What's in the Water?

Net-Pen Farming

Wild Atlantic salmon were last harvested commercially in Maine in the late 1800's. In 2000, the National Ocean and Atmospheric Administration (NOAA) added wild Atlantic salmon in the Gulf of Maine to the federal list of endangered species, prohibiting all recreational fishing of the species as well. To keep up with the commercial demand, Maine farmers were able to cultivate domestic populations of Atlantic salmon and began utilizing net pen farming practices in the 1980's to provide high quality fish to consumers.

Sea Grant MAINE

NOAA National Oceanic and Atmospheric Administration U.S. Department of Commerce

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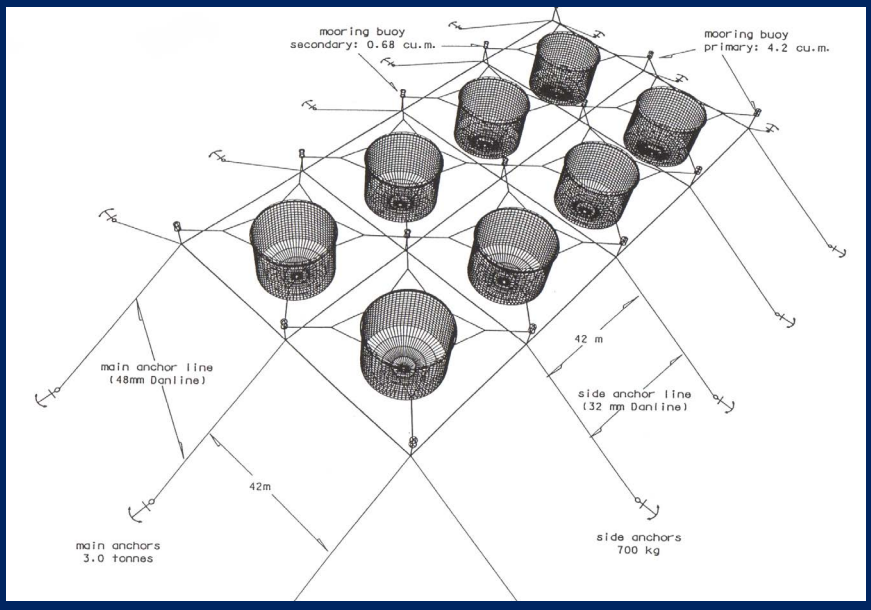
The Maine Sea Grant College Program at the University of Maine, sponsored by the National Oceanic and Atmospheric Administration (NOAA) and the State of Maine, is a part of a network of 34 NOAA Sea Grant Programs throughout the coastal and Great Lakes states and territories.

What Can I See?

When looking at a salmon farm, you'll be able to see large, circular, floating cages in open bodies of saltwater. These floating cages are covered with netting to reduce bird predation. You may see other floating structures near the pens – farmers anchor their boats that are equipped for feeding, harvesting, and netwashing to the pens. In addition to the farm itself, Maine requires all aquaculture sites to be marked with bright, large, corner buoys that say "Sea Farm".

What Can't I See?

Containment nets extend 30 to 50 feet below the surface, and are attached to the floating pens. The net mesh size is small enough to prevent fish from escaping but large enough to allow water flow. More recent pen designs include a secondary net layered around the primary net, which works to prevent predators such as seals and cormorants from ripping through the containment net and allowing fish to escape. In most cases, a series of net pens are held in place by a checkerboard grid of strong lines on the seafloor, and multiple anchors, to provide stability.



Farming Process

Atlantic Salmon are sea-run fish: they spend part of their life in freshwater and another part in saltwater. Because of this, farmers raise salmon in on-shore, freshwater hatcheries before transporting them to the marine net pens.

Freshwater Hatcheries

The salmon spend 18 months in a temperature-controlled, freshwater, land-based hatchery. Here they grow from fertilized eggs to small fish, roughly six to eight inches long. Around late April or early May when the saltwater gets to around 50° Fahrenheit, farmers carefully transport the salmon to saltwater farms.

Marine Net Pens

The salmon stay in their new saltwater environments for another 18-24 months with routine feeding, monitoring, and sampling by farmers. During this time they grow from three to five ounces to eight to twelve pounds and are in their fourth year.

