National Policy: Commercial Origin Salmon Release

1. The release of commercial origin chinook salmon into open systems of water, where these fish are able to reach the ocean, is undesirable because it dilutes the wild chinook salmon population with genetically inferior fish that reduce the available food and spawning habitats for wild fish. The effect of this is a diminishment of wild fish spawning, resulting in an overall degradation of the wild salmon population.

2. For this reason, Fish & Game does not support the release of hatchery reared commercial origin chinook salmon into any open system of water, or the planting of ova from such sources.

3. In implementing this policy:
    a. no Fish and Game council will release ova or hatchery reared commercial origin chinook salmon into any open system of water; and
    b. no approval will be granted by any Fish & Game council for external parties seeking to release ova or hatchery reared commercial origin chinook salmon into open systems.

4. Note this policy explicitly does not apply to the release of commercial origin chinook salmon into closed systems and does not preclude any Fish and Game council from releasing chinook salmon into a closed system or from granting approval for an external party to do so.

5. It also does not apply to the release of salmon reared in a hatchery from first generation wild stock, as these are genetically similar to wild fish, and therefore do not have the same detrimental effect on wild populations.

6. This policy forms part of a co-ordinated set of initiatives to restore wild chinook salmon populations.

7. The scientific basis for this policy is supported by advice from both NIWA and the Cawthron Institute, and a review by Dr Robin Holmes (2018) from the Cawthron Institute. See the Appendix for further information.

Definitions:

- Open system is defined as any system of water where there is a high risk of connection-to the ocean. This includes waterways where a connection is likely to

occur at specific times of the year or during high water events and includes the ocean itself insofar as a Fish and Game Council may be consulted by the Ministry for Primary Industries on the release of chinook salmon into the ocean.

- Closed system is defined as any system of water where there is no connection, or a low risk of connection, to the ocean.
- Hatchery reared commercial origin chinook salmon is defined as any salmon (or ova) originating from or bred in a commercial hatchery, excluding those reared from first generation wild stock.
- 'Wild stock' is defined as any salmon that has spent its entire life cycle in the wild (Boyd, 2018)

Appendix One: Cawthron Advice Letter

20 April 2020 ID: 2019

Rasmus Gabrielsson

North Canterbury Fish & Game Council

595 Johns Road, Harewood

Christchurch 8051

Dear Rasmus

We are collectively responding to your request for our opinion on North Canterbury Fish &

Game Council's (NCF&G) recent decision to cease hatchery production of chinook salmon to support sea-run fisheries.

The decision to close the chinook salmon hatcheries during a time when wild salmon runs are in crisis may seem counter intuitive to some. Over the past decade, NCF&G have administered the release of about 200,000 salmon smolt annually into the Waimakariri and Rakaia Rivers, with undocumented ova planting also occurring throughout the region. The smolt releases were undertaken with the intention of augmenting angler catch and enhancing wild salmon runs. However, research both within the Canterbury region and from overseas shows that in most cases hatchery releases fail to improve fisheries in the longterm. In fact, there are many instances where hatchery release programmes have been demonstrably damaging to wild salmonid populations. Once released, hatchery salmon can breed with wild salmon and reduce recruitment rates by producing offspring with poor survival rates relative to wild fish pairings. Furthermore, hatchery fish can consume resources that would otherwise go to wild fish with higher survival rates (i.e. higher fitness).

If hatchery operations are undertaken at a vast scale they can produce good returns for anglers—albeit at the expense of the wild-run component of a fishery. For example, some hatchery release programmes in Japan and North America support commercial and recreational fisheries. However, these operations are undertaken with a level of state subsidised resourcing that is orders of magnitude above what would ever be available in New Zealand. NIWA trialled moderate-scale hatchery releases in New Zealand during the

1990's and showed that even well-resourced hatchery programmes here produce poor return-rates relative to overseas.

The sparse data that are available from the recent NCF&G hatchery operation at Montrose suggest paltry return rates for anglers during most years. From an estimated 200,000 smolt released annually, numbers of returning adult fish (adjusted for a 40% angler catch rate and 10% strays) have

varied from about 1000 to just 41 over the 2007 – 2017 period, with an average return rate of 433. In recent years, (adjusted) returns have been very low, between 260 – 41 fish over 2015 – 2017. This means that the estimated range of survival rates for released smolts is at best 0.5% and at worst 0.02%, depending on the year, with an average of 0.2%.

Hatcheries are expensive to run and consume a substantial amount of staff time, even if they are supported by volunteers. The NCF&G licence holders ought to be aware that a substantial proportion of their licence revenue has been allocated to smolt production for returns of only 10's to 100's of adult salmon to anglers per annum. Before considering other pros and cons of running hatcheries to support sea-run salmon fisheries, NCF&G licence holders need to consider if the numbers of catchable salmon produced from hatchery releases warrant the investment.

Recently the National Fish and Game office contracted the Cawthron institute to undertake a review of Fish & Game New Zealand's hatchery release practices. Across the country we found many instances of hatcheries being put to effective use to support put-and-take style fisheries. However, our case study of NCF&G found an alarming lack of basic monitoring to assess the effectiveness of the hatchery programme and misleading reporting regarding salmon smolt production (See report online: https://fishandgame.org.nz/dmsdocument/1418).

