In-flow imaging ZooCAM system for zooplankton counting, identification and classification

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The ZooCAM is an in-flow system designed to digitize and analyse fish eggs and zooplankton on board ships or in the lab, at high frequency [1]. It enables the quasi real time analysis of large volume samples collected from plankton nets or pumped and concentrated water samples at a flow rate up to 1L/min. The system captures images of water and its particle content (plankton, fish eggs, marine litter) in a calibrated flow cell using LED light source, a telecentric objective and a camera. Each imaged particle is processed to extract morphological features that enable automatic sorting using built-in AI tools. It is a fast, robust, replicable and cost-effective method to provide fish eggs data for fish stock assessment, and zooplankton data for research and ecosystem survey purposes. The current prototype has been used on board Ifremer fish stock assessment surveys over the last 6 years.

This communication will present the development of a compact ZooCAM. An integrated electronic board was specifically designed to achieve fast in-flow imaging and overall control of all the sub systems (pump, lighting, camera and sample stirring module). This integration enabled a 20 % weight loss and a division by 2 of the system bulk volume. These specs specifically respond to the users' requests, and enable the deployment and use of the ZooCAM in smaller ships compared to the previous ZooCAM prototype. Built-in recently integrated machine learning tools (CNN and SVM) enhanced the detection and automatic classification of particles and plankton individuals by 10% with respect to the previous set-up.

These improvements will enhance the ergonomy of the overall system and ease the transport, set up, operational use, reliability, and robustness, especially when working conditions at sea can be rough. The interest for these instruments is constantly growing and their development is essential for the marine environment study and understanding [2]. This new system is currently deployed onboard PELGAS 2022 survey along with the older ZooCAM prototype for intercalibration.

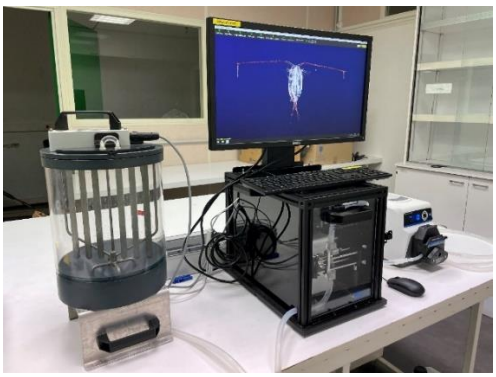

Figure 1. Compact ZooCAM system.

References:

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