



## FEEDING FARMED SALMON

Industrialized salmon farming relies on a deeply flawed assumption that agricultural practices for animals can be applied to carnivorous fish. In terms of the marine food chain, farming salmon is roughly analogous to raising tigers for meat:<sup>1</sup> Both approaches are inherently unsustainable.

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### A FLAWED PREMISE

It takes vast quantities of fish caught in the wild to provide sufficient food for penned salmon. A study in the journal *Nature* calculated that more than three pounds of wild fish—anchovies, herring, sardines, menhaden, mackerel, and the like—are needed to produce one pound of marketable farmed salmon. This produces a net loss of fisheries resources, not a gain as the global salmon farming industry claims.

### THE MAGNITUDE OF THE PROBLEM

The voracious appetite of the global farmed salmon industry has impacted wild fisheries for more than a decade. On average two-thirds of a farmed salmon's diet consists of fishmeal and fish oil.<sup>2</sup> These can only be obtained by catching and processing millions of tons of other fish. Salmon farms presently use about 573,000 tons of processed fish meal and 409,000 tons of fish oil annually.<sup>3</sup>

Besides being unsustainable, large quantities of fish feed are wasted by salmon farms. Globally, these mechanized facilities discharge 15-20 percent of uneaten salmon feed into the sea. In Canada, for example, salmon farms discharge more than 10,000 tons of uneaten food annually. Worldwide, some estimates of lost feed run as high as 300,000 tons yearly.

### POLLUTION AND SALMON FEED

In addition to the toxic chemicals and food additives used by salmon farms, the food itself causes environmental pollution. In 1995, the world's largest international poultry and fish feed manufacturer, Nutreco, reported a link between farmed salmon wastes, high in nitrogen and phosphorus because of their artificial nature, and the loss of oxygen in adjacent waters (eutrophication).<sup>4</sup> Other studies have found that chemicals and pollutants inherent in salmon feed contaminate both the salmon themselves and the ocean floor beneath their pens.<sup>5</sup>

The costs of fishmeal and fish oil, together with mounting environmental problems, are leading some industrial salmon farms to use less wild caught fish for food and seek more plentiful, cheaper alternatives. Under study or in current use are various types of vegetable

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<sup>1</sup> Rosamond Naylor and Marshall Burke, "Aquaculture and Ocean Resources: Raising Tigers of the Sea," *Annual Review of Environment and Resources*, 30 (2005), pp. 185–218, <<http://arjournals.annualreviews.org/doi/abs/10.1146/annurev.energy.30.081804.121034>>.

<sup>2</sup> Albert G. J. Tacon, Ph.D., "State of Information on Salmon Aquaculture Feed and the Environment," [report prepared for the U.S. World Wildlife Fund Salmon Aquaculture Dialogue], p. 5, <[www.worldwildlife.org/csi/pubs/Feed\\_final\\_resaved2.pdf](http://www.worldwildlife.org/csi/pubs/Feed_final_resaved2.pdf)>.

<sup>3</sup> Albert G. J. Tacon, Ph.D., op. cit., Table 1, pp. 8–15.

<sup>4</sup> C. Talbot and R. Hole, "Fish diets and the control of eutrophication resulting from aquaculture," *Journal of Applied Ichthyology* 10:4 (1994), pp. 259-270.

<sup>5</sup> J. Hellou et al., "Presence and distribution of PAH, PCB and DDE in feed and sediments under salmon aquaculture cages in the Bay of Fundy, New Brunswick, Canada," *Aquatic Conservation: Marine and Freshwater Ecosystems*, Vol. 15, chapter 4 (2005), <[www3.interscience.wiley.com/cgi-bin/abstract/110471440/ABSTRACT](http://www3.interscience.wiley.com/cgi-bin/abstract/110471440/ABSTRACT)>.

proteins and animal byproducts, including chicken feathers and slaughter waste. Norwegian scientists are even experimenting with genetically modified (GM) soy products for salmon feed, and experts say it is only a matter of time before GM soy and GM-corn are part of a farmed salmon's diet.<sup>6</sup>

### **FOOD FOR THOUGHT**

Aquaculture cannot be economically or environmentally viable for carnivorous salmon. Such an inherently unsustainable method already causes an irreparable net loss of marine fish resources. Not surprisingly, the answer lies in the marketplace: consumers must become aware that when they buy a pound of farmed salmon, rather than sustainable fish or seafood, it contributes to the potential loss of three pounds of wild fish from our oceans.

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<sup>6</sup> M. Sanden et al, "The fate of transgene sequences present in genetically modified (GM) plant products in fish feed: investigating the survival of GM Soybean DNA fragments during feeding trials in Atlantic salmon," *Aquaculture*, 237 (2004), pp. 391-405, <[www.nifes.no/gmo\\_eng.html](http://www.nifes.no/gmo_eng.html)>. See also M. Sanden et al, "Growth, organ development and function of Atlantic salmon, Salmon salar L., Parr fed genetically modified (GM) soy and maize," *Aquaculture Nutrition* (in press, 2005), <[www.nifes.no/monicasanden.html](http://www.nifes.no/monicasanden.html)>.