Alaska aquaculture is blooming

Once just salmon, rearing expands to kelp and shellfish

By SARA WHITNEY

Alaska has more coastline than the lower 48 states combined and an abundance of clean water, but only in June of this year was Alaska deemed a federal aquaculture opportunity area. That means the state is environmentally, socially, and economically able to support multiple commercial aquatic farming operations.

According to the National Oceanic and Atmospheric Administration, Alaska received more letters of support than any other region and zero public opposition.

While salmon hatcheries began operating in Alaska in the early 1970s to rejuvenate the state's fisheries, shellfish and aquatic plant farming were first approved in 1988 but slow to take root. Modern commercial seaweed cultivation in Alaska didn't begin until 2017.

Mariculture, or marine aquaculture, has flourished in recent years. Alaska is now home to the largest kelp farm in the United States, Seagrove Kelp, which covers 100 acres near Craig. Mollusks, various types of seaweed, sea cucumbers, and urchins are grown along the southeastern, southcentral, and southwestern coasts. Alaska has 95 active operations, and permitted acreage has grown from less than 350 acres in 2016 to more than 1,360 today.

Kelp and shellfish values and select harvests in 2022

Species	Farms reporting	Harvest	Value of sales to public
Oysters	28	6.8 million*	$1.5 million*
Kelp	10	872,288 lbs	$278,929
Mussels	3	510 lbs	$2,990

*1.9 million oysters were sold to the public and 4.9 million were sold to other farms, but value is for public sales only.
Note: Small harvests/individual farms are not publicly reported.

Source: Alaska Department of Natural Resources

Oysters are the money-maker

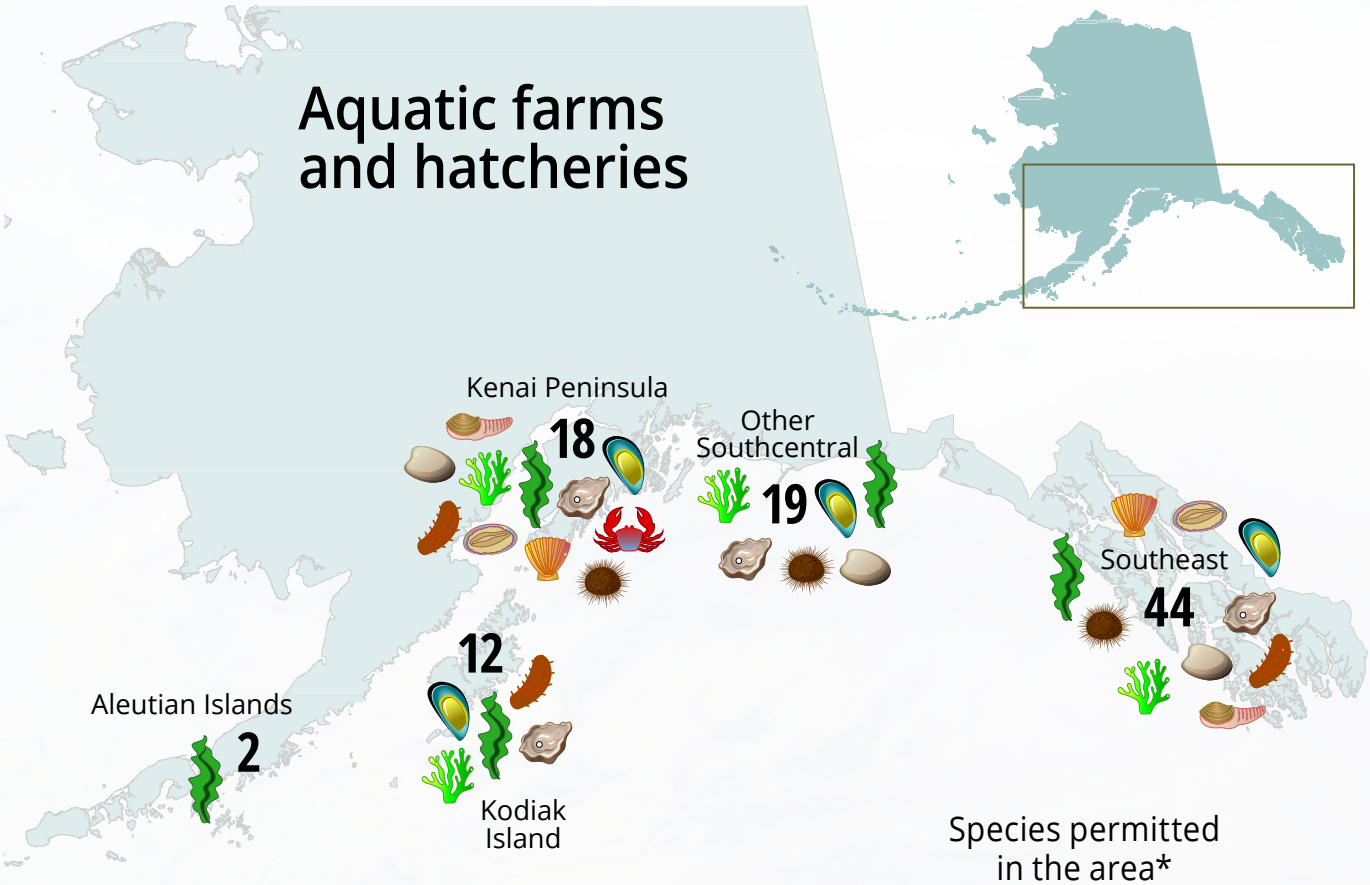
As the map on the next page shows, Alaska's operations farm a plethora of marine species. Oysters are the highest-value harvest, with the Pacific oysters

