Farm salmon pose clear reproductive threat to wild gene pools

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Farmed salmon show full reproductive potential to invade wild gene pools and should be sterilised - according to new research from the University of East Anglia (UEA).

Findings published today reveal that, while farmed salmon are genetically different to their wild counterparts, they are just as fertile. This is important information because millions of farmed salmon escape into the wild – posing threats to wild gene pools.

Lead Researcher Prof Matt Gage from UEA's school of Biological Sciences said: "Around 95 per cent of all salmon in existence are farmed, and domestication has made them very different to wild

populations, each of which is locally adapted to its own river system.

"Farmed salmon grow very fast, are aggressive, and not as clever as wild salmon when it comes to dealing with predators. These domestic traits are good for producing fish for the table, but not for the stability of wild populations.

"The problem is that farmed salmon can escape each year in their millions, getting into wild spawning populations, where they can then reproduce and erode wild gene pools, introducing these negative traits.

"We know that recently-escaped farmed salmon are inferior to wild fish in reproduction, but we do not have detailed information on sperm and egg performance, which could have been affected by domestication. Our work shows that farm fish are as potent at the gamete level as wild fish, and if farm escapes can revive their spawning behaviour by a period in the wild, clearly pose a significant threat of hybridisation with wild populations."

Researchers used a range of in vitro fertilization tests in conditions that mimicked spawning in the natural environment, including tests of sperm competitiveness and egg compatibility. All tests on sperm and egg form and function showed that farmed salmon are as fertile as wild salmon – identifying a clear threat of farmed salmon reproducing with wild fish.

"Some Norwegian rivers have recorded big numbers of farmed fish present – as much as 50 per cent. Both anglers and conservationists are worried by farmed fish escapees which could disrupt locally adapted traits like timing of return, adult body size, and disease resistance.

"Salmon farming is a huge business in the UK, Norway and beyond, and while it does reduce the pressure on wild fish stocks, it can also create its own environmental pressures through genetic disruption.

"A viable solution is to induce 'triploidy' by pressure-treating salmon eggs just after fertilisation - where the fish grows as normal, but with both sex chromosomes; this is normal for farming rainbow trout. The resulting adult develops testes and ovaries but both are much reduced and most triploids are sterile. These triploid fish can't reproduce if they escape, but the aquaculture industry has not embraced this technology yet because of fears that triploids don't perform as well in farms as normal diploid fish, eroding profits."

More information: 'Assessing risks of invasion through gamete performance: farm Atlantic salmon sperm and eggs show equivalence in function, fertility, compatibility and competitiveness to wild Atlantic salmon' is published by *Evolutionary Applications* on March 10, 2014.

Provided by University of East Anglia