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COLUMN ONE

Fish Farms Become Feedlots of the Sea

Like cattle pens, the salmon operations bring product to market cheaply. But harm to ocean life and possibly human health has experts worried.

By Kenneth R. Weiss, Times Staff Writer

PORT McNEILL, Canada -- If you bought a salmon filet in the supermarket recently or ordered one in a restaurant, chances are it was born in a plastic tray here, or a place just like it.

Instead of streaking through the ocean or leaping up rocky streams, it spent three years like a marine couch potato, circling lazily in pens, fattening up on pellets of salmon chow.

It was vaccinated as a small fry to survive the diseases that race through these oceanic feedlots, acres of net-covered pens tethered offshore. It was likely dosed with antibiotics to ward off infection or fed pesticides to shed a beard of bloodsucking sea lice.

For that rich, pink hue, the fish was given a steady diet of synthetic pigment. Without it, the flesh of these caged salmon would be an unappetizing, pale gray.

While many chefs and seafood lovers snub the feedlot variety as inferior to wild salmon, fish farming is booming. What was once a seasonal delicacy now is sometimes as cheap as chicken and available year-round. Now, the hidden costs of mass-producing these once-wild fish are coming into focus.

Begun in Norway in the late 1960s, salmon farming has spread rapidly to cold-water inlets around the globe. Ninety-one salmon farms now operate in British Columbian waters. The number is expected to reach 200 or more in the next decade.

Flash Photo Gallery



Troubled Harvest

Video



Times reporter Ken Weiss narrates a two-part video about the environmental effects of salmon aquaculture.

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Industrial fish farming raises many of the same concerns about chemicals and pollutants that are associated with feedlot cattle and factory chicken farms. So far, however, government scientists worry less about the effects of antibiotics, pesticides and artificial dyes on human health than they do about damage to the marine environment.

"They're like floating pig farms," said Daniel Pauly, professor of fisheries at the University of British Columbia in Vancouver. "They consume a tremendous amount of highly concentrated protein pellets and they make a terrific mess."

Fish wastes and uneaten feed smother the sea floor beneath these farms, generating bacteria that consume oxygen vital to shellfish and other bottom-dwelling sea creatures.

Disease and parasites, which would normally exist in relatively low levels in fish scattered around the oceans, can run rampant in densely packed fish farms.

Pesticides fed to the fish and toxic copper sulfate used to keep nets free of algae are building up in sea-floor sediments. Antibiotics have created resistant strains of disease that infect both wild and domesticated fish.

Clouds of sea lice, incubated by captive fish on farms, swarm wild salmon as they swim past on their migration to the ocean.

Of all the concerns, the biggest turns out to be a problem fish farms were supposed to help alleviate: the depletion of marine life from overfishing.

These fish farms contribute to the problem because the captive salmon must be fed. Salmon are carnivores and, unlike vegetarian catfish that are fed grain on farms, they need to eat fish to bulk up fast and remain healthy.

It takes about 2.4 pounds of wild fish to produce one pound of farmed salmon, according to Rosamond L. Naylor, an agricultural economist at Stanford's Center for Environmental Science and Policy.

That means grinding up a lot of sardines, anchovies, mackerel, herring and other fish to produce the oil and meal compressed into pellets of salmon chow.

"We are not taking strain off wild fisheries. We are adding to it," Naylor said. "This cannot be sustained forever."

In British Columbia, the industry, under pressure from environmentalists, marine scientists and local newspapers, is taking steps to mitigate some of

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the ecological problems.

"We have made some mistakes in the past and we acknowledge them," said Mary Ellen Walling, executive director of the British Columbia Salmon Farmers Assn. "We feel the industry is sustainable, if well-managed, and we have a code of practices that is followed by all of our member companies."

Nearly 30 farms are preparing to move to less ecologically fragile areas, under orders from Canadian authorities.

Some farms have installed underwater video cameras to detect when fish quit feeding, so workers can stop scattering food pellets. Many farms are switching to sturdier nets to stop fish from escaping and keep out marauding sea lions, which are shot if they penetrate the perimeter.

The industry now recognizes that it will soon be pushing the limits of the ocean.

"There will come a time when our industry will use more of the fish oil and fish meal than is available," said Odd Grydeland, an executive at Heritage Salmon in British Columbia. "Our biggest challenge is to find substitute grains for fish meal and fish oil."

Farm-raised salmon now dominates West Coast markets, arriving daily from Canada and Chile. About 80% of the salmon grown in British Columbia goes to markets from Seattle to Los Angeles.

