Project for MSc, BSc or special courses:

Marine biology projects at the Technical University of Denmark (DTU Aqua) in 2021-2023

General information

DTU Aqua collaborates with many students from Danish and foreign universities. Students are welcome to join ongoing research projects or start their own independent project. Students often produce one of the following options: 1) a project film (e.g. Youtube format), 2) a popular science article, or 3) a draft for peer reviewed scientific paper. Undergraduate students spearheaded all the highlighted items. Students are encouraged to first-author or co-author the various options. Most projects include data collection, data analyses and data interpretation. All projects are flexible and are designed to match student needs and enable students to pass various study program requirements (e.g. Erasmus requirements). Students from all national and international universities are welcome, and students are encouraged to work in groups, although working alone is also fine. Projects may be expanded, or combined, in case a single project (see below) provides insufficient work for a complete student project.

The work location is the Technical University of Denmark campus, north of Copenhagen in Denmark. Field work is carried out in a diversity of locations, including the estuary Roskilde Fjord, the marine bay Sønderborg Bugt (see picture below) as well as the narrow marine area Little Belt. An example of fieldwork is available here.

Student guidance covers study planning, data collection, statistical analyses, results presentation and writing of the thesis/manuscript. In addition to the student guidance, the university offers a study location (desk, PC, access to library, software etc.), laboratory space, transportation, research equipment (boats, underwater cameras etc.) and a friendly and international work environment. Depending on the project, direct financial support may be available. The university will ensure that students learn how to carry out a research project and report the findings. Students are not expected to learn to speak the Danish language. Speaking English is fine.

Students at DTU doing recent fieldwork on a stone reef in Sønderborg Bugt. Students are from the Netherlands, Faroe Islands, the UK and France.
A study on the positive effects of the world’s first smolt reef

Aim:
The aim of this study is to document positive effects of a constructed coastal reef on brown trout in the Little Belt. Data will reveal if the reef will provide sufficient shelter and nursery habitat for juvenile brown trout (termed smolt) to increase in presence and survival. Data will also reveal when and to what extent the smolt will use the reef. The data are important for management of recreational fisheries (i.e. angling). The overarching goal is to provide sustainable recreational fisheries.

Background:
Brown trout hatch in freshwater streams. After 1-3 years, many juvenile trout begin migrating downstream towards the marine environment to exploit a better food availability. It requires physiological and morphological changes for the juvenile trout to adapt from freshwater to saltwater. These alterations are known as smoltification and the juvenile trout are in this period referred to as smolt. It is a vulnerable stage for smolt when they reach the new and unknown marine environment. In addition, smolt are prey for a wide range of predators, including cormorants. Cormorant populations have increased since the 70s and each individual bird eats up to 400g of fish per day. This can negatively affect local trout populations.

Figure illustrating the life cycle of sea trout. Note how sea trout hatch in freshwater and migrate to the marine environment. Adult sea trout return to fresh water to spawn.
The world’s first smolt reef will be established in the outlet of the stream Storå, near the harbor Varbjerg Havn in Denmark. Brown trout hatch and migrate downstream in Storå, which terminates in Little Belt. The smolt reef will be positioned in the marine environment at the stream outlet in the shape of a horseshoe, where the smolt will pass over as they disperse from the outlet of the stream. The reef will be a cavernous rocky reef and will provide shelter, allowing the smolt to be less exposed to predators. The reef is also expected to provide feeding grounds for the smolt. We hypothesize that these factors will increase the presence and survival of brown trout smolt emigrating from Storå.

Smolt that migrate downstream and into the marine environment can grow into large sea trout as adults. These adult sea trout are targeted by recreational fisheries. The picture shows a large sea trout that was caught in a Danish stream in 2020.

Content:
The study will commence in Storå in early 2022 using electro-fishing. Listening posts (hydrophones) will be placed near and around the area where the smolt reef will be established. Brown trout smolt will be captured and tagged with transmitters in Storå. These transmitters will be registered by the listening posts when the trout leave the stream and enter the area with the smolt reef. In this way, we will track the presence and movements of the smolt and map them in association with the reef. The smolt tracks will be analyzed to document the effect of the smolt reef on the trout presence, behavior, and survival.

Duration:
Literature review is expected to take 1-2 months. Data collection is expected to take 1-3 months; followed by 1-2 months for analyses of the fish tracks, 1-2 months for the statistical analyses, and 1-3 months for write-up, depending on the scope of the specific student project. Students will receive support by a statistician for the statistical analyses (if needed). The project scope and duration may be adjusted to match different study programs.
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A student (Nico) examining hydrophones in the Roskilde Fjord.