Text continues on page 6

Oysters grow at the Hump Island Oyster Company in Ketchikan. The oysters are suspended in bags under these rafts. Visible in the background, kelp is farmed via rope suspension beneath the buoys.

This photo and the banner photo of kelp are by Steven Whitney, National Marine Fisheries Service

Aquatic farms and hatcheries



Species permitted in the area*

- Kelp
- Other seaweed
- Mussel
- Oyster
- Sea cucumber
- Urchin
- Scallop
- Clam
- Geoduck
- Red/blue king crab*
- Abalone

Notes: As of November 2023. Permits include farms as well as aquatic farm hatchery permits for providing seed or stock to other farms.
*Icons mean that species is listed on at least one permit in that area/region and do not indicate specific locations. King crab is hatchery only.

Sources: Alaska Department of Fish and Game, Alaska Department of Natural Resources, and Alaska Department of Labor and Workforce Development, Research and Analysis Section

Some of the species that can be raised in Alaska might surprise you

While aquatic farms and hatcheries are usually permitted for a larger variety of species than they actually grow, current permits include these specific species under the larger categories on the map.

OYSTERS and MUSSELS are blue mussels, Pacific oysters, and Kumamoto oysters.

KELP includes ribbon kelp, sugar kelp, bull kelp, five-ribbed kelp, three-ribbed kelp, split kelp, giant kelp, broad-ribbed kelp, dragon kelp, and spaghetti kelp.

OTHER SEAWEED includes black seaweed-nori, red ribbon-dulse, stiff ribbon-dulse, sea lettuce, dark sea lettuce, beach asparagus, seagrass laver, and fucus.

URCHINS and SEA CUCUMBERS are green and red sea urchins and California sea cucumbers.

SCALLOPS are weathervane scallops, pink scallops, purple-hinged rock scallops, and spiny scallops.

CLAMS are mainly geoducks followed by cockles, butter clams, littleneck clams, and Pacific razor clams.

Pinto abalone and red or blue king crab (one hatchery only) are also permitted. One Southeast permit includes sea staghorn, a coral.

sold to the public worth nearly $1.5 million in 2022, a number that's climbing again after taking a hit during the pandemic when demand plummeted.

Oysters are also a special case, as they are the non-native species that can be imported and farmed in Alaska. Farms purchase seed stock from other West Coast states and Hawaii and grow the oysters here, but they can't reproduce in Alaska because the water is too cold. They also grow slower in our waters.

Shellfish cultivation in Alaska is mainly oysters, but farms include multiple varieties of mussels, clams, scallops, sea urchins, and sea cucumbers.

Seaweed is a newcomer with many uses, and it's expanding

Most of the oysters grown in Alaska are consumed here, but seaweed goes mainly to Asia, where it's a much larger part of their market and cuisine. Seaweed's popularity in food is taking off in the United States, though.

Farming seaweed — especially kelp — is the fastest-growing branch of the aquaculture industry. Alaska farms sold nearly 873,000 wet pounds of kelp last year to the public or other farms, up from almost nothing in 2016. That doesn't include the wild kelp harvested commercially.

Maine dominates U.S. production by a large margin, and Alaska is second. Alaska still represents a fraction of a percent of the world's seaweed market, but recent growth and feasibility studies on several parts of the state suggest there's room for expansion. So does the growing list of uses.