The salmon industry took off so fast in British Columbia in the 1980s that the provincial government, worried about the environmental toll, imposed a ban in 1995 on any new farms.

The industry responded by stuffing, on average, twice as many fish into each farm. Today, farms typically put 50,000 to 90,000 fish in a pen 100 feet by 100 feet. A single farm can grow 400,000 fish. Others raise a million or more.

The moratorium on new farms was lifted in September by the provincial government after voters elected a pro-business slate of lawmakers and administrators. As a result, 10 to 15 farms are expected to open each year over the next decade.

Five international companies — three of them based in Norway — control most of the existing farms. Nearly all are situated around Vancouver Island, which begins outside Seattle's Puget Sound and extends up the coast for 300 miles.

It's a lightly populated place of stunning beauty. Cedar, hemlock and Douglas fir grow right down to the high-water mark.

Massive tides flush rich blue-green waters through the archipelago of

islands, straits, bays and inlets, nurturing five types of wild salmon. These, in turn, attract seals, sea lions, white-sided dolphins and the world's best known pods of killer whales.

Residents rely on boats and seaplanes to reach surrounding islands that host many of the farms. Each farm is a cluster of pens, often interconnected by metal walkways and tethered offshore by a lattice of steel cables, floats and weights.

In the midst of this idyllic setting, signs of strain on the marine environment are bubbling to the surface much the way diseases and parasites, incubated in European salmon farms, fouled the fiords of Norway and the lochs of Scotland.

In Norway, parasites have so devastated wild fish that the government poisoned all aquatic life in dozens of rivers and streams in an effort to re-boot the ecological system.

"The Norwegian companies are transferring the same operations here that have been used in Europe," said Pauly, the fisheries professor. "So we can infer that every mistake that has been done in Norway and Scotland will be replicated here."

Dale Blackburn, vice president of West Coast operations for Norwegian-based Stolt Sea Farm, said his staff works very closely with its counterparts in Norway. But, he said, "It's ridiculous to think we don't learn from our mistakes and transfer technology blindly."

Still, more than a dozen farms in British Columbia have been stricken by infectious hematopoietic necrosis, a virus that attacks the kidneys and spleen of fish.

Jeanine Siemens, manager of a Stolt farm, said, "It was really hard for me and the crew" to oversee the killing of 900,000 young salmon last August because of a viral outbreak.

"We had a boat pumping dead fish every day," she said. "It took a couple of weeks. But it was the best decision. You are at risk of infecting other farms."

Farms are typically required to bury the dead in landfills to protect wild marine life and the environment. But Grieg Seafood recently got an emergency permit from the Canadian government to dump in the Pacific 900 tons of salmon killed by a toxic algae bloom. The emergency? The weight of the dead fish threatened to sink the entire farm.

About 1 million live Atlantic salmon — favored by farmers because they grow fast and can be packed in tight quarters — have escaped through holes in nets and storm-wrecked farms in the Pacific Northwest.

Biologists fear these invaders will out-compete Pacific salmon and trout for

food and territory, hastening the demise of the native fish. An Atlantic salmon takeover could knock nature's balance out of whack and turn a healthy, diverse marine habitat into one dominated by a single invasive species.

Preserving diversity is essential, biologists say, because multiple species of salmon have a better chance of surviving than just one.

John Volpe, a fisheries ecologist at the University of Alberta, has been swimming rivers with snorkel and mask to document the spread of Atlantic salmon and their offspring.

"In the majority of rivers, I find Atlantic salmon," Volpe said. "We know they are out there; we just don't know how many, or what to do about them."

His research focuses on how Atlantic salmon can colonize, if given a chance. It has terrified the U.S. neighbors to the north. Alaskan officials banned fish farms in 1990 to protect their wild fishery. So they don't take kindly to British Columbian farms creeping toward their southern border.

Although native Pacific salmon are rare and endangered in the Lower 48, Alaska's salmon fisheries are so healthy they have earned the Marine Stewardship Council's eco-label as "sustainable." The council's labels are designed to guide consumers to species that are not being overharvested.

Recently, the prospect of genetically modified salmon that can grow six times faster than normal fish has heightened anxiety. Aqua Bounty Farms Inc., of Waltham, Mass., is seeking U.S. and Canadian approval to alter genes to produce a growth hormone that could shave a year off the usual 2½ to three years it takes to raise a market-size fish.

