae, and insects to produce protein and amino acid-rich oils for feeds that are healthful to the fish, maintain the desired seafood qualities consumers look for, and reduce the strain of aquaculture production on environmental resources.

WHY IS THERE INTEREST IN EXPANDING DOMESTIC MARINE AQUACULTURE?

The U.N. predicts that we will need to produce 50 percent more food by 2050 to feed an additional 2.5 billion people (12). Present agricultural practices cannot scale to meet this demand. There are not enough fresh water or land resources to support production at scale, and environmental burdens (greenhouse gas emissions, runoff, and soil degradation) will only increase as we attempt to scale up (12). Feeding the growing population while adapting to climate change will require a diverse portfolio of food production systems that are more resilient to the changes ahead. Marine aquaculture provides an opportunity to increase our food supply without heavy reliance on land and freshwater resources. It can also increase our food supply with less greenhouse gas emissions (GHG). An integrated program that combines responsible land-based agriculture with ocean-based aquaculture can support a long-term strategy to create a safe, secure, sustainable, and more resilient global food system.

Room to grow

The ocean has the capacity to expand food production while relieving pressures on land that can otherwise be used for wildlife and natural ecosystem functions, which are experiencing the fastest rates of extinction because of habitat loss. The U.S. has one of the largest exclusive economic zones (EEZ) in the world. This area includes vast expanses of water with depths, current speeds, and temperatures that are necessary to support responsible production of a diverse portfolio of species (shellfish, seaweed, and finfish) and production methods that can be adapted to meet the specific ecological, economic, and social requirements of the areas in which they will operate. Combined with easy accessibility to ports and markets, these factors make U.S. waters home to some of the highest offshore aquaculture potential in the world (2; 5).

The U.S. is also leader in sustainable seafood production. Research shows that we have the ecological, economic, and regulatory capacity to grow a diverse and sustainable marine aquaculture sector within our EEZ (2; 5; 6). Despite this, the U.S. imports more seafood by value than any other nation in the world to support the growing domestic seafood demand, resulting in a trade deficit of nearly $16 billion in 2017 (3). Imported sources are harder to trace and increase the likelihood for seafood products lacking the sufficient environmental, social, and/or food safety standards to enter the market.

Offshore aquaculture can fill gaps in California seafood production

As coastal development continues to flourish in California, options for siting aquaculture along the state's coastline will start to diminish. However, there is considerable potential to develop marine aquaculture offshore in state and federal waters (5; 7). Research suggests strategic and moderate marine aquaculture development in the Southern California Bight (SCB) will yield substantial economic returns without significant negative impacts on the environment (7). Marine spatial planning can help balance marine aquaculture with other ocean uses and management priorities in addition to the biophysical, technological, and ecosystem impact constraints historically considered in site selection. With this approach, development of offshore marine aquaculture in the SCB can be realized (7). Coordinated planning of finfish, shellfish, and seaweed mariculture sectors may offer the best solution for economically sustainable marine aquaculture development in SCB waters that also supports a more climate-resilient food supply (7).

WHY NOT JUST RELY ON WILD-CAPTURE FISHERIES?

Well-managed fisheries are an important source of seafood, but they cannot keep pace with growing demand (Figure 2). The production from wild seafood harvests have been flat for decades. According to the U.N. Food and Agriculture Organization (FAO), more than 90% of global fish stocks are fished at or above sustainable limits (4). With appropriate science-based management that includes setting aside more and larger areas of the ocean for protection, some expansion of wild-capture harvests is possible, but this expansion will be modest (4). Expanding a diverse marine aquaculture sector is the only way to significantly increase the seafood supply to compliment land-based agriculture and support a more resilient food supply in the changing climate. However, to meet this sustainable food production potential, marine aquaculture development must be underpinned by the best available science and technology and take into account the other uses and values that depend on our oceans (13).

