A comparison of the survival and migration of wild and F1-hatchery-reared brown trout (Salmo trutta) smolts traversing an artificial lake

Supplementing salmonid populations by stocking is a widely-used method to improve catch or to rehabilitate populations. Though, most studies found that survival and fitness of hatchery-reared salmonids is inferior to wild fish. We compared survival, emigration patterns, migration speed and return rates from the sea of wild and 1-year old F1-hatchery-reared brown trout smolts in a Danish lowland stream that contains an artificial lake using passive integrated transponder telemetry in the years 2011–2013 and 2016. The majority of hatchery-reared smolts descended within 72 h after their release, whereas wild fish migration was mainly triggered by increased water discharge. Increased probability of a successful lake passage was found at higher discharge. Within years, the groups differed in lake passage time, but without a significant overall difference. Overall, there was no difference in lake survival (wild: 30%, hatchery-reared: 32%) between the two groups, but survival differed between years. Only a single fish (0.9%) of the hatchery-reared smolts tagged in 2011–2013 returned from the sea compared to 11 (6.4%) wild smolts tagged in that period, which questions the value of supplementary stocking of smolts for conservation purposes.
Hjælper udsætninger havørresbestanden i Egå?

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Survival of migrating sea trout (Salmo trutta) smolts during their passage of an artificial lake in a Danish lowland stream

Artificial lake development is often used as a management tool to reduce nutrient runoff to coastal waters. Denmark has restored more than 10 000 ha of wetlands and lakes in the last 14 years as a consequence of 'Action Plans for the Aquatic Environment', which aim to meet the demands of the European Union’s Water Framework Directive. Juvenile, seaward migrating salmonids are highly affected by impounded waterbodies, as they are subjected to extraordinary high mortalities due to predation and altered habitat. From 2005 to 2015, survival and migration patterns of wild brown trout (Salmo trutta) smolts were investigated by using radio, acoustic and Passive Integrated Transponder telemetry both before and after the development of an artificial lake in a small Danish lowland stream. In 2005 and 2006, before the lake developed, survival was estimated to be 100% in the river stretch where the lake later developed. In 2007 and in the period between 2009 and 2015, mean yearly survival decreased to 26%. Mean time for passing the area increased significantly after the development of the lake from 0.42 to 5.95 days. Generalized additive models were used to model the probability of a successful passage. Water temperature and discharge were key environmental factors affecting survival of the smolts during the passage of the lake. Furthermore, smolt survival was negatively correlated with condition factor. This elevated level of smolt mortality may seriously compromise self-sustaining anadromous salmonid populations when artificial lakes are developed in connection with rivers.

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Vådområder kan påvirke de naturlige fiskebestande negativt

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Effects of the newly established lake on migrating juvenile salmonids (smolts)
National Institute of Aquatic Resources
Period: 01/03/2015 → 28/02/2018
Number of participants: 6
Phd Student:
Schwinn, Michael (Intern)
Supervisor:
Baktoft, Henrik (Intern)
Main Supervisor:
Koed, Anders (Intern)
Examiner:
Jepsen, Niels (Intern)
Moore, Andy (Ekstern)
Effects of new-developed lowland lakes on salmonid populations (38265)

Development of artificial lakes is a management tool to reduce nutrient runoff to coastal waters. Denmark has restored more than 10,000 ha of wetlands and lakes in the last 14 years in consequence of “Action Plans for the Aquatic Environment”, that aim to meet the demands of the European Union’s Water Framework Directive. Juvenile, seaward migrating salmonids (smolts) are highly affected by impounded waterbodies, as they are subjected to extraordinary high mortalities due to predation and altered habitat. Pike and birds have been demonstrated to be major predators on brown trout and salmon smolt in rivers and reservoirs. Migration delay of smolts in lakes may cause desmoltification. The objective of this project is to evaluate the effect of lake development on the salmonid smolt run in restored rivers and wetlands. This knowledge is important not only from a scientific perspective, but also in relation to DTU Aqua’s ongoing recommendations and advice given to counties and Ministry of Foods, Agriculture and Fisheries of Denmark on restoration projects.

The project is coordinated by DTU Aqua.

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National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Council of Aarhus
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Number of participants: 2
Research area: Freshwater Fisheries and Ecology
Project participant:
Schwinn, Michael (Intern)
Project Manager, academic:
Koed, Anders (Intern)
Project