

Lessons from coronavirus risk assessment applied to salmon farming

PUBLISHED JUNE 21, 2021

NORWEGIAN AMERICAN NEWS

Modified from original WITH EXTRA PHOTOS

Manolin uses big data and artificial intelligence to predict disease risk



Photo courtesy of Manolin

Tony Chen (left) and John Costantino (right) are the cofounders of Manolin.

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You may have seen in news media over the last year how scientists used computer modeling to predict the spread of the coronavirus. Before there was sufficient information to make these predictions, historical data from outbreaks of other respiratory diseases were used. They put all this information together and asked a computer to look for patterns that might reveal who is most at risk, what hospitals are developing into hotspots, how the disease is being spread, and which treatments seem to work or not work.

You might be surprised to learn that salmon farmers in Norway are doing the same thing to determine what farms are most at risk, how diseases are spread, and what treatments work best. There are several diseases that can affect fish health, but one the most important problems is sea lice infestations. Since Norway produces nearly half of the global world supply of salmon from its many salmon farms, gaining insight into controlling sea lice is a major priority for salmon farmers.

Sea lice

Sea lice are a type of external parasite that feed on the skin, scales, and slime on the surface of fish. Unlike the lice that infect humans, sea lice don't feed on the blood of their host.

Sea lice are part of the floating community of organisms called copepod plankton, found near the surface of the ocean. When they hatch, they're less than a millimeter long, which is virtually invisible to the naked eye. The young larvae find a fish to attach to and grow through several life stages to be about 2 centimeters ($\frac{3}{4}$ inch) long. Salmon farms are ideal places for sea lice to grow and thrive, since the fish are concentrated in pens and newly hatched lice can easily find a new host.

Even though the lice don't often kill their fish hosts, they create open skin wounds that make the salmon unmarketable. They can spread between neighboring salmon farms, by boat traffic between farms, or through transport on wild fish that swim between farms. For that reason, Norway requires salmon farms to keep sea lice at low levels or else the fish have to be slaughtered, and the farm left empty or "fallow" for several months before introducing new fish. This allows the lice die off, since as parasites they cannot survive long without a host.

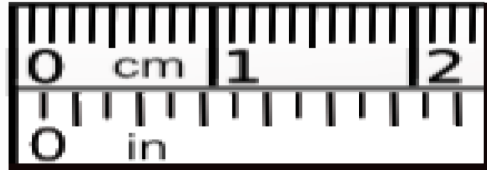
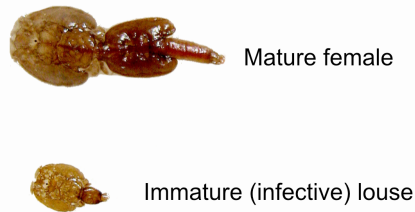


Photo: Eric Stavney

Immature sea lice range from less than 1 mm to as large as 2 cm when the "tail" is fully grown.



Photo: Marit Hommedal/NTB

Sea lice are a type of external parasite that feed on the skin, scales, and slime on the surface of fish.

Predicting sea lice infestation

But disease outbreaks—whether human or fish—can be hard to predict. New lice infestations are linked to variables like boat traffic, weather, and the proximity of an already infected neighboring farm. Computer modeling is about the only way to make sense of the many variables that go into causing disease transmission and risk.

Manolin is a computer analysis company that set up shop in Norway to specifically assess the risk of sea lice infection (among other diseases) to any specific salmon farm. Their specialty is analyzing huge amounts of data by computer. Looking for patterns in large data sets using computers is a type of artificial intelligence.



*Photo: Wikimedia Commons
Salmon farms are ideal places for sea lice to grow and thrive.*

Manolin starts with large amounts of publicly available information collected from farms on lice infestations. The Norwegian government requires farms to report it, along with other disease information. That information and private farm data, create huge “data sets” that artificial intelligence is perfectly suited to analyze.

To go one step further in improving predictive value, computers can then be set up to learn from their predictive successes and failures. This is known as machine learning. Using artificial intelligence and machine learning together is how scientists were able to zero in on which human populations are most at risk of coronavirus infection, and what the contributing factors are.

“No human could even look for trends across so many variables,” says Tony Chen, CEO of Manolin.

For instance, Manolin can analyze sea water temperatures, weather, boat traffic, and fish mortality due to sea lice, all at the same time. “[Machine learning] is what we’re

leveraging to try to forecast these health issues. So, in a way, we're finding needles in the haystack."

Manolin makes all this information and their predictions accessible to salmon farmers in any easy-to-navigate website. Farmers can see which farms near them have sea lice infestations, as well as what treatments are being used and to what effect. Together with their own hard-won wisdom in farming over several generations, the factors that control sea lice and other diseases can be better controlled. As it says on the Manolin website, they enable farmers to "predict fish health events sooner."