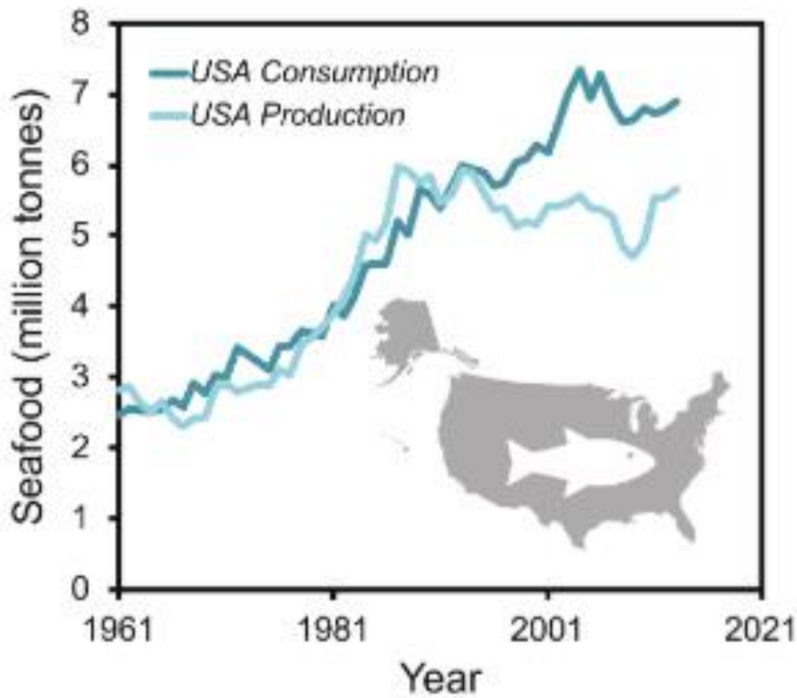

Figure 2. Total United States seafood consumption and production (fisheries and aquaculture) over time. Data from FAOSTAT. Credit: Halley E. Froehlich.

WHAT ROLE CAN MARINE AQUACULTURE PLAY IN ADDRESSING CLIMATE CHANGE?

Research shows that food system diversification will play an important role in supporting a more stable food supply in the changing climate (14). Farming in the ocean requires less space and freshwater than terrestrial agriculture making aquaculture an important supplement for food production in times of drought, which will likely worsen in California as a result of climate change. Mollusk and salmon aquaculture (marine) – along with pelagic and whitefish fisheries and poultry production – produce fewer GHG emissions per portion of protein than beef production, shrimp aquaculture and fisheries, and catfish and tilapia aquaculture (fresh water) (15). By focusing on improved application of alternative feeds research and increased efficiency of energy and water use, marine aquaculture production can contribute animal protein in a sustainable way that minimizes negative impacts on the environment (15).

Temperatures, while changing, are more stable in the ocean than they are on land. As a result, farming in the ocean offers the opportunity to provide more stability for food production as the climate changes (16; 17). A diverse portfolio of marine aquaculture methods and species (shellfish, seaweed, and finfish) should play a bigger role in a domestic strategy to become a more economically stable and resource-conscientious nation in the face of climate change.

CAN MARINE AQUACULTURE HAVE POSITIVE EFFECTS ON THE LOCAL ENVIRONMENT?

Marine aquaculture can provide ecosystem services that benefit the surrounding environment. Shellfish and seaweed aquaculture can clean the water; protect and stabilize shorelines; and provide habitat for wild marine species. Emerging research indicates that shellfish and seaweeds may also help to sequester carbon, possibly buffering local environments from the impacts of ocean acidification (17; 18; 19). Nutrient enhancement from finfish mariculture in otherwise nutrient-limited areas can promote a more productive local environment through increased nutrient input (17). Factors that affect the provision of ecosystem services include proper siting, use of appropriate gear and species for the environment, and leveraging science-based best management practices.

HOW DO AQUACULTURE FARMS AFFECT THE LOCAL ENVIRONMENT?

When developing marine aquaculture, it is important for planners, managers, and future farmers to consider how new sites will affect the surrounding marine ecosystems. Marine aquaculture farms can be viewed as an extension of the existing ecosystems, and, as such, they must adhere to the “rules” of the local environment. Poor site selection, farm design, and management can have detrimental impacts on local ecosystems including pollution, habitat destruction, eutrophication, and the spread of diseases. However, through science-based site selection and responsible planning and management, marine aquaculture can offer benefits that positively contribute to local environments, possibly even restoring lost ecosystem services (17). As the industry scales up its operations, it is important to understand how the cumulative impacts of marine aquaculture production around the world affect marine environments globally and weigh the potential for some risk with the bigger picture potential for marine aquaculture to support a climate-resilient food supply. This does not mean it cannot be done. The U.S. has the scientific knowledge and regulatory framework to implement safeguards to ensure operations in U.S. waters are consistent with prevailing science-based environmental standards.

HOW DOES AQUACULTURE AFFECT SENSITIVE ENVIRONMENTS?