Commercial fishermen and other critics fear that these "frankenfish" will escape and pose an even greater danger to native species than do the Atlantic salmon.

"Nobody can predict just what that means for our wild salmon," Alaska Gov. Tony Knowles said. "We do see it as a threat."

Canadian commercial fishermen, initially supportive of salmon farms, have grown increasingly hostile. They were stunned in August when their nets came up nearly empty during the first day of the wild pink salmon season in the Broughton Archipelago at the northeast end of Vancouver Island.

"There should have been millions of pinks, but there were fewer than anyone can remember," said Calvin Siider, a salmon gill-netter. "We can't prove that sea lice caused it. But common sense tells you something, if they are covered by sea lice as babies, and they don't come back as adults."

Alexandra Morton, an independent biologist and critic of salmon farms, began examining sea lice in 2001 when a fishermen brought her two baby

pink salmon covered with them.

Collecting more than 700 baby pink salmon around farms, she found that 78% were covered with a fatal load of sea lice, which burrow into fish and feed on skin, mucous and blood. Juvenile salmon she netted farther from the farms were largely lice-free.

Bud Graham, British Columbia's assistant deputy minister of agriculture, food and fisheries, called this a "unique phenomenon."

"We have not seen that before. We really don't understand it," he said. "We've not had sea lice problems in our waters, compared to Scotland and Ireland."

Salmon farmers point out that the sea louse exists in the wild. Their captive fish are unlikely hosts, the farmers say, because at the first sign of an outbreak, they add the pesticide emamectin benzoate to the feed.

Under Canadian rules, farmers must halt the use of pesticides 25 days before harvest to make sure all residues are flushed from the fish. If that's done, officials said, pesticides should pose no danger to consumers.

European health officials have debated whether there is any human health risk from synthetic pigment added to the feed to give farmed salmon their pink hue.

In the wild, salmon absorb carotenoid from eating pink krill. On the farm, they get canthaxanthin manufactured by Hoffman-La Roche. The pharmaceutical company distributes its trademarked SalmoFan, similar to paint store swatches, so fish farmers can choose among various shades.

Europeans are suspicious of canthaxanthin, which was linked to retinal damage in people when taken as a sunless tanning pill. The British banned its use as a tanning agent, but it's still available in the United States.

As for its use in animal feed, the European Commission scientific committee on animal nutrition issued a warning about the pigment and urged the industry to find an alternative. But in response, the British Food Standards Agency took the position that normal consumption of salmon poses no health risk. No government has banned the pigment from animal feed.

Scientists in the United States are far more concerned about a pair of preliminary studies — one in British Columbia and one in Great Britain — that showed farmed salmon accumulate more cancer-causing PCBs and toxic dioxins than wild salmon.

Scientists in the U.S. are trying to determine the extent of the contamination in salmon and what levels are safe for human consumption.

The culprit appears to be the salmon feed, which contains higher

concentrations of fish oil — extracted from sardines, anchovies and other ground-up fish — than wild salmon normally consume. Man-made contaminants, PCBs and dioxins make their way into the ocean and are absorbed by marine life.

The pollutants accumulate in fat that is distilled into the concentrated fish oil, which, in turn, is a prime ingredient of the salmon feed.

Farmed salmon are far fattier than their wild cousins, although they do not contain as much of the beneficial omega-3 fatty acids.

The industry complains that environmental activists have misinterpreted the contaminant studies, needlessly frightening consumers.

"The concern is that people will stop eating fish," said Walling, of the British Columbia Salmon Farmers Assn. "Salmon is a healthy food choice. Our Canadian government says this is a safe food."

Environmentalists in British Columbia and Scotland recently launched campaigns urging consumers to boycott farmed salmon until the industry changes many of its practices.

At the least, they want the farms to switch to solid-walled pens with catch basins to isolate farmed fish — and their diseases, pests and waste — from the environment. The ideal solution, they say, is to have the farmed stock raised in landlocked tanks.

Protests notwithstanding, the industry is expected to get a lot bigger. Demand for seafood is rising and will double by 2040, according to the U.N.'s Food and Agriculture Organization. Nearly half the world's wild fisheries are exhausted from overfishing, thus much of the supply will likely come from farmed seafood.

"Aquaculture is here to stay," said Rebecca Goldberg, a biologist who co-authored a report on the industry for the Pew Oceans Commission. "The challenge is to ensure that this young industry grows in a sustainable manner and does not cause serious ecological damage."

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