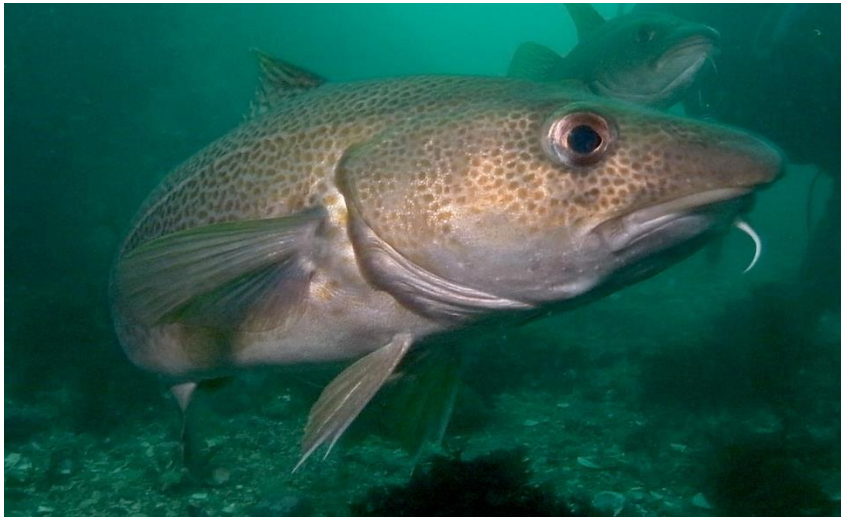**Topic/Title (Norwegian)**

Fisk velferd/ Hvordan er det å bli fisket?

Topic/Title (English)

Fish welfare/ How is it being fished

Supervisors

Main supervisor: Dr. Marco A Vindas.
Co-supervisor: Dr. Lynne Sneddon (Gothenburg University)
Faculty of Veterinary medicine, Norwegian University of Life Sciences (NMBU)

Summary:

Project background: There is an increasing interest by researchers, commercial fishing companies, producers, consumers, interest groups and authorities to increase the ethical capture and welfare of fish. This is part due to growing evidence on fish sentience and their capacity to experience nociception (i.e. painful stimul). However, despite this current trend of growing awareness, understanding and concern for the welfare of fish, there are very large welfare concerns associated with how wild fish are caught and killed in commercial fisheries, including cod fisheries.

Due to both environmental changes and fishing pressure, the cod stock has declined dramatically throughout the years, even crashing in some locations. However, there is much variation and both healthy and diminishing populations are currently being exploited with a variety of fishing and slaughter methods which may compromise the welfare of fish in different ways. The most common fishing methods are:

- Bottom trawlers
- Gill nets
- Danish seines

- Longlines
- Fish traps

The cognitive experience fish have to being caught and killed will potentially depend on the fishing method and eventually the slaughter practice. In the cod industry, it is common to kill and bleed the fish as they are hauled onboard to avoid discoloration of the fillet. However, when fish are caught in large hauls, which is often the case with bottom trawling, nets, and Danish seine, they often die before bleeding or are kept in storage bins for hours before bleeding. Notably, electrical stunning has been proposed to be an effective way to render fish unconscious as soon as they are taken onboard and before they are bled.

Longer term storage in tanks or net cages is also used in order to provide a fresher product over a longer season. This latter practice is referred to as "live storage", and potentially poses a considerable, but understudied, welfare issue related to physical impact of different fishing gear, as well as storage type and time.

In this project we aim at understanding the neurophysiological, emotional, and behavioral cognitive responses of cod to different fishing gear, slaughtering methods, and any post-catch handling of live fish, in order to be able to understand and highlight the welfare challenges the cod faces. By understanding the welfare implications we can then seek to inform improved practices that will enhance the welfare of the cod.

Hypotheses:
We hypothesize that:
1- **Different fishing methods have a different impact on fish welfare**
2- **Electrical stunning will significantly increase fish welfare in fisheries**

Aim of the project: to understand the neurophysiological, emotional, and behavioral cognitive responses of cod to different fishing gear, slaughtering methods, and any post-catch handling of live fish, in order to be able to understand and highlight welfare challenges

Project plan and implementation: this project is in collaboration with several fishing companies based out of Måløy on the west coast of Norway. We are in the process of collecting samples from the different fishing activities and will be conducting small experiments on holding tanks at the research station in Måløy. There is a possibility for 1 to 2 master projects in which students will have the opportunity to join sample collection and experimental studies. In addition, video analysis for fish behavior and sample analysis will also be part of the work.
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Materials and methods
Animals: wild cod (*Gadus morhua*)

Methods:

Experimental design: the student will learn how to plan and conduct fish experiments to assess different behavioral outputs associated with cognition, stress and pain.

Tissue sampling: the student will learn how to plan and conduct sampling for biological samples. This will include brain, heart and blood plasma samples.

Immunohistochemistry (IHC): the student will learn to process samples (embed brain samples for tissue slicing onto glass slides) for the application of IHC labelling antibodies used to assess neuronal activity.

Microscopy: The student will learn how to use different types of microscopes, including dissection and fluorescent microscopes. This will allow to conduct microdissections and evaluate IHC results.

High performance liquid chromatography (HPLC): The student will learn how to use the HPLC system to measure neurotransmitter signaling, specifically dopamine, serotonin and noradrenaline. This will be done in microdissected tissue from specific brain areas of interest

Quantitative Polymerase Chain Reaction (qPCR): The student will learn this regular laboratory technique of molecular biology which monitors the amplification of a targeted DNA molecule during the PCR (i.e., in real time), which provides information on specific gene expression levels in a tissue.

Blood sampling: The student will learn how to collect blood in a small fish for analysis.

ELISA: The student will learn how to perform immunoassays (using antibodies) that measure analytes such as the stress hormone cortisol, in a tissue or blood samples.

Behavioral analysis: The student will learn how to analyze fish behavior from video recordings.

Statistical analysis: The student will receive training on how to analyze and run statistics on the collected data.

Implementation

- The student will be supervised by experts in their field all along the project.
- Dr Marco A Vindas is localized in the new vet building at NMBU which facilitates communication, particularly in the coordination and supervision of laboratory techniques. In addition, the student will also interact with the fish pain and welfare expert Lynne Sneddon located at Gothenburg University which will give a unique opportunity to gain from a broader network. Furthermore, the project includes several other partners which will allow for further interactions for the student.
- The student will have the possibility to travel and stay in Måløy if they wish to have hands on experience on cod experiments and sampling from fishing vessels
- All the techniques in this project are already established and regularly used in our lab.
- Our group has ample experience with the supervision of students. We have a very international environment which allows for a varied exciting environment were students flourish and thrive.

Subject area

Neurobiology, behavior, fish welfare, wild fisheries, cod

Thesis

Master thesis of 30 or 60 credits to be written in English or Norwegian

Project/company

VELFISK project

Please contact

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