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## **Averting the perfect storm for wild salmon**

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We hear so much about missing wild salmon and recently a record run.

But Simon Fraser University scientists say a population explosion of hatchery and wild salmon in the North Pacific Ocean is leading hatchery fish to beat out their wild cousins for food.

In a new paper in *Marine and Coastal Fisheries*, four researchers, including Randall Peterman and Brigitte Dorner in SFU's Faculty of Environment, predict a perfect storm is evolving that could seriously reduce wild salmon populations.

Peterman, a Canada Research Chair in Fisheries Risk Assessment and Management, notes stressors, such as overharvesting and poor environmental conditions, are reducing many individual North Pacific salmon populations in particular regions. 'But the sum of both wild and hatchery pink, chum and sockeye salmon across all populations from all regions of the North Pacific is now the highest that has ever been recorded. This is likely due to favourable ocean conditions,' adds the professor.

The North Pacific stretches from Korea, Japan and Russia over to Alaska, B.C. and the west coast of the United States.

Peterman and the other co-authors of this paper maintain that the population explosion in the North Pacific causes hatchery and wild salmon to compete for a limited and unpredictable ocean food supply.

It's a fight that hatchery fish could easily win by virtue of being the more prolific relative that can more easily persist in the face of intense fishing.

'The ocean is always changing, and current favourable ecological conditions for salmon will not last indefinitely,' warns Peterman. 'Unless international agreements are developed to manage hatchery production levels across nations, hatchery salmon may dominate in the North Pacific, when ocean conditions deteriorate.'

The co-authors warn that the dominance of hatchery salmon would decrease not only wild salmon abundance in the North Pacific but also their biological diversity.

'Higher levels of hatchery fish straying onto spawning grounds, combined with low numbers of wild fish, could further erode wild salmon diversity, which helps stabilize their abundances,' explains Peterman. 'Many salmon from both sides of the Pacific intermingle in the Gulf of Alaska, Bering Sea and/or south of there. Together, these factors create the perfect storm for reducing wild salmon over the long term.'

-30-

Backgrounder: Averting the perfect storm for wild salmon

There are more salmon (pink, chum, and sockeye) today than we have seen before in the North Pacific. Since comprehensive estimates were first made in the 1950s, total abundance has doubled, likely due to more favorable ocean conditions for juvenile salmon.

Since the 1950s, the release of juvenile hatchery salmon into the North Pacific Ocean -

## **Averting the perfect storm for wild salmon**

or salmon ranching - has skyrocketed to about five billion fish per year. Adult hatchery salmon now account for at least 20 per cent of total adult salmon production.

In some regions, hatchery salmon dominate (50 per cent of total or more) wild fish. For example, in Asia salmon hatcheries produce 76 per cent of all adult chum salmon. In contrast to wild sockeye and pinks, wild chum production did not increase significantly in the mid-1970s, prompting concerns that hatchery chum production limits wild chum production.

Events that could precipitate a perfect storm for wild salmon depletion are:

**Higher competition:** If ocean productivity decreases, there will be less food for all salmon, wild or hatchery, leading to slower growth and lower survival. Fishery managers might respond by ramping up hatchery production, attempting to maintain or increase returns of adult salmon in leaner times. This would intensify competition among all salmon for increasingly limited resources.

**More overfishing:** Most salmon are caught in places where both hatchery and wild fish intermingle. When there is intense fishing, which often occurs with increased numbers of hatchery fish, wild fish cannot withstand as much fishing pressure as hatchery fish. They are not as productive as hatchery stocks in terms of adult offspring produced per parent.

**Lower diversity:** Loss of wild salmon biodiversity is of concern because wild salmon have substantial social and economic value, and population diversity makes them more environmentally resilient.

Large-scale hatchery production might impact salmon from distant regions. Stocks from distant regions of Asia and North America mix in the open ocean and there is evidence that different species of salmon compete for food-directly or indirectly-on the high seas.

The co-authors of this new paper are: Greg Ruggione, Randall Peterman, Brigitte Dorner and Katherine Myers. Peterman and Dorner are in SFU's School of Resource and Environmental Management. Their findings are published in the October 2010 issue of *Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science* at <http://afs-journals.org/doi/full/10.1577/C09-054.1>

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-30-

Comments

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