As with any food production activity, farming seafood in the ocean has the potential to negatively affect local ecosystems, including eelgrass beds and mangroves. Research suggests farms that are properly sited and managed may also have positive relationships with these habitats (17; 19). Most of the negative outcomes result from mismanagement and improper siting. Collaborative research is underway to better understand the relationships between marine aquaculture and local ecosystems. For example, in the case of oyster farming, eelgrass may buffer the effects of ocean acidification, while oysters filter disease-causing organisms out of the water, which should improve eelgrass growth (18; 20; 21). There are also regulations to protect sensitive habitats from irreversible harm by activities, including marine aquaculture (Table 2).

Table 2. Regulations Protecting Sensitive Marine Habitats

	Regulation	*How it protects marine environments*
Federal	National Environmental Policy Act (NEPA)	Requires any action that has the potential to impact the environment to conduct an assessment of the likelihood and degree of impacts to occur (through Environmental Assessments (EA) and Environmental Impact Statements).
	Magnuson-Stevens Fishery Conservation and Management Act (MSA)	Regulates management of national fish stocks in order to ensure long-term biological and economic stability of the U.S. fisheries.
	Clean Water Act (CWA)	Administered by the U.S. Army Corps of Engineers. Protects clean water resources through issuance of permits for activities in marine waters (22).
	Endangered Species Act (ESA)	Administered by the National Marine Fisheries Service (NMFS). Requires agencies to consult with NMFS on actions that could result in the take of threatened or endangered species (22).
	Marine Mammal Protection Act (MMPA)	Under the jurisdiction of the U.S. Fish and Wildlife Service. Protects marine mammals in U.S. waters.
	National Pollution Discharge Elimination System (NPDES) Program	Requires aquaculture projects obtain a NPDES permit to discharge effluents into marine waters within discharge limits.
	Coastal Zone Management Act (CZMA)	States are responsible for creating Coastal Zone Management Plans to preserve coastal communities and resources (22).
California	California Coastal Act (CCA)	Through the California Coastal Commission, the CCA guides plans and regulations for the use of California land and water in the coastal zone (22).
	California Environmental Quality Act (CEQA)	Requires a review of potential environmental impacts of an operation within California jurisdiction (22).
	Porter-Cologne Water Quality Control Act	Facilitates the development of state water quality standards as determined by the State Water Resources Control Board (22).

IS FINFISH FARMING BAD FOR THE ENVIRONMENT?

As with any form of food production, poorly managed finfish farming can negatively impact the environment. However, it can also support a more nutritious, sustainable, and climate-resilient food supply if done responsibly. Scientifically informed, proactive spatial planning combined with science-based best management practices have been shown to minimize the risks while enabling the U.S. to realize the ecological and economic benefits of responsible marine aquaculture (6; 7).

Some concerns associated with finfish aquaculture include changes to water and habitat quality, potential genetic consequences of escapes, disease transmission, entanglements, and the use of wild fish to feed farmed fish (2; 9; 23). Research has shown that implementing science-based best management practices can greatly reduce the risks and increase the benefits associated with seafood farming (9). The current state of scientific knowledge and technological capacity have given us more tools to minimize the risks of any adverse environmental impacts and sustainably manage finfish aquaculture to contribute to a diverse portfolio of nutritious, sustainable, and more climate resilient protein options.

WHY DO WE NEED TO FARM FINFISH? WHY NOT JUST STICK WITH SHELLFISH AND SEAWEED?

Shellfish (oysters and mussels) and seaweed can provide more localized environmental benefits through ecosystem services that include cleaning the water column, providing habitat for juvenile fish, and absorbing carbon. While they also play an important role in a sustainable and resilient food supply, there are constraints to their increase in demand due to the fact that Americans love meat. Finfish are much more likely to be accepted by the broader population as a regular food item than shellfish and seaweed, which tend to appeal to more high-end, niche markets. Finfish dominate the top ten list of preferred seafood in the U.S. (9 lbs. per capita of salmon, canned tuna, tilapia, pollock, pangasius, cod, and catfish in 2015) alongside shrimp, crab, and clams (4 lbs.; 0.6 lbs.; 0.3 lbs. in 2015 respectively). The U.S. and California also have significant areas offshore that are conducive to responsible finfish production in terms of ecological, economic, and regulatory potential (5; 7). Given these, the U.S. and California are in unique positions to expand marine finfish aquaculture production guided by regulatory frameworks with higher environmental standards compared to the rest of the world.

