

Master's Thesis Assignment

Development and Evaluation of an Optical Measurement Method for the Quantification of *Calanus finmarchicus* in the Water Column

The open-source prototyping platform *OpenAquaSense* enables the development of modular sensor system prototypes for underwater applications that can be flexibly adapted to specific use cases. Among other applications, the platform supports the development of photonic sensor systems for marine environmental monitoring. In recent years, the copepod species *Calanus finmarchicus* has gained increasing attention due to its high abundance and nutritional value, making it a promising resource for feed production, particularly in aquaculture. However, the spatial and temporal occurrence of this species in the water column cannot currently be predicted reliably, resulting in inefficient and largely blind fishing operations.

A key requirement for improving the targeted harvesting of *Calanus finmarchicus* is the availability of suitable in situ measurement methods that allow a reliable quantification of its abundance in the water column. Optical sensing approaches are particularly promising in this context, as they enable non-invasive measurements and can be integrated into compact underwater sensor systems. The *OpenAquaSense* platform provides an open-source framework for the development of such photonic measurement systems, allowing transparent, adaptable, and reproducible sensor designs.

The objective of this Master's thesis is the development and evaluation of a functional prototype of an open-source based optical measurement method for the quantification of *Calanus finmarchicus* in the water column based on the *OpenAquaSense* prototyping platform. The focus lies on the derivation of application-specific sensor requirements from the biological and optical characteristics of the species, the prototypical implementation of the measurement system, and its experimental validation under laboratory conditions.

The following tasks are to be addressed in detail:

- Literature review on optical measurement techniques suitable for plankton and zooplankton detection and quantification
- Analysis of the relevant physical and optical characteristics of *Calanus finmarchicus* to derive functional and technical sensor requirements
- Development of an optical measurement concept based on the *OpenAquaSense* platform
- Hardware and software integration of the optical sensor based on the *OpenAquaSense* platform
- Experimental evaluation of the prototype regarding measurement performance, reliability, and suitability for quantifying *Calanus finmarchicus* in the water column

The written thesis must be submitted before the end of the processing period. The results of the work are to be presented in a colloquium in the form of a presentation of approximately 20 minutes, followed by a discussion.

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