Seaweed goes into a variety of medicines, foods, and personal care products across the world. It's a good thickener, for example, and it's even hiding in your toothpaste.

Food-wise, dried sheets for sushi might come to mind, but seaweed is popping up in more and more products. You can find it in pasta or as tea or jerky. Juneau-based Barnacle Foods' popular kelp salsas, sauces, and pickled snacks are now sold beyond our borders. Maine is known for its kelp flakes, kelp seasoning, and even kelp burgers.

Seaweed has biological and environmental value as well. Kelp forests support the fishing and recreation industries by providing biologically productive habitats for other marine species. Seaweed also absorbs carbon dioxide and can ease local impacts from ocean acidification.

The U.S. Department of Energy is developing seaweed as a petroleum substitute for producing plastics and biodiesel in the future, but right now, the food

Numbers of aquatic farm and fish hatchery business licenses

Type of operation	Licenses
Fish hatcheries	24
Shellfish farming	50
Aquatic plants and misc.	120

Notes: As of November 2023. Some have multiple facilities while others have multiple people licensed at one business or licenses in multiple categories. Includes Alaska-based licenses only.

Source: Alaska Department of Commerce, Community, and Economic Development, Division of Corporations, Business, and Professional Licensing

Aquaculture licenses by area and type

Area	Aqua plants and misc.*	Shellfish farming	Fish hatcheries
Kenai Peninsula Borough	26	13	5
Valdez and Cordova	21	5	2
Anchorage	13	3	7
Kodiak Island Borough	13	2	3
Prince of Wales Census Area	10	8	1
Ketchikan Gateway Borough	9	11	–
Juneau	7	3	2
Matanuska-Susitna Borough	5	1	1
Petersburg Borough	5	–	–
Wrangell Borough	4	1	1
Sitka	2	2	1
Dillingham Census Area	2	–	–
Fairbanks North Star Borough	2	–	–
Hoonah-Angoon Census Area	1	–	–
Yukon-Kuskokwim Census Area	–	–	1
Lake and Peninsula Borough	–	1	–

*This category, "other aquaculture," is mainly seaweed but includes a small number of worm, betta, and axolotl cultivators and hydroponic operations.
Notes: As of November 2023. Some have multiple facilities while others have multiple people licensed at a single business or licenses in multiple categories.

Source: Alaska Department of Commerce, Community, and Economic Development, Division of Corporations, Business, and Professional Licensing

At left, Barnacle Foods workers harvest kelp at the Hump Island Oyster Company in Ketchikan. Above, a worker seasons kelp pickles at Barnacle's kitchen in Juneau.

Photos by Steven Whitney, National Marine Fisheries Service

market is more lucrative for the amount of seaweed produced.

The most popular species grown commercially are ribbon, sugar, and bull kelp, but Alaska farms are permitted for a long list, from nori to sea lettuce.

Salmon hatcheries came first

While seaweed and shellfish farms have taken the spotlight in recent years, salmon hatcheries represent the bulk of aquaculture in Alaska. (See the November 2013 issue of *Alaska Economic Trends* for more on fish hatchery history and operation.)

Alaska's aquaculture firms with employees in 2022, at a glance

Total employers	16, at ~40 sites
Total average employment	349 jobs
Peak month, August	453 jobs
Low month, December	218 jobs
Total wages paid in 2022	$17,337,364
Average monthly wage	$3,325

Note: Excludes self-employment. Firms with employees are mostly fish hatcheries and shellfish farms. Includes aquaculture support jobs such as administrators and receptionists.

