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Fish farms clean up their act

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by Helen Dell



Fish farms have been controversial because of their impact on the environment, but a new system is cleaning up after itself. One species' waste can be turned into another species' food, report Canadian researchers, and the results come with the support of Canada's food safety inspectors.

Farms for fish and shellfish are becoming more important to meet an increasing world-wide demand that capture fisheries cannot keep up with. However, large-scale fish farms are controversial because of the effluent pollution they create. Fish rarely eat all the food they are given, and large numbers of fish produce large quantities of excrement. The result is high concentrations of insoluble organic particles and soluble inorganic nutrients, such as phosphates and nitrates, which pollute the local area.

Now, Thierry Chopin, from the University of New Brunswick, and colleagues at the Canadian Department of Fisheries and Oceans have developed a system of 'bioremediation' to clean up the effluent pollution. Alongside their farmed salmon, they culture shellfish that feed on the organic matter, and they grow seaweed that uses up the inorganic nutrients. "One component [of the system] produces a lot of waste, but the other two components are more than happy to take advantage of that," said Chopin. "I call them my little 'scrubbers'."

But culturing the three species together - termed polyculture - is not only about bioremediation. Each species can be sold as a crop, increasing and diversifying production from a small area. The markets for mussels and salmon are well established. As for seaweed, some is sold for human consumption, but it also is used as a source of pigments and vitamins, and as 'botanical' components in the cosmetics industry.

Seaweed is also the major food source for the fast-growing sea urchin and abalone farming industries, which currently rely heavily on diminishing wild resources. Chopin's preliminary results show that sea urchins fed the polycultured seaweed grow much faster than when fed wild-grown seaweed.

The idea of polyculture is not new; more than a millennium ago the Chinese developed combinations of fish with different food sources to maximize production from a single pond. But, Chopin feels that the West still needs to be persuaded of the benefits of polyculture. Following his initial success with the system, however, he is

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finding that more commercial operations are becoming interested in joining the team. "I had my period of preaching in the desert," he said, "now people are getting interested."

He has already dealt with one of the persistent criticisms of polyculture. Farmed fish are treated regularly with various antibiotics and therapeutics to keep them healthy and parasite free. Critics say that the other polycultured species might take these up, making them unsuitable as a human food source. However, Chopin has been monitoring his mussels and kelp, in association with the Canadian Food Inspection Agency, and has failed to detect the chemicals in their tissues.

"This is very exciting," said Don Bishop, president of Fukui North America, a firm of consultants who specialize in the development of marine farms. "Therapeutics were always going to be an issue, but Thierry has already paved the way by proving that they are not a problem."

The new polyculture system is presently only small scale, but Chopin hopes that it can be increased to industrial scale in two to three years. They still need to optimize the proportions of the three organisms and to define the site conditions needed to maximize the growth of all three species. He is also working towards seaweed culture systems that will be self-perpetuating and not need re-seeding from wild stocks.

Bishop argues that the project has a long way to go to produce an economically viable industry. But salmon farmers are looking for new alternatives, he says, because the price of salmon has fallen in recent years. He estimates that the average salmon farmer will already have 40-50% of the infrastructure needed to undertake polyculture, including equipment, a labor force, distribution networks and a sales force.