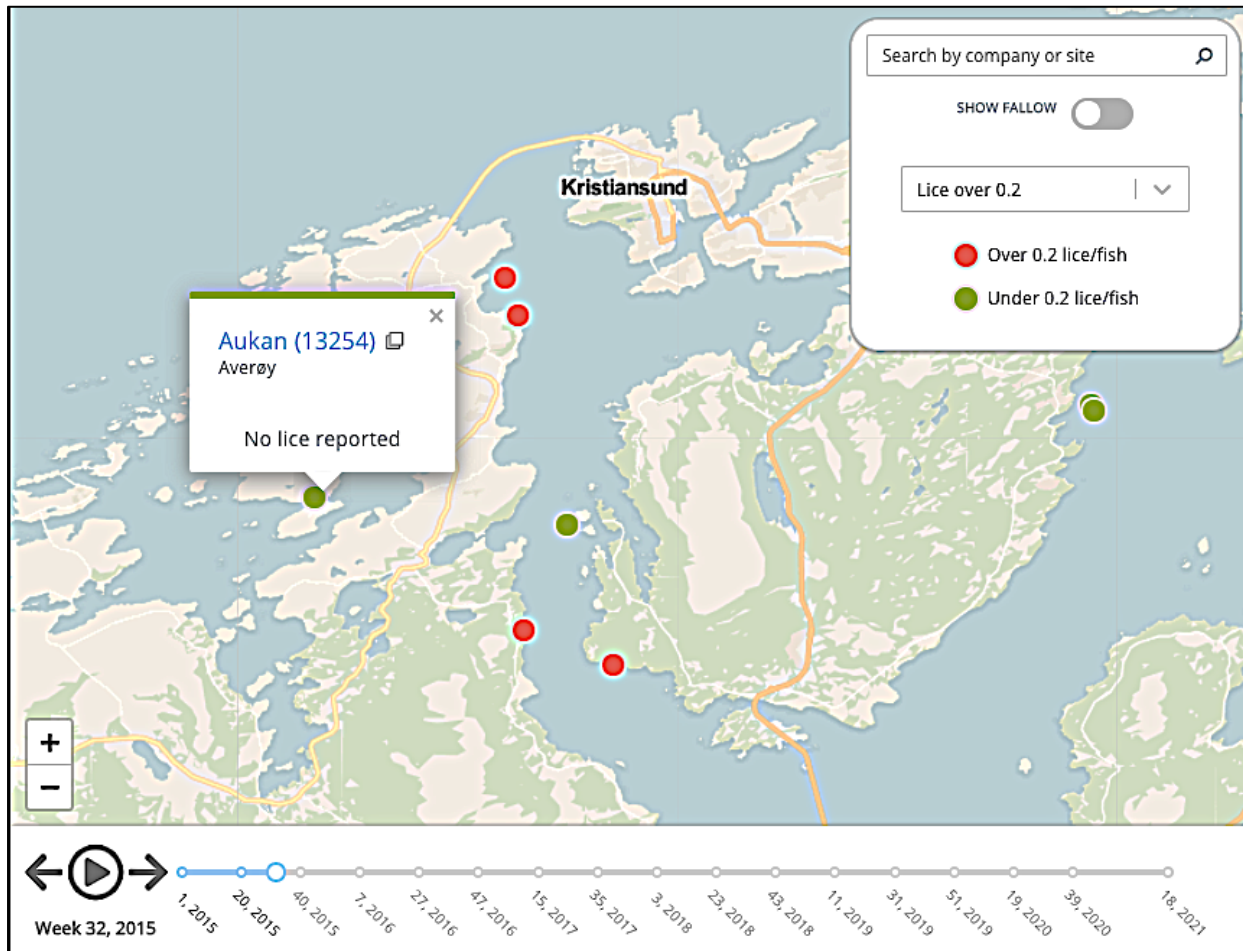


Photo: manolinaqua.com

With a free Manolin account, you can view publicly available data on the Manolin website, such as lice levels at salmon farms near Kristiansund in August of 2015. Salmon farmers subscribed to the Manolin's predication service can view the risk of fish developing a disease.

Håvard Olsen from the Kvarøy Arctic farm, near Mo i Rana, Norway, notes that aquaculture holds a lot of promise in bringing “nutrient-rich protein to more communities through one of the least resource-intensive forms of food production. Manolin is breaking down barriers in data to help us reach this.”

To learn more about salmon farming and the benefits and drawbacks of the industry, please see:

- healthy? “Eric Stavney, *The Norwegian American*, Feb. 22, 2019.
- friendly? “Eric Stavney, *The Norwegian American*, March 6, 2019.
- Manolin’s webbsite, www.manolinaqua.com

*This article originally appeared in the June 18, 2021, issue of The Norwegian American. To subscribe, visit **SUBSCRIBE** or call us at (206) 784-4617.*