

Monitoring Phytoplankton in the California Current with an Automatic Imaging Flow Cytometer

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Introduction

- The Imaging FlowCytobot (IFCB) can automatically capture pictures of eukaryotic phytoplankton within the 8 to 150 μm size range. Up to **30,000 images** are generated per hour.

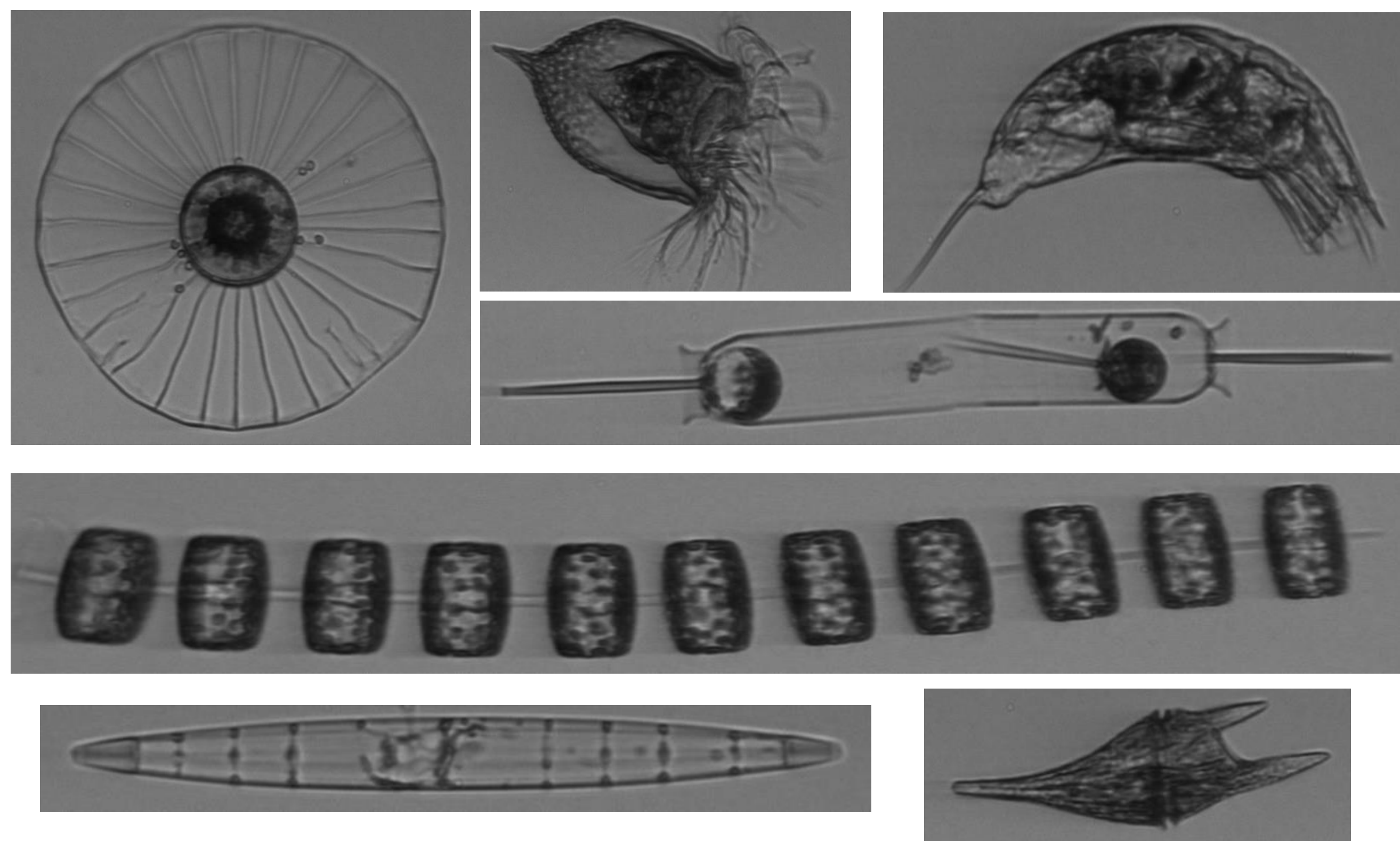


Fig 1: Images captured by the IFCB on the fall 2022 CalCOFI cruise (not to scale).

