Sockeye Salmon Reintroduction To The Canadian Columbia River: Lessons From Small-Scale Pit Tag Releases

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Introduction

- The Canadian Reaches of the Upper Columbia River once hosted vast runs of Salmon and supported extensive Indigenous fisheries[1,2].
- These runs were extirpated when the Grand Coulee Dam blocked fish passage[1].
- The Canadian Reaches of the Upper Columbia were home to at least four different rearing lakes for Sockeye Salmon (Upper and Lower Arrow Lake, Slocan Lake, and Whatshan Lake)[1,2].
- Closely tied to ceremony, the Okanagan Nation Alliance (ONA) has engaged in experimental reintroduction efforts for Sockeye Salmon to the blocked section upstream of Grand Coulee Dam.

Objectives

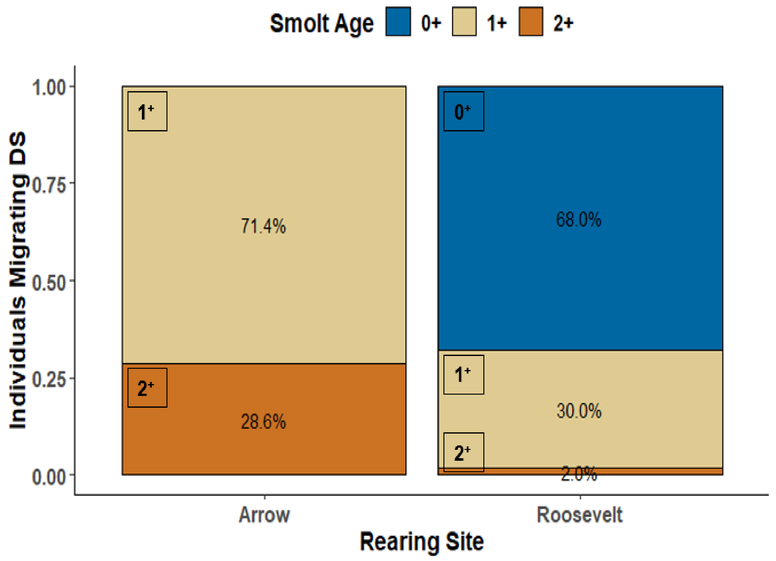
- Assess survival and behaviour of juvenile Sockeye Salmon in the Arrow Lakes and Roosevelt Reservoir.
- Inform future reintroduction activities in the Upper Columbia River.

Methods

- Use passive integrated transponders (PIT) to tag hatchery-reared Sockeye fry and track their migration through the Columbia River using PTAGIS.
- Release 5789 tagged fish to rear in Lake Roosevelt in 2020, and in 2021, release 1910 to rear in Arrow Lakes and 1998 to Lake Roosevelt.
- Calculate outmigration date using first detection, distance to rearing lake outlet dam, and average migratory rate (50 km/day) of Okanagan Sockeye smolts.
- Use Cormack-Jolly-Seber models to estimate juvenile survival.

Results

- From the 2020 release cohort, 82 fish were detected downstream, and 39 from the 2021 release cohort.
- From the 2020 and 2021 cohorts, 11 and 12 fish were detected at Bonneville Dam, respectively.



Rear Location	0+ Outmigration	1+ Outmigration	2+ Outmigration
Roosevelt Reservoir	2021-08-06	2022-05-12	2022-05-30
Arrow Lakes	NA	2022-05-04	2023-05-17

- 0^+ smolts were all detected in August.
- Survival was estimated to be 3.3 % (± 57), to Rocky Reach Dam for the 2020 cohort and 2.3 % (± 59), for the 2021 cohort.
- Four returning fish were detected, of which two were last detected at Wells Dam. Age classes of returning fish were two ocean age-2, one ocean age-1 and one ocean age-0.

Conclusions

- Outmigration behaviour differed between Lake Roosevelt and Arrow Lakes' rearing fish.
- Extensive 0^+ migration, and improper outmigration timing, from Lake Roosevelt may impact survival, and its success as a rearing lake for Sockeye Salmon.
- Our survival estimates are likely biased, due to low sample size, and extensive 0^+ migrants, and are difficult to compare with other survival studies as we used hatchery fry, not smolts.
- Despite low estimated survival we observed four returning fish from the 2020 cohort.
- We plan to increase sample size, to generate more precise survival estimates, and alter release strategy (timing, size at tagging) to reduce hatchery effects as we continue to assess reintroduction feasibility.

Acknowledgements

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