Nets cover the pens to keep predators from entering and the salmon from accidentally jumping out

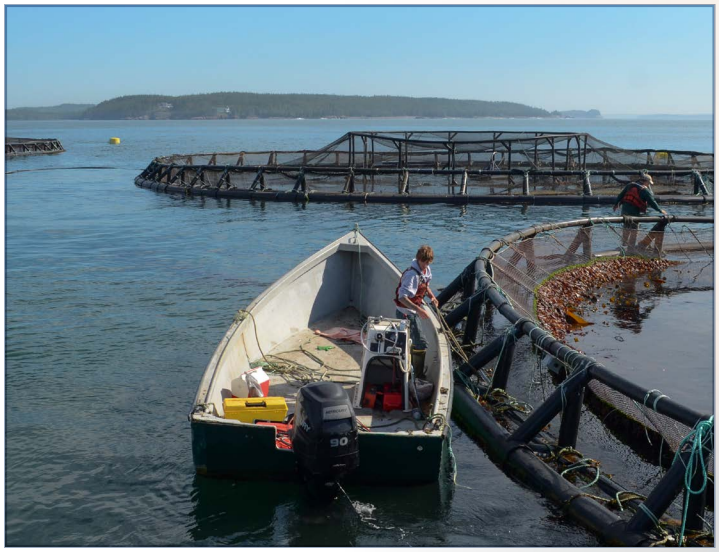
Harvest

When the salmon reach marketable size, the fish are harvested, cleaned, iced, and shipped to customers.

Hydraulic pumps are used to load fish to processing vessels

Why Net-Pen Aquaculture?

Due to fishing restrictions and the decline in wild population of Atlantic salmon, the United States imports salmon from other countries like Chile, Norway, and Canada. The utilization of net-pen farms can reduce carbon emissions from import, while supporting a healthy and sustainable fishing practice.




NOAA Fisheries


Steven Hedlund

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Maine Sea Grant's work across Maine, from the Piscataqua River to Passamaquoddy Bay, is carried out on the lands and waters of the Penobscot, Passamaquoddy, Maliseet, and Mi'kmaq. We thank them for their stewardship and continued strength and resilience in protecting it. We support all efforts for healing and protecting the land and water we share.

Cover photo: Chris Bartlett, Design: Aimee Whitman

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Frequently Asked Questions

What do the salmon eat?
Net pen salmon are fed nutrient-dense dry pellets made of fish meal, plant proteins, vitamins, and minerals.

How many times a day do the salmon eat?
For the first month or so, young salmon can be fed up to 12 times a day and are hand fed by farmers by sprinkling feed into the pens. The transition from fresh to saltwater suppresses their appetite, so they're fed more frequently to try to get them back into eating. Once they are comfortable in their new saltwater environment, they are fed on average two times a day with 45 minute meals. This is done with a spinner head, similar to a lawn sprinkler, that is located in the middle of the pen and blows out fish feed counterclockwise – the direction the fish swim in – around the pen.

How many net-pen farms are in Maine?
There are between 25 and 30 salmon farms in Maine. While this is the number of lease sites, not all are active all the time, due to the "all in all out" method; on average, there are around seven farms raisingf fish at any one time.

How many fish are in a pen?
It all depends on the size of the nets and the depth of the water. In Cobscook Bay, where the first commercial salmon farms were located, the average is 30,000 fish per pen.

Do other fish species ever get into the net pens?
Herring and harbor pollock are common inside pens in small amounts, however, farmers do their best to minimize this happening as they consume the salmon's food.

How do net pen farms affect surrounding ecosystems?
Proper feeding practices minimizes feed waste under the pens. There's a chance of migration by species that like cool, shaded, nutritious environments provided under the pens such as capatella worms, which are food to other nutritious fish like flounder. Likewise, certain species might attach to the net pens, like blue mussels, which are filter-feeding shellfish. As a result, net pen farming has the potential to expand the diversity of life in the aquatic environments immediately surrounding the operation.

How far offshore are farms required to be?
There's no specific requirement as to how far offshore farms need to be, however, when applying for a lease, it's taken whether or not the location will create an impediment to existing navigation channels, other preexisting fishing practices in the area, and if a farmer would have to cross someone else's property to access their farm, although this is less likely with salmon farms since they're located in subtidal waters rather than intertidal zones.

What precautionary measures do I need to take as a boater?
As a boater it's important to be aware of navigational hazards like ropes that can't be seen on the water's surface. Be sure to keep an eye out for buoys to avoid getting your propellers wrapped around underwater gear. While kayaking, swimming, and boating near farms is not prohibited, they are private property and should be respected and treated as such.

How do storms affect fish and farms?
Pens are built to be flexible and strong in order to withstand wind, waves, and storms. When choosing a site, prospective farmers look for an area that has cold, oxygen-rich water and tidal flow with enough depth, located near a shore to provide some protection of offshore high energy storms.