Methods

- The IFCB can operate in:
 - Continuous mode** where samples are automatically collected from the ship's underway system via a diaphragm pump. These samples occur in 5 mL increments every 20-25 minutes.
 - Discrete mode** where samples are collected from the 10 m and chlorophyll maxima depths of the CTD at CalCOFI stations.



- The IFCB can be secured in the lab for deployment and simple switching between sampling modes.

Fig 2: The IFCB set up on the summer 2022 CalCOFI on the Bold Horizon.

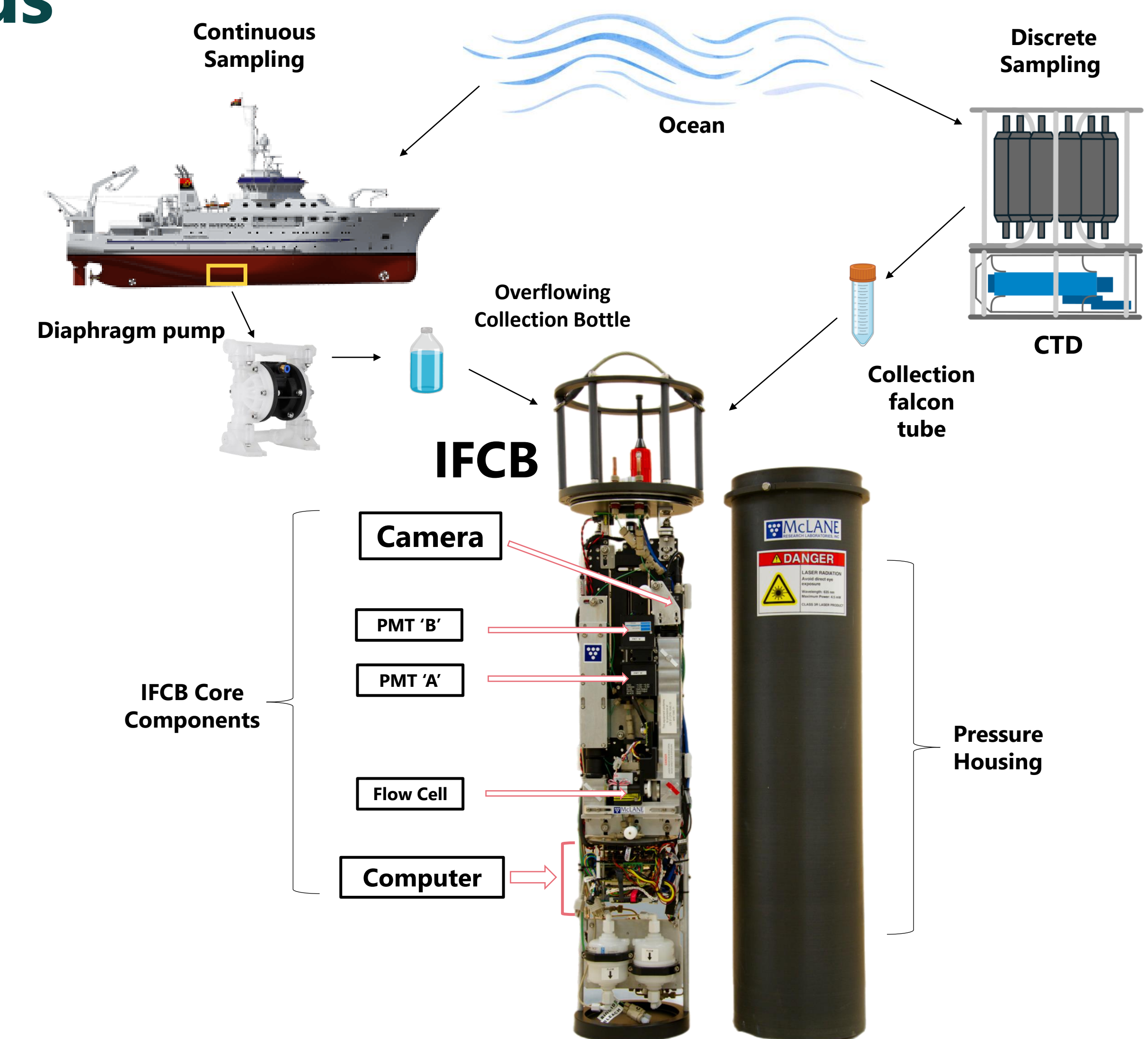


Fig 3: Schematic of IFCB sampling protocol. Environmental samples are collected and delivered to the unit via the underway system or CTD. Key components identified include the camera and photomultiplier (PMT) B (chlorophyll detection), and the computer.