Finfish aquaculture and climate change

Finfish could prove to be more resilient to the impacts of a changing climate than shellfish and seaweed, which may be more vulnerable due to ocean acidification. According to research on the production potential of finfish and shellfish aquaculture in response to climate change, finfish aquaculture is expected to experience less of a decline in production compared to shellfish (16). The potential changes to marine aquaculture production as a result of climate change should be considered as California determines what types of aquaculture it will include to support a more climate-resilient food portfolio for the state.

WHAT HAPPENS IF THE FISH ESCAPE?

Escapes can and do happen. Research indicates that domesticated fish have a low probability of surviving in the wild, and the risk of farmed fish causing a disease outbreak among wild populations is low (9; 23). The impact of escapes depends on a variety of factors including the life stage of escaped fish, their reproductive capabilities, and the proximity of captive fish to wild fish habitat (9). The loss of fish from escapement represents significant financial loss for farmers, therefore it is in their best interest to prevent it. In the U.S. farmers are required to have strategies in place to prevent escapes that include strategic farm site selection and net-pen design, regular monitoring of pens and quick response to the need for repairs, use of appropriate technology to build pens, and sterilization and selective breeding of finfish. Much of the historical data on fish escapes comes from salmon farming. Modeling systems, such as NOAA's Offshore Mariculture Escapes Genetics Assessment (OMEGA) model, are helping researchers to better understand the potential risks associated with and best practices to reduce the impacts that could result from the escape of other species, such as yellowtail *(Seriola dorsalis)*, a candidate species for offshore production in California and the U.S.

IS THERE A DIFFERENCE IN QUALITY BETWEEN WILD SEAFOOD AND AQUACULTURE SEAFOOD?

There is a perception that wild caught fish are healthier than farmed fish. However, research has shown that farmed fish can offer the same quality in terms of health benefits and taste as wild fish (24). The risk from pollutants, such as PCBs and mercury, are similar in farmed and wild seafood, with most samples in the U.S. being below FDA approved levels.

IS FARMED SEAFOOD SAFE TO EAT? HOW IS SEAFOOD SAFETY REGULATED IN THE UNITED STATES? IN CALIFORNIA?

Seafood offers unique health benefits that can support a healthy diet. According to the "Dietary Guidelines for Americans 2015-2020" and the American Heart Association, seafood should be consumed two times per week, but most Americans are not meeting these recommendations. Seafood is an excellent source of protein and has unique nutrients, like marine omega-3 fatty acids, that support a healthy cardiovascular system and reduce the risk of heart disease. Possible relationships between omega-3 fatty acids and disorders such as Alzheimer's disease, arthritis, depression, and asthma are also being studied. Research shows that the benefits of eating seafood twice each week outweigh the risks. Some groups may need to be more selective in their seafood choices to minimize their exposure to potentially harmful bacteria and mercury. These groups include children under 12 years of age and women who are pregnant, may become pregnant, or who are breastfeeding. Visit seafoodhealthfacts.org to learn more.

The United States has a rigorous process for ensuring seafood products are safe for human consumption. The United States Food and Drug Administration (FDA) is the regulating body for ensuring food for human consumption is safe. The FDA holds wild caught and farmed seafood from national and international sources to the same food safety standards (25). They work in conjunction with the National Marine Fisheries Service (NMFS) Seafood Inspection Program under NOAA with the authority granted by the 1946 Agricultural Marketing Act. The Office of International Affairs and Seafood Inspection works to maintain a “level playing field” for domestic and international seafood producers through promotion of responsible fisheries management (26).

HOW DOES MARINE AQUACULTURE IMPACT OTHER OCEAN USES, SUCH AS FISHING, DIVING, SURFING, AND OTHER RECREATIONAL ACTIVITIES?

Aquaculture has not been identified to have an impact on coastal recreation activities. Coastal stakeholders – including property owners, recreationists, and business owners – share concern for the potential diminished esthetic value, ecosystem damage, and increased competition for space resulting from the development of working waterfronts (27). Research on perceptions of local shellfish aquaculture development shows that lack of support for local aquaculture stems from the perception that aquaculture is bad for the environment, with potential for ecosystem damage and pollution from farming gear and equipment (27). It is not the intention of aquaculture to disrupt coastal recreation nor will aquaculture farms take up the entire coastline. Research suggests strategic development of offshore aquaculture sites in the SCB can positively contribute to substantial economic returns without necessitating the tradeoff of restricting existing uses of the marine environment (13). Current practice in the U.S. is to carefully site farms after existing ecology, physical processes, transportation routes, and other factors have been considered. The use of marine spatial planning tools can identify the best locations for marine aquaculture that support productivity without significantly compromising existing uses of the space and minimizing detrimental impacts to the environment (7; 13).

