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Wild Salmon Under Threat of Extinction, Study Shows

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Intensive farming of salmon for American dinner plates is threatening some wild salmon populations with imminent extinction, according to the most detailed study ever done of the contentious issue. The study comes as the federal government and aquaculture industry are pushing hard for a major expansion of fish farming in coastal areas.

The new research found a direct connection between the rapid growth of fish farming in the waters of the Broughton Archipelago off British Columbia and the abrupt decline in the region's wild pink salmon. What linked the two, the researchers found, was widespread infestations in the open-net salmon pens by sea lice -- a parasite that older salmon can easily tolerate but that kills young wild salmon migrating through the same waters.

"These young salmon wouldn't be dying if it wasn't for the salmon farms and all those sea lice," said lead author Martin Krkosek, a fisheries ecologist at the University of Alberta. "The wild population is dropping so fast that there isn't much time left to act."

With Americans increasingly enamored of fresh salmon, and with the farmed variety making up almost three-quarters of all salmon served, the finding is an unwelcome guest at the feast. Salmon farms have been suspected in the decline of wild salmon for some time, but the study being published online today, in the journal *Science*, is seen by some as the strongest evidence so far of a significant connection.

"This is the broadest look so far at the effects on a total population" of salmon farms, said Andrew Rosenberg, a former deputy director at the National Oceanic and Atmospheric Administration (NOAA), an expert in the field.

"We're not talking about being mean to some individual fish; we're talking about a possible extinction within the next few years" of an important local population of pink salmon, he said.

The study comes at an awkward time for aquaculture advocates, including NOAA, which drafted the proposed National Offshore Aquaculture Act now pending in Congress. The bill would set up procedures to streamline and regulate a major expansion of fish farming.

Advocates argue that with demand for fish -- especially for nutritious species like salmon -- expanding quickly, aquaculture is the only way to meet the demand. They also say that American aquaculture has lagged well behind that of many other nations. Eighty percent of U.S. seafood consumption, and two-thirds of the salmon, is now imported, and much of it is farmed.

Kevin Amos, aquatic health coordinator for NOAA's Marine Fisheries Service, said the conclusions of the new study were unwarranted and unsupported. He said pink salmon runs vary greatly year to year and are effected by many factors, including the variable salinity of rivers, the number of predators present and the extent of fishing in the area.

"We have to consider all things when establishing a cause and effect in aquaculture, and in this case the authors did not do that," he said.

The researchers collected Canadian records dating back to 1970 on the numbers of adult wild salmon returning from the ocean to British Columbia's rivers each year. The count included 14 populations that were exposed to salmon farms and 128 that were not.

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They found that populations in the areas with many salmon farms were collapsing, while those in areas without farms were not. In addition, they found that when salmon farms were temporarily closed or allowed to lie fallow, the wild salmon populations from those rivers rebounded and sea lice infestations declined.

The paper's findings have implications beyond the Broughton Archipelago, where juvenile salmon have to swim past a nearly 50-mile string of fish farms before reaching the open ocean.

With lucrative fish farming now widespread in Atlantic Canada, the coast of Maine, northern Europe and Chile, however, the industry has become increasingly controversial. Sea lice is the problem off British Columbia and in some areas of northern Europe, but a dispute over infectious salmon anemia is the central issue off the Maine and Canadian Atlantic coast, while the escape of penned salmon is key in Chile, where salmon are an aggressive invasive species.

As the world's population expands, authorities in the United States and abroad have promoted aquaculture as a way to sustain current levels of fish consumption. Last month, the U.N. Food and Agriculture Organization issued a statement suggesting the global seafood supply would have to increase by 37 million metric tons in order to satisfy the growing demand, and much of it will have to be farmed.

Fish farming in British Columbia, for example, is aimed more at meeting America's seafood needs than Canada's. The region exports roughly 80 percent of its farmed salmon, and of that amount, nearly 90 percent heads to West Coast cities. Washington state imported 45,000 tons of farmed salmon last year.

Sea lice are naturally-occurring parasites that attach themselves to wild salmon in the open ocean and feed on skin and muscle tissue. They thrive in open-net salmon farms because the fish are crowded together. Adult salmon can generally live with the lice, but wild juveniles migrating out to sea are particularly vulnerable because they are small and thin-skinned.

"In the natural system, the youngest salmon are not exposed to sea lice because the adult salmon that carry the parasite are offshore," study co-author Alexandra Morton, who directs the Salmon Coast Field Station in the Broughton Archipelago. "But fish farms cause a deadly collision between the vulnerable young salmon and sea lice. They are not equipped to survive this, and they don't."

Daniel Pauly, who directs the University of British Columbia's Fisheries Centre and was not involved in the study, said in an interview that he went into the archipelago with Morton a few years ago and collected 20 to 30 juvenile pink salmon, all of which were infected.

"It was like 'Alien,' " he recalled, referring to the movie in which an alien creature infiltrates its victims' bodies before killing them. "They were destined to die."

Critics of current aquaculture practices in coastal areas generally propose two possible remedies: building enclosed holding tanks that would not allow disease, parasites and salmon to escape, and placing open-net farms much further out at sea so that vulnerable young salmon would not be harmed and sensitive shallow waters would not be polluted by the waste from millions of farmed fish. Both alternatives, however, would increase costs.

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