Results

- Continuous operation detected a harmful algal bloom dominated by *Pseudo-nitzschia* during the 2022 Summer Cruise.
- Combined with the molecular data from the NOAA-CalCOFI Ocean Genomics (NCOG) project, the IFCB data will provide new insights into the phytoplankton community structure off the coast of California.

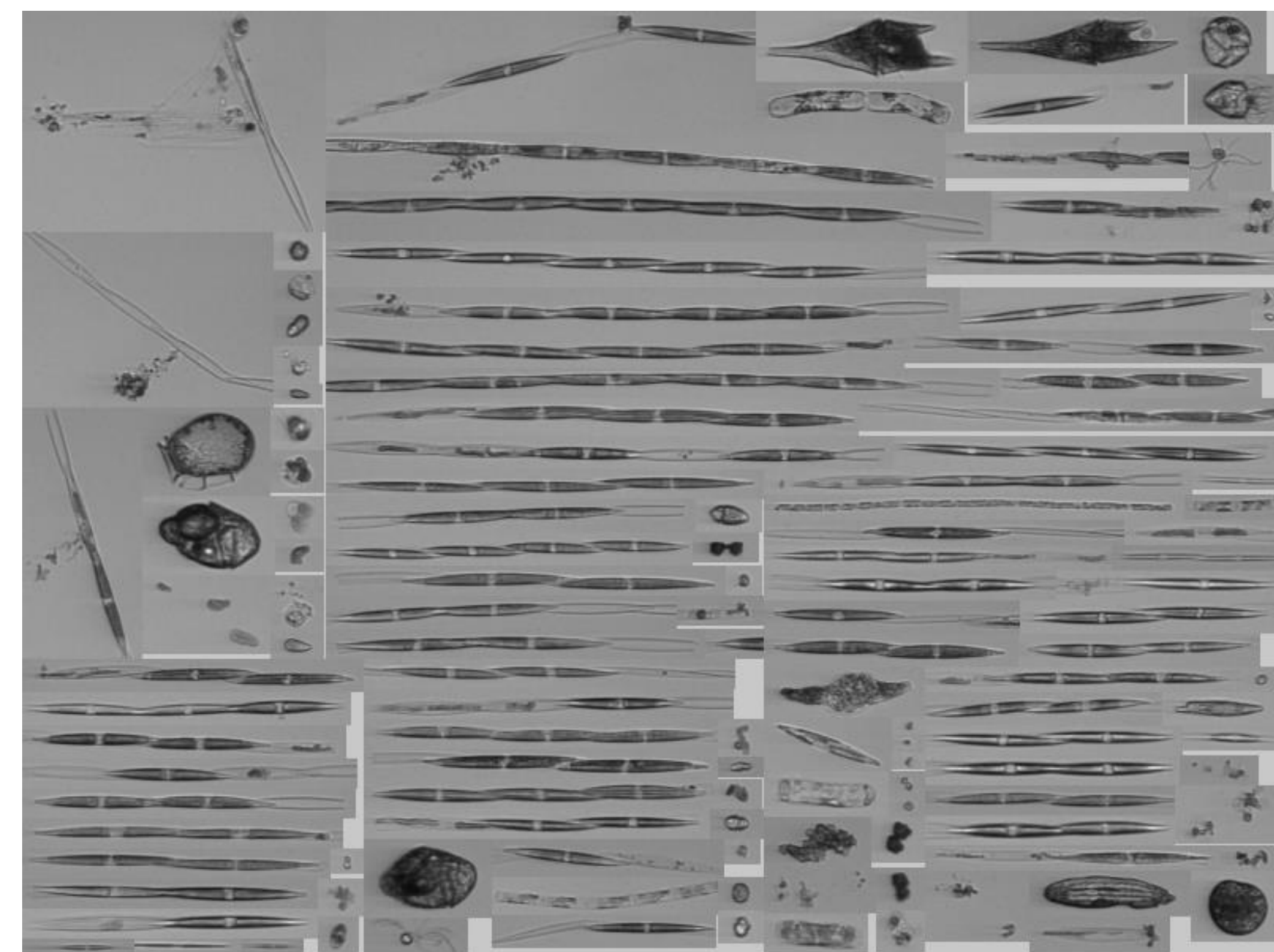


Fig 4: Mosaic image including *Pseudo-nitzschia* chains from the IFCB dashboard.

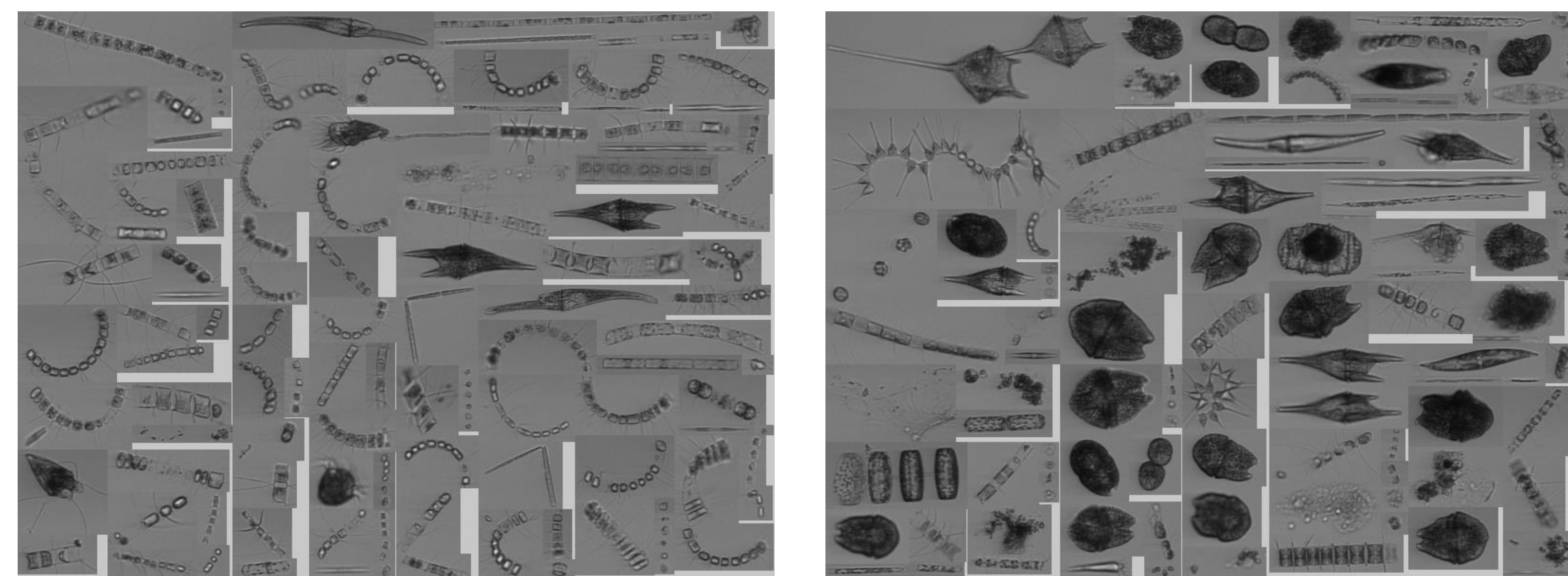


Fig 5: Mosaic images captured by the IFCB on the fall 2022 CalCOFI Images are compiled live from the surrounding waters and arranged on the IFCB dashboard.

The IFCB was deployed on 3 CalCOFI cruises in 2022 and will continue to be incorporated into the CalCOFI time series.

- The IFCB California coastal network is growing, and data are becoming available to public through an online IFCB dashboard (<https://ifcb.caloos.org/>).



Fig 6: Map of deployed IFCBs in California. Adapted from the SCCOOS website (<https://sccoos.org/ifcb/>).