

## Natural Spawning of Chum Salmon in the Toyohira River, Hokkaido

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The Toyohira River runs through Sapporo city, and is a tributary of the Ishikari River, which flows into the Japan Sea. Although wild chum salmon in this river had become extinct in 1950s by urbanization, the people of Sapporo city have stocked hatchery juveniles to restore the run since 1979. The activity is called the “Come Back Salmon Program”. Recently, about 200 thousand juvenile chum salmon are released by the Sapporo Salmon Museum, and thousands of adults spawn naturally in the river. The released juveniles are transplanted from the Chitose River, which is a tributary of the Ishikari River system.

Hatchery programs may change genetic and phenotypic traits of salmonids (Waples 1991). Breeding behavior is also different between hatchery and wild fish (Fleming and Gross 1992). The objective of this study is to clarify information on the spawning habitat of stocked chum salmon in Japan.

From September 2003 to January 2004, a mapping survey of chum salmon redds was carried out semimonthly by walking along the Toyohira River. The number of adult returns was supposed to be twice the number of redds. We defined the early run as the salmon spawning from September to October and the late run as fish reproducing from November to January. Hourly water temperatures in redds and in river water were recorded from late January to mid March 2004. To measure temperature, a standpipe was inserted into the redd as deep as 30 cm, and a data logger (Onset Tidbit) was installed at a depth of 25 cm from the gravel surface.

Adult chum salmon in the Toyohira River returned from September to early in January. The peak of spawning was late in October. Different patterns in the reproduction period were observed between natural spawners and their parents that reproduced artificially. Spawning habitat was different, depending on run timing. The early run fish migrated to upper reaches, but the late run fish stayed in lower reaches. The water temperature in redds of the early run fish was almost same as the river water temperature. On the other hand, late run fish used high temperature areas for spawning. These results indicate that the early fish spawned in areas of the river bed with sub-surface river water seepage, and the late fish made redds where ground water is upwelling.

This difference in spawning habitat is similar to that between summer-run and fall-run chum salmon in wild populations. Thus, there is a possibility that wild chum salmon populations could be recovered by stocking hatchery fish in Japan. To identify whether adult chum salmon in the Toyohira River are of wild or hatchery origin, the adipose fins of all released hatchery fry were clipped starting in 2004.

### REFERENCES

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