Letters

Author: Madin, Elizabeth M. P.

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Genetically Engineered Salmon Pose Environmental Risks That Must Be Considered

As the US Food and Drug Administration (FDA) considers whether to approve the first genetically engineered animal to enter the American food supply (Williams 2010), we face the worrying prospect that approval will come without consideration of its full suite of potential environmental and ecological impacts.

If the veterinarian-led FDA advisory group concludes that the new fish poses no substantial environmental risks (as it appears likely they will; Pollack 2010), the application can be approved without a full environmental impact statement.

The proposal is for a modified Atlantic salmon (*Salmo salar* L.) containing genetic material from Chinook salmon and ocean pout, allowing it to produce growth hormone when it normally would not. The new fish grows to marketable size roughly twice as fast as its wild counterparts.

FDA approval of this application could pave the way for greater future production of this and other genetically engineered food animals. The consequences of future production, in farms and ocean pens and potentially in less-well-regulated environments and countries, absolutely must be considered.

Escape by these salmon into marine ecosystems would pose a wide range of environmental and ecological threats beyond those of conventional salmon (Naylor et al. 2005) grown in farms (Krkosek et al. 2007) and ocean pens (Vester and Timme 2010). Larger fish at a given age or season may outcompete wild salmon, potentially reducing individual or population growth rates. Predator-prey dynamics could be disrupted both through lethal and nonlethal means. The larger-at-age engineered salmon are likely to be more effective predators. Importantly, even in the absence of lethal effects, the mere presence of larger fish predators has been shown to alter prey behavior, causing trophic cascades in marine systems that can dramatically alter seafloor structure. Such ecosystem alterations could potentially have unanticipated repercussions throughout the food web.

Given the wide range of potential environmental and ecological ramifications of engineered salmon escaping into natural ecosystems, the FDA must consult ecologists with the knowledge and tools to accurately assess the risks posed by commercialization of these fish. Critically, a full environmental impact statement must be conducted before this decision is made in order to set a precedent for other genetically engineered species in one of the world's largest seafood markets.

ELIZABETH M. P. MADIN

Elizabeth M. P. Madin (elizabeth.madin@uts.edu.au) is with the Department of Environmental Sciences at the University of Technology-Sydney, in Sydney, Australia.

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