

# Challenges to improve hatchery program of chum salmon in Kitami region, Hokkaido

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**Background:** In the eastern region on the Okhotsk side of Hokkaido, the Kitami Salmon Enhancement Program Association produces and releases a total of approximately 180 million chum salmon fry every year. In the last 10 years, 6,893-19,144 with a mean of 12,224 thousand chum salmon returned to this region; this quantity is equivalent to 33-48% of Hokkaido and 28-42% of Japan. The number of chum salmon returning to the Kitami region peaked in 2003-2013, but has declined significantly since 2014. In Hokkaido, non-profit private salmon enhancement program associations established in 9 regions, including the Kitami region, produce and release juvenile chum salmon. The operating expenses of the enhancement programs are collected from fishery production; however, the recent decline of chum salmon returning to Hokkaido has made the operation of the salmon enhancement associations even more difficult.

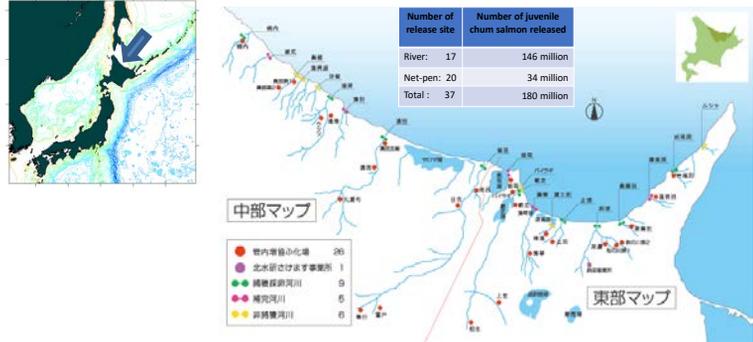


Figure 1 Location of hatcheries in the Kitami region, Hokkaido.

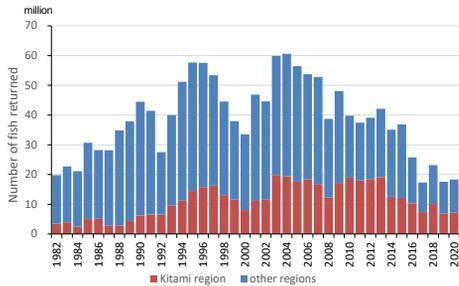
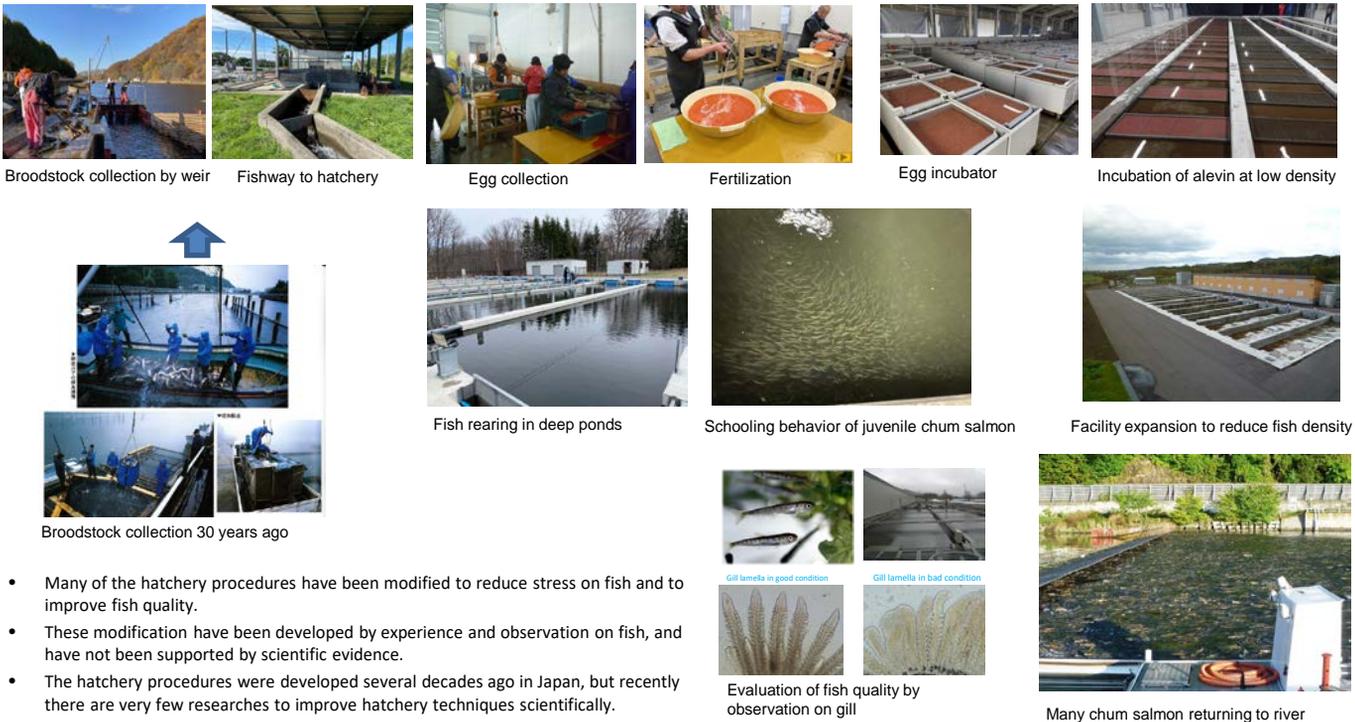


Figure 2 Number of chum salmon returning to Hokkaido since 1982.

The hatchery techniques for chum salmon in Japan have been intensively developed for several decades until the 2000s. To further raise the stocking effectiveness for chum salmon, the Kitami Salmon Enhancement Program Association continues to modify and improve the hatchery procedures, which are not stick to the conventional manual for hatchery program. Each procedure in the hatcheries is aimed to reduce stresses on fish at each stage (e.g., broodstock collection, incubation of alevin, fry rearing) and improve the fish quality, by considering the habitat environment and ecology of chum salmon in the wild.

Photos of hatchery procedures for chum salmon in the Kitami region.



- Many of the hatchery procedures have been modified to reduce stress on fish and to improve fish quality.
- These modification have been developed by experience and observation on fish, and have not been supported by scientific evidence.
- The hatchery procedures were developed several decades ago in Japan, but recently there are very few researches to improve hatchery techniques scientifically.

- Because salmon fishery is one of the most important fisheries in the northern Japan, those involved in salmon fishery and stock enhancement are eager to know the causes of recent decline of chum salmon returns.
- Recent researches suggest the possibility that reduction of fitness and genetic alterations by consecutive hatchery breeding is one of the causes of recent decrease of chum salmon returning to Japan.
- Since the hatchery-based stock enhancement program has been and will be a major management method for chum salmon in Japan, we expect that researchers will show the effective and viable measures for hatchery improvement to realize the recovery of salmon returns and sustainable salmon fishery.