Since writing that report we have become aware that commercial salmon farm ova were being used to produce salmon smolt for release into the Waimakariri and Rakaia rivers, as well as for various ova planting projects. The practice of sourcing eggs from salmon farms has been condemned internationally because it can introduce domesticated salmon traits into wild populations, reducing overall population fitness and run strength. By way of analogy, consider the survival rates of battery-farmed chickens (and their progeny) when released into the wild.

The hatchery stocking practices, including the sourcing of commercial stock ova for smolt releases, has likely reduced the resilience of the wild East Coast salmon populations at a time when they are subject to unprecedented pressures from increasing ocean and river temperature, hydropower, water abstraction, spawning and rearing habitat degradation associated with intensified agriculture and over harvest. Fish and Game can make a positive contribution to nursing the wild salmon fisheries on the road to recovery by concentrating management efforts on factors it can control (e.g. harvest regulations) or influence (e.g.

advocating for better environmental flows and habitat protection) and avoiding practices that science has demonstrated to be potentially damaging (e.g. hatchery liberations).

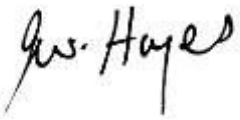
We support the collective management direction of NCF&G and the Central South Island Fish and Game Council to reduce harvest rates. In our opinion, implementing a season bag limit with the daily bag limit is the best available short-term management option to maintain the viability of the East Coast salmon fisheries. Most salmon anglers catch only one or two fish per season and will be unaffected by the regulation changes. If anglers collectively abide by the new rules there will be

more salmon available for all anglers to catch and more salmon successfully reaching the spawning grounds to improve the chance of better runs in the near future.

Yours sincerely

Robin Holmes

Freshwater Ecologist
Cawthron Institute



John Hayes

Senior Scientist, Freshwater Fisheries
Cawthron Institute

Appendix Two: NIWA Advice Letter

5/3/2020

Rasmus Gabrielsson

Fish & Game New Zealand (North Canterbury Region)

595 Johns Road

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Local Adaptation in New Zealand Chinook Salmon

Hi Rasmus,

I'm responding to your email of 24 February 2020 seeking a scientific perspective on Fish & Game New Zealand's (FGNZ's) recent decision to close its sea-run Chinook salmon hatchery operations in the North Canterbury region.

Based on our understanding of this species in New Zealand waters I believe this decision to be justified on scientific grounds. This conclusion is well supported by the results of a six-year joint NZ (NIWA)/US research programme, conducted during the 1990s, which used New Zealand as a natural laboratory to study evolutionary changes and local adaptation in a newly established fish population isolated from its parent stock. Our results, which appeared as a series of scientific publications over the decade from 1993–2003, are well recognised internationally and include a core of 15 papers which have collectively been cited over 1,600 times.

Chinook salmon from the Sacramento River in California were introduced into the Waitaki River in the early 1900s, and by 1915 had established self-sustaining populations in large east coast South Island rivers such as the Rangitata, Rakaia, and Waimakariri. Hatchery releases were discontinued shortly thereafter, leaving the progeny of the original liberations to adapt through natural selection. Our research used this process as a natural experiment by rearing stocks from three distinct populations under controlled environmental conditions, and comparing their physical, behavioural, and genetic traits as they grew to maturity.

Our key finding was that within 90 years of their introduction — roughly 30 generations — Chinook populations in different New Zealand rivers had already begun to diverge in an evolutionary sense, in both behavioural and genetic traits. This created locally adapted, river-specific stocks with a marked advantage over stocks from other rivers, with lifetime survival rates up to three times higher for stocks released into their natal river relative to stocks originating from other rivers.

FGNZ re-established hatchery releases into North Canterbury rivers approximately 20 years ago but were only rarely able to draw on locally-sourced populations for their broodstock. In many instances, hatchery stock sourced from the salmon aquaculture industry were used as a surrogate, despite having been reared in captivity for up to 30 years under a selection regime which favoured maximising commercial production rather than survival in the wild.

Despite some initial successes, declining survival rates in recent years have led FGNZ managers to acknowledge the possibility that these releases have ultimately been counter-productive, creating populations of spawning adults that have reversed some of the evolutionary changes which occurred over the previous 90 years. Specifically, Chinook salmon returning to Canterbury rivers in 2020 may now be less well adapted to their local environment than the largely natural stocks which FGNZ hoped to enhance by supplementary hatchery releases.

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FGNZ's shift in focus, emphasising habitat preservation and harvest management in preference to hatchery supplementation, is well supported by the underlying science. As one of my US colleagues put it in a 1999 review paper[1] on the application of our findings to managing salmon populations under the US Endangered Species Act:

> "*… for the most part we need to give salmon access to healthy, diverse physical habitats and allow these habitats to be filled (or over-filled) with the full community of salmonid species native to the region. The salmon can take it from there.*"

Kind regards,

Martin Unwin

Fisheries Scientist

[1] Quinn, T. P. (1999). Revisiting the stock concept in Pacific salmon: insights from Alaska and New Zealand. Northwest Science 73:312-324.