

The Prince William Sound Plankton Camera: a profiling in situ observatory of plankton and particulates.

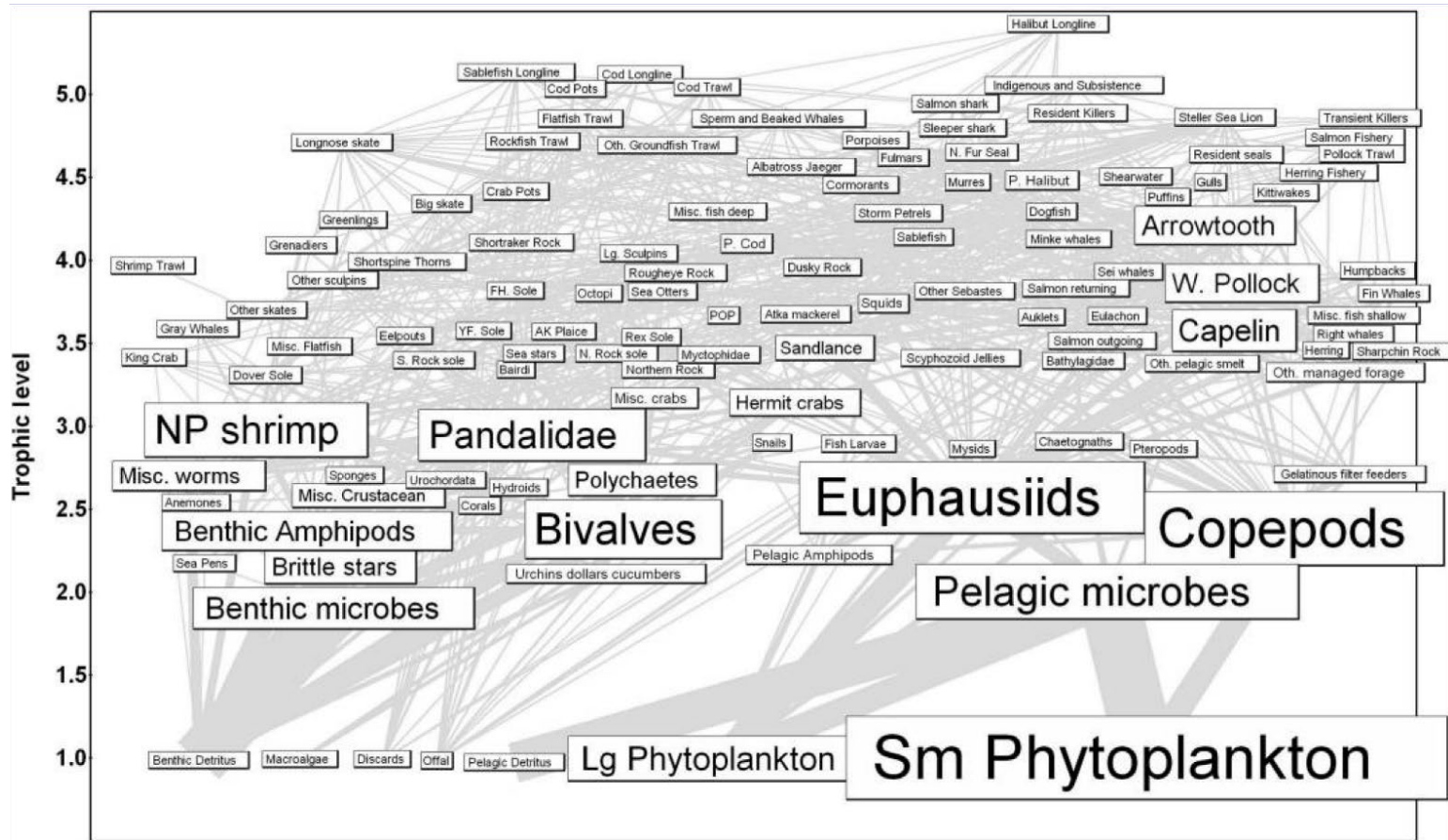


Rob Campbell - PWS Science Center

Paul Roberts – Monterey Bay Aquarium Research Institute

