FlowCam®

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Flow Imaging Microscopy in the Plankton Analysis Toolbox
Integrating FlowCam into Diverse Analytical Workflows

Daniela Sturm, Savannah Stresser, Kendal Studd | Yokogawa Fluid Imaging Technologies, Inc.

Fluorescence tools
Molecular tools
AI tools
FlowCam data outputs
QUANTITY | TYPE | SIZE & SHAPE

Introduction

Plankton are central to aquatic ecosystem function, yet no single method can fully describe their diversity, abundance, and structure. Expanding observational capacity requires methods that maximise information from each sample while remaining scalable across space and time.

Researchers increasingly combine Flow Imaging Microscopy (FIM) with complementary approaches to capture different biological and spatial dimensions of plankton communities. Several case studies show FlowCam, an FIM instrument, is an integral tool for comprehensive assessment.

FlowCam + Molecular Tools

Case Study: Tracking Copepod Range Shifts
British Antarctic Survey, UK   Tarling et al., 2022 *Front. Mar. Sci.*
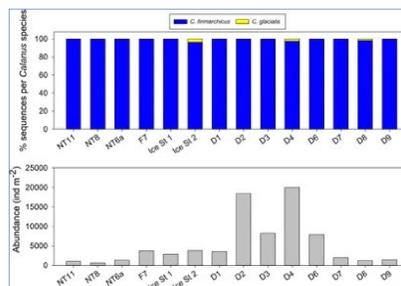
🔍 **Objective**

Assess the role of *Calanus* expansion in Arctic carbon cycling.

💡 **Approach**

FlowCam Macro to quantify and image late-stage *Calanus*, and 16S genetic barcoding to distinguish morphologically similar species.

🎯 **Result**

FlowCam provided reliable, high-throughput copepod counts that complemented molecular data and supported ecosystem modelling.

FlowCam Macro copepod images and 16S abundance data compared with molecular identification of *Calanus* species.

> FlowCam links morphology and abundance with molecular information (e.g., eDNA metabarcoding, metagenomics, targeted gene assays).

FlowCam + Fluorescence Tools

Case study: Microplastic and Plankton Interaction
Environment Institute Helsinki, Finland   Schenone et al., 2025 *Environ. Pollut.*

🔍 **Objective**

Assess how plankton affect the breakdown of "biodegradable" plastics.

💡 **Approach**

• FlowCam to count & classify particles (plastics vs. plankton).
• Epifluorescence microscopy to investigate bead ingestion.

🎯 **Result**

• FlowCam showed that microplastic abundance and size declined faster in response to plankton treatment.
• Epifluorescence microscopy confirmed ciliate ingestion.

Free PLGA particles   PLGA attached to mucous matrix   Ciliates
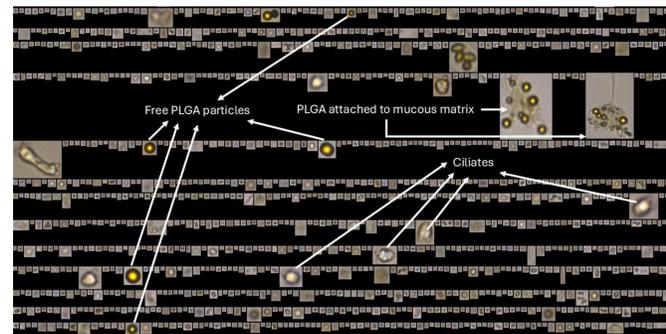
FlowCam image collage of microplastics within a complex particle assemblage.

> FlowCam image-based particle identification and quantification complements fluorescence-based techniques (e.g., fluorescence microscopy, staining assays, spectrophotometry).

FlowCam + AI Tools

Case Study: Plankton Validation with EcoTaxa
Tara Pacific Expedition   Mériguet et al., 2024 *Earth Syst. Sci. Data*

🔍 **Objective**

Describe plankton communities in undersampled regions of the Pacific & quantify potential bias between sampling strategies.

💡 **Approach**

• FlowCam to acquire images of live samples (20 to 200 µm) onboard
• EcoTaxa to annotate and calculate abundance, biovolume & diversity.

🎯 **Result**

Quantitative plankton imaging plus underway sampling increases spatial resolution, providing visibility into plankton distribution & diversity in the Pacific.
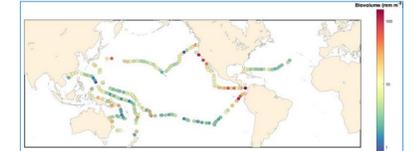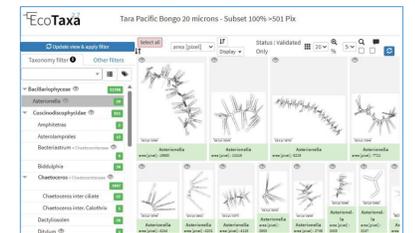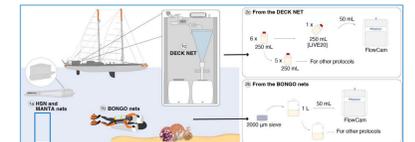
Sampling and FlowCam method (top), EcoTaxa annotation (middle) & biovolume mapping across the *Tara Pacific* expedition (bottom).

> Leveraging quantitative imaging with FlowCam and open-source tools like EcoTaxa to characterize plankton communities and compare novel, underway sampling techniques.

How does FlowCam work?

Flashing LED Illumination   Flow cell   Fluid flow   Camera & Objective

• Particles flow past a camera & light source.
• Software captures images, measures size/shape, and archives data.
• Users classify particles and generate reproducible quantitative results.

Key Specs

• Size range: 0.4 µm – 5 mm across instruments
• Flow rate: 25 µL/min (40X), 750 mL/min (1/2X)
• Laser options: 488 nm, 532 nm, 633 nm

Conclusion

FIM adds quantitative, image-based information that links particle size, shape, and morphology with other observational, molecular, and computational tools.

Get in Touch

Scan for more FlowCam in Plankton Research

Questions about flow imaging microscopy or integrated plankton analysis?

@ info@fluidimaging.com