

# Sea trout in Norway and the Kerguelen Islands

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Conflicts between nature conservation and anthropogenic interactions such as urbanization, aquaculture, fisheries and recreation in coastal marine ecosystems are common and divisive for communities. In Europe, the increasing use of near-coastal areas for sea cage aquaculture may negatively influence anadromous brown trout (*Salmo trutta*; a.k.a. sea trout). Sea trout provide important social and ecosystem services in many countries, including Norway. However, during the last 10-20 years, the abundance of sea trout has declined markedly in many regions. For example, catches in Norwegian rivers have declined by 23%–70% during the last two decades, excluding the southern- and northernmost areas.

Knowledge about the biology, ecology and habitat use of sea trout is limited and insufficient for successfully planning sustainable coastal developments. “The secret life of sea trout” research program is using acoustic telemetry linked with physiology, stable isotopes and genomics to document marine migrations and habitat use of anadromous brown trout from several Norwegian fjords. The findings show that sea trout exhibits diverse marine behaviour in time and space depending on nutritional state, sex and morphology of the home watercourse. Thus, potential negative impacts from coastal developments may vary among individuals and watercourses.

Acoustic telemetry has been used in several estuaries and fjord systems in Norway to document potential conflicts with human influences such as different infrastructure and fish farming. At the same time, habitat use of sea trout has been studied in undisturbed and pristine estuaries at Kerguelen Island to serve as a reference point. Results show that estuaries are important transitional zones, especially for younger individuals, between the nursery areas in freshwater and feeding grounds at sea. Additionally, during certain times of the year, estuaries may act as an important longer-term habitat, with fish residing there for weeks to months, and sometimes for the whole duration of the summer feeding migration. A consequence of longer-term residency in estuaries is an increased risk of disturbance from boat traffic, industrial development, harbours, local pollution, gravel extraction, and other physical developments that are often located in estuaries.

As a part of our project, we are mapping physiological differences between juvenile trout that become residents or migrate to sea and between short and long distance migratory sea trout. Seaward migration is a behaviour that can be expected when the gain for the individual fish is higher than the cost. Consequently, one can expect that this behaviour will be changed or disappear if sea conditions are so negative for sea trout that it loses reproductive potential by migrating to sea. Our findings so far suggest that morphology of the watercourse, condition before the seaward migration and sex influence the marine migratory behaviour. So far, we see that (i) body condition factor differs among fish adopting different migratory tactics, with outer fjord migrant being in poorer condition; and (ii) within migratory groups, plasma triglyceride concentration is negatively correlated with the duration of marine residency. The results support the idea of condition-dependent migration in veteran migrants, with individual variation in nutritional state influencing the spatiotemporal aspects of marine habitat use. Further, our data suggest that sea trout from watercourses with good conditions for over-wintering, such as lakes, stay shorter at sea than individuals from smaller rivers and streams.

The findings are used by stakeholders when decisions are made regarding locations of new fish farms and the development of new infrastructure in coastal areas. The participation of the public in the research project through community consultations has provided educational opportunities for the local communities, especially their youth, and has allowed for exchange of local and scientific knowledge, enriching both communities.