



SCHOOL OF OCEAN AND EARTH SCIENCE AND TECHNOLOGY

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Ocean fish farming harms wild fish, study says

Honolulu, HI—Farming of fish in ocean cages is fundamentally harmful to wild fish, according to an essay in this week's *Conservation Biology*.

Using basic physics, Professor Neil Frazer of the Department of Geology and Geophysics at the University of Hawaii at Manoa explains how farm fish cause nearby wild fish to decline. The foundation of his paper is that higher density of fish promotes infection, and infection lowers the fitness of the fish.

For wild fish, lowered fitness means more difficulty finding food and escaping predators, causing higher death rates. But farmed fish are not only fed, they are also protected from predators by their cage, so infected farm fish live on, shedding pathogen into the water. The higher levels of pathogen in the water cause the death rates of wild fish to rise.

The above paradigm explains recently documented declines of wild fish in areas with sea-cage farm fish.

“Sea lice are an important example of disease transfer in ocean fish farming,” explains Frazer. “Sea lice are tiny crabs that attach to marine fishes, eating their skin and sometimes deeper tissue. Skin is important to fish because they need to keep their tissues less salty than the ocean. Also, when lice puncture the skin they create an entry point for other infections. So wild fish weakened by lice have more difficulty finding food and escaping predators.”

A female sea louse can produce over a thousand larvae during her life. Larvae drift in the ocean and a lucky few of them drift close enough to a fish to attach. Most larvae die without ever finding a fish. In a fish farm environment, a larva's chance of finding a fish increases, so more larvae survive to become lice, and those lice put more larvae into the water. With more larvae in the water, more wild fish become infected and die as a result.

Larger numbers of lice are especially dire for salmon because juvenile salmon must transit coastal areas where salmon farms are located. Juvenile pink and chum salmon (Pacific species) suffer most because they spend much of their early life in coastal waters, and they are so small at ocean-entry that infection by even one or two lice can be fatal.

The calculations in the paper show that even if lice levels on farm fish are controlled by medication, local wild fish still decline. Also, there is a critical stocking level of farmed fish. If a sea-cage system is stocked above the critical level, local wild fish decline to extinction. Long story short — growing farm fish in sea cages can't save wild fish, but it can easily destroy them.



Salmon farm in British Columbia, Canada.
Photo by Lara Renehan, Living Oceans Society.



Sea lice on a juvenile pink salmon. Visible are the egg strings on a female louse, and the puncture tracks in the salmon's skin. Photo by Alexandra Morton, Raincoast Research.

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