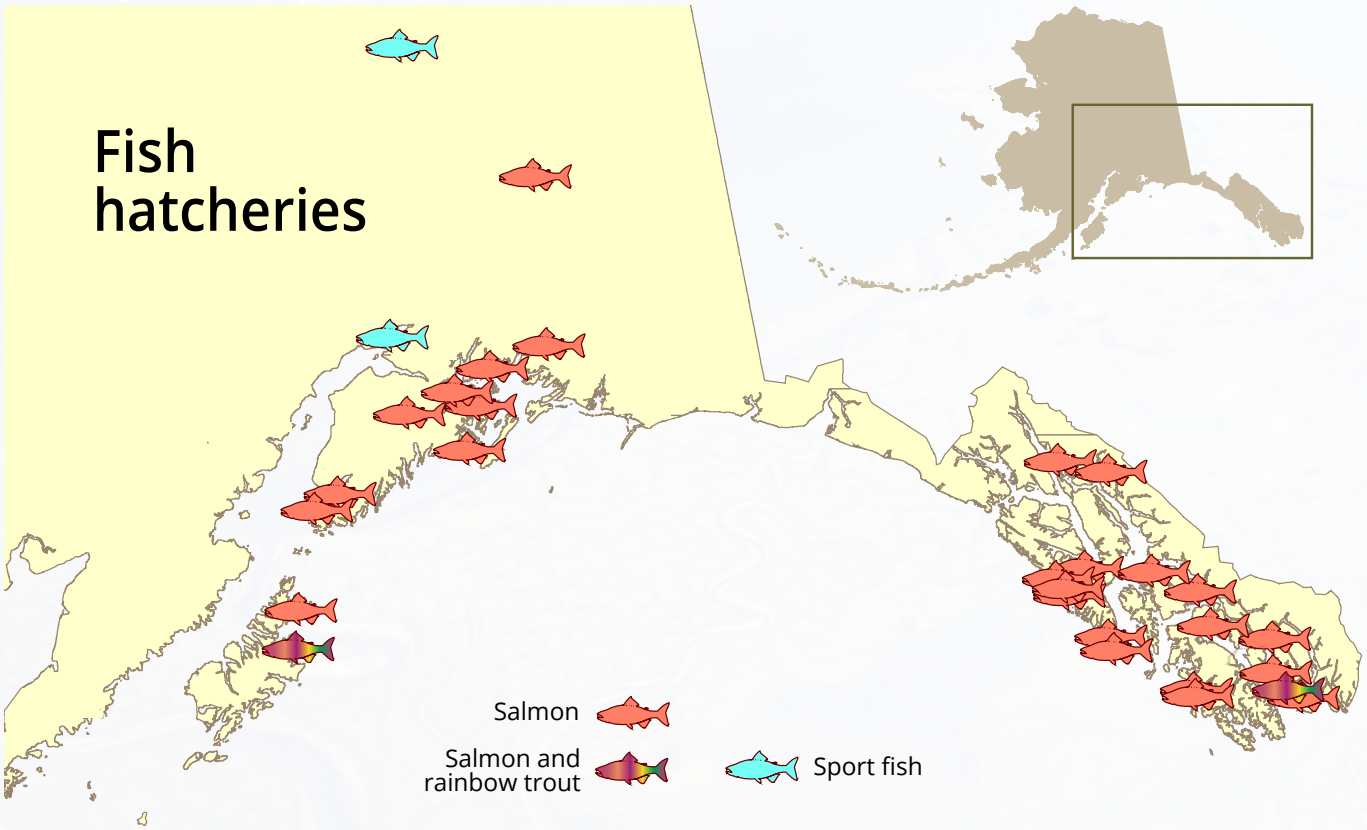
Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section

Their impact is huge. Alaska fish hatcheries released nearly 2 billion fry into Alaska waters in 2022, and about 43.3 million hatchery fish returned, worth an estimated $163 million. Those fish represented 25 percent of the state's salmon harvest and 23 percent of its ex-vessel value, or the amount paid to fishermen by processors.

Hatcheries cultivate salmon through a method called ocean ranching, rearing and then releasing juvenile salmon into the wild to return as adults.

Alaska bans the fish farms common around the world and in many states. Statute prohibits cultivating finfish "in captivity or under positive control for commercial purposes" but allows for "fishery rehabilitation, enhancement, or development activities … [and] the ability of a nonprofit corporation that holds a salmon hatchery permit to sell salmon returning from the natural water of the state, or surplus salmon eggs, rearing and sale of ornamental finfish for aquariums or ponds provided the fish are not reared in or released into the water of the state."

> Only native species can be farmed in Alaska. The exception is oysters, which can be seeded from warmer coastal states.



Notes: Shows main location. Some hatcheries operate multiple sites. Sport fish hatcheries release salmon, trout, and Arctic char into landlocked lakes and some Southcentral streams and lagoons.

Sources: Alaska Department of Fish and Game and Alaska Department of Labor and Workforce Development, Research and Analysis Section

That means Alaska can rear baby salmon and release them into the wild to supplement natural-born stocks, but not raise them to adulthood and sell them out of captivity as fish farms do elsewhere.

Hatcheries give eggs a higher survival rate than they would have otherwise. According to the industry group Salmon Hatcheries for Alaska, in the wild, just 10 percent survive to become fry, but for hatchery eggs, it's 90 percent.

