

Environmental risks associated with fugitive Atlantic salmon

Fugitive farmed Atlantic salmon are taking over in eastern Canada. Escaping from damaged cages, farmed salmon are free to enter rivers where they can breed with their wild cousins. Conservative estimates indicate that 1 in 10 salmon that return from the sea to spawn are fish of farmed origin. Dr. Jeffrey Hutchings (Dalhousie University) and Dr. Dylan Fraser (Concordia University) studied the potential consequences of interbreeding, and the results suggested that fugitive farmed salmon may have significant impacts on wild populations.



Researchers discovered that many traits in farmed fish may be inadvertently selected by current fish farming practices. For example, faster growth and increased disease resistance might seem like obvious traits that would be favoured by farmers, but these traits are associated with others such as increased aggression and altered developmental rates. Genetic variation in the farmed populations is low, meaning that a large proportion of farmed fish have these traits. Consider that in some rivers the proportion of farmed fish observed can exceed 90%; thus interbreeding with their wild cousins can lead to significant changes in the wild population. Future generations inherit traits that their farmed parents carried—traits that ensured survival in captivity, where food was abundant and predators were scarce. However, these traits might not be adaptive under natural conditions.

The resilience of any wild fish population depends on adaptations for survival in the face of environmental change, such as unusual temperature extremes (more common now due to global warming), and changes in water acidity. In a 'worst-case scenario,' where the incidence of escape and interbreeding is high and the genetic diversity is low, the worry is that Atlantic Canadian rivers could become devoid of wild salmon altogether. The low level of genetic diversity in the escaped farm fish may limit the potential for future adaptation in a changing climate.

Hutchings and Fraser make the case for the importance of novel research to better inform assessments of the environmental risks associated with this industry. As well, government agencies are being asked to implement regulations and reporting systems to ascertain the extent of the fugitive salmon problem, including artificial selection, escapes, and interbreeding.

To learn more:

Fraser DJ, ALS Houde, PV Debes, PT O'Reilly, JD Eddington, JA Hutchings (2010) Consequences of farmed-wild hybridization across divergent wild populations and multiple traits in salmon. *Ecological Applications* 20: 935-953.

Fraser DJ, AM Cook, JD Eddington, P Bentzen, JA Hutchings (2008) Mixed evidence for reduced local adaptation in wild salmon resulting from interbreeding with escaped farmed salmon: complexities in hybrid fitness. *Evolutionary Applications*. 1: 501-512.

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