Improved recapture rate of vaccinated sea-ranched Atlantic salmon, *Salmo salar L.*

Vaccination of sea-ranched Atlantic salmon was conducted in order to investigate if immunoprophylactic measures could improve their survival. Fish were either vaccinated by bath or injection. A total of 66 000 fish were reared in fresh water at a hatchery on the island of Bornholm and at the presmolt stage were separated in three groups each comprising of 22 000 fish. One group was vaccinated intraperitoneally with a polyvalent vaccine (containing killed *Vibrio anguillarum* serotype O1 and O2, *Yersinia ruckeri* and *Aeromonas salmonicida*). A second group was bath vaccinated with the corresponding vaccine-components and the third group was used as a non-vaccinated control. One month after vaccination these groups were allocated to three separate net-pens located 500 m from the coastline of the island. After 4 months in the net-pens, 1000 fish from each cage were tagged with Carlin-tags below the dorsal fin. The fish were then released for a migration period in the Baltic Sea. Following a sea period of 40 months (45 months post-vaccination), the recapture rates of the groups were calculated from the returned tags from fishermen. Recapture of the injection vaccinated group was significantly higher (25%) compared with the bath vaccinated fish (14.7%) and the control group (16.8%).
Projects:

**Handbook for management of lake fish and fisheries (38826 & 39169)**

This project has developed a web based handbook in lake fisheries management. The end goal was to provide local anglers and lake managers (which are often not biologists) with knowledge about the biology of focal species as well as a tool box on how to manage these with regards to both environment and fisheries. A central part of the handbook focus on compiling thorough descriptions of species and their ecology, environmental requirements etc. based on existing knowledge from our own research and the literature. Focus is also on a description of different measures that can be used to protect or enhance abundance of specific fish species. The handbook incorporates existing legislation on freshwater...
fisheries and management as well as a description of angling techniques. In addition we give advice on how anglers specifically and citizens in general can participate in the process, i.e. by practical help or cooperation with the municipalities or other authorities that may be responsible for the lake management.

The handbook covers all types of lake fishery preferences (species, sizes, quantity, etc.), with due consideration to authenticity and environmental conditions. All pages include FAQ’s to answer the most common inquiries, as well as email addresses of the authors of the text which facilitates that users of the handbook easily can interact with the researchers. The lake handbook was published on line in 2013 as an integrated part of the existing homepage www.fiskepleje.dk. It is continuously updated when new knowledge is available, always providing latest knowledge on fisheries management to a broad audience of users.

Lake ecology and fish population dynamics is complex and often very lake specific. Unfortunately knowledge on the environment and fish populations of specific lakes is often scarce or lacking, making fisheries management difficult. A part of the project has focused on how to use citizen science to increase our knowledge. Hence, we explore the use of anglers log book as a method to get knowledge on fish populations and we initiated a nation-wide anglers log book for pc and cellphones (which in 2013 became an independent project expanding from lakes to cover all freshwater and marine habitats). The project also explores the use of citizens reporting on environmental parameters in lakes. We have by now recruited a corpse of citizens ('Water Environment Agents') who measure Secchi depths and presence of the invasive zebra mussel in various lakes on a regular basis. We continue recruitment of citizens for this purpose.

Another part of the project has been aimed at establishing a web-based platform, named The Knowledge Base, where citizens and authorities can find knowledge about specific lakes. The cornerstone is a web-library, where close to 1000 reports on lake environment or fish covering the last ca. 75 years can be found in pdf-format. Some reports has never been published before, others has been very hard to find (only paper-versions in The National Library). A large collection (1000+) of historic (1915-1960) photos of Danish lakes and rivers taken by former employees of the department (C. V. Otterstrøm and Knud Larsen) has been digitalized and will be available online in fall 2016. The primary search method is via a GIS-based map. This will be supplemented with a more traditional database search option fall 2016.

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