As mentioned earlier, except for oysters that must be continually seeded from out-of-state stock, only native species can be raised. Hatcheries rear all types of wild Alaska salmon and trout but no walleye, perch, or other game fish.

Many hatcheries operate in multiple locations, some temporarily or periodically. Fish and Game lists 30 hatcheries for 2022. (See the map above.) Twenty-six are run by private nonprofits, National Marine Fisheries Service operates one research hatchery, and the Metlakatla Indian Community oversees the Tamgas Creek Hatchery under federal regulation.

The state also operates two sport fishing hatcheries: the William Jack Hernandez Hatchery in Anchorage and the Ruth Burnett Hatchery in Fairbanks. They release around 7 million salmon, trout, and Arctic char each year, the former into Southcentral lagoons, lakes, and creeks and the latter into landlocked Interior and Southcentral lakes.

Those with employees average nearly 350 jobs over the year

As the sidebar on the next page details, there's no single data source on aquaculture, but looking at permitting, licenses, and the limited amount of employment and wage data gives some sense of the industry's reach.

Many are sole proprietorships, but 16 employers in Alaska reported quarterly jobs and wages paid to their employees in 2022 at around 40 different sites. While the number of employees at each business varied from none to 123 in any given month, the total number of jobs over the year averaged 349. Jobs peaked in late summer, with employment spanning the full year.

These employers — mainly salmon hatcheries and

oyster farms — paid more than $17 million in wages last year.

These are conservative numbers, as they only include businesses that grow their own harvests. Barnacle Foods, for example, falls under seafood product manufacturing because they harvest kelp in the wild or buy it from Alaska kelp farms.

Seaweed and shellfish farms occupy just 2 square miles.

Other sources paint a picture of how far this industry stretches

Business licenses add another angle, as they capture the self-employed. In November, Alaska had 24 active business licenses for fish hatcheries, 50 for Alaska-based shellfish farms, and 120 under "other aquaculture."

That catch-all category is mainly seaweed farming but includes a handful of hydroponic growers and commercial cultivators of nonmarine species such as worms, bettas, and axolotls, to name just a few examples. These species, often grown in ponds or manmade structures, can be raised and sold as long as they are strictly ornamental and are not released.

Multiple state and federal agencies play a role in assessing and permitting aquatic farms, and approval hinges on environmental and other factors. The Alaska Department of Natural Resources handles leasing on state-owned tidelands, good for 10 years, and the Department of Fish and Game permits the operations. The map on page 5 shows the 95 aquatic farming operations' spread and the types of species permitted in each region, although permits don't mean a farm or hatchery is growing every species on its list or is currently growing and selling.

Salmon hatcheries aren't included in the aquatic farms category and are covered separately. Hatchery permits for aquatic farms mean the farm cultivates shellfish or marine plant stock or seed to supply to other farms.

Southeast has the largest number of aquatic farms (and the most fish hatcheries), followed by the South-central Region — mainly Prince William Sound — and the Kenai Peninsula, and then Kodiak Island. Even Adak in the Aleutians has two permitted kelp farms.

Aquaculture doesn't take up much space compared to most farming

Overall, Alaska had nearly 1,360 acres of permitted aquatic farms as of November, which is only about 2 square miles total.

While not directly comparable, for context, the average U.S. farm size was 446 acres in 2022, or about two-thirds of a square mile, according to the U.S. Department of Agriculture.

Farms of all types take up around 40 percent of the nation's landmass, covering nearly 1.4 million square miles. Cattle and dairy farming represents about 44 percent of that farmland, with oilseeds and grains second at around 30 percent.

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About the data

Aquaculture refers to any breeding, raising, or harvesting of fish, shellfish, and aquatic plants for food or other commercial products, and it can be in salt water or fresh water. Marine aquaculture is often called mariculture. While mariculture is the bulk of aquaculture in Alaska, this article uses the umbrella term aquaculture that appears in federal and state data sources, which include some freshwater cultivation.

No single data source provides a comprehensive picture of aquaculture as an industry in Alaska, so this article cobbles together several sources on different aspects of marine cultivation to get a sense of the size and economic impact. Our employment and wage data cover only the ventures with employees, so we also looked at business licenses and state permits to estimate how many people and operators are involved as well as harvest data and value. Each source has its limitations. For example, an active business license or active aquatic farm permit doesn't necessarily mean the cultivator is always growing or selling, or that the operation is producing every species permitted.