Privatization of public land

The California Coastal Act of 1976 (CCA) protects the public's right to access the shoreline. This means that any coastal development that is approved by the California Coastal Commission, including the building of coastal aquaculture farms, will not interfere with coastal access (28). Furthermore, any oceanfront land that is suitable for water recreation uses will be protected for those uses (28). Aquaculture development is protected in Article 3 Section 30222.5 of the CCA, but it cannot not infringe on the rights of other coastal-dependent industries. Management of the coastal zone requires consideration of stakeholder interests and science-based recommendations to determine the best option for development within the marine environment.

CAN MARINE ANIMALS LIKE WHALES AND SEA TURTLES GET ENTANGLED IN AQUACULTURE GEAR LIKE THEY DO IN FISHING GEAR?

As with any artificial structure put in the ocean, interactions between wildlife and aquaculture operations do occur and occasionally result in mortality. Animals could be attracted to aquaculture gear for food and shelter provisions. The animals most at risk for incidental catch are marine mammals (such as seals, sea lions, whales, and dolphins), sea turtles, sea birds, and sharks. There is little information on negative interactions between marine animals and aquaculture gear in the United States. Globally, there is evidence that the implementation of best management practices, such as maintaining tight lines and stringent waste disposal have been successful in reducing interactions (29). Knowledge and experience from farms around the world, coupled with information on interactions with gear used in the fishing industry can inform potential interactions for aquaculture and provide insight for permitting, siting, and management decisions (29; 30). There is a risk that other interactions – including spatial competition, underwater noise disturbance, and alterations in trophic pathways – may drive marine animals from their habitats (29). It is important to understand these interactions as the aquaculture industry continues to expand in the United States.

Managing potential interactions

The greatest concern for marine animal interactions with aquaculture gear is in regards to maintenance of the ropes and lines that may entangle the animals. To minimize risk of detrimental interactions, there are management plans in place to inform responsible aquaculture practices. The first and foremost consideration is whether the site location invites interactions between wild animals and aquaculture farms. NOAA's National Ocean Service (NOS) has integrated whale migration and other related data to identify potential farm sites that minimize the likelihood of interactions. After the facility has been established, the continuous monitoring for presence and proximity of marine animals to farm locations, including observations of animals interacting with the farm, can better inform management and policy decisions. Establishing strict guidelines for maintaining farm gear (minimizing vertical lines, maintaining line tension, avoiding conversion of sea floor habitat, and installing weak links) and using appropriate methods for disposal of biological and non-biological waste can minimize the risk of entanglement (29; 31; 30).

WILL MARINE AQUACULTURE DISPLACE WILD FISHERIES IN THE MARKET?

More research needs to be done to fully understand the market interactions between aquaculture and wild fisheries. Due to the unpredictable influence of public perception and consumer preferences, current understanding of market interactions is limited. According to the United Nations Food and Agriculture Organization (FAO), studies have been constrained to the most commonly traded species in larger consumer markets. This includes salmon, trout, shrimp, prawn, catfish, tilapia, seabass, and seabream in the European Union, Japanese, and United States markets (32). Some research indicates that prices for wild salmon were impacted by the entry of farmed salmon in the market, but the fishers were able to bring their prices back up with innovative marketing (e.g. Copper River Salmon). This demonstrates how different market segments for aquaculture and wild product can lessen the impact of increased production on prices for both products. For example, the yellowtail farm proposed off the coast of California would largely cater to sushi-grade markets, which are now supplied primarily by fish farms in the western Pacific, whereas the wild yellowtail caught seasonally in California and Baja California waters is not sushi-grade and will enter different segments of the market. This segmentation should lessen the impact on wild yellowtail prices as compared with the farmed version entering the same markets.

WHERE CAN I LEARN MORE ABOUT MARINE AQUACULTURE?

- Aquaculture in California (California Sea Grant)
- California Aquaculture Permit Guide (California Department of Fish and Wildlife)
- Coastal Aquaculture Siting and Sustainability (NOAA National Centers for Coastal Ocean Science)
- NOAA Office of Aquaculture
- Seafoodhealthfacts.org (A joint project by Sea Grant programs at the Universities of Oregon State, Cornell, Delaware, Rhode Island, Florida, and California).
- Seafood for the Future (A program of the Aquarium of the Pacific)
- The Aquaculture Opportunity (The Nature Conservancy)
- US Department of Agriculture Subcommittee on Aquaculture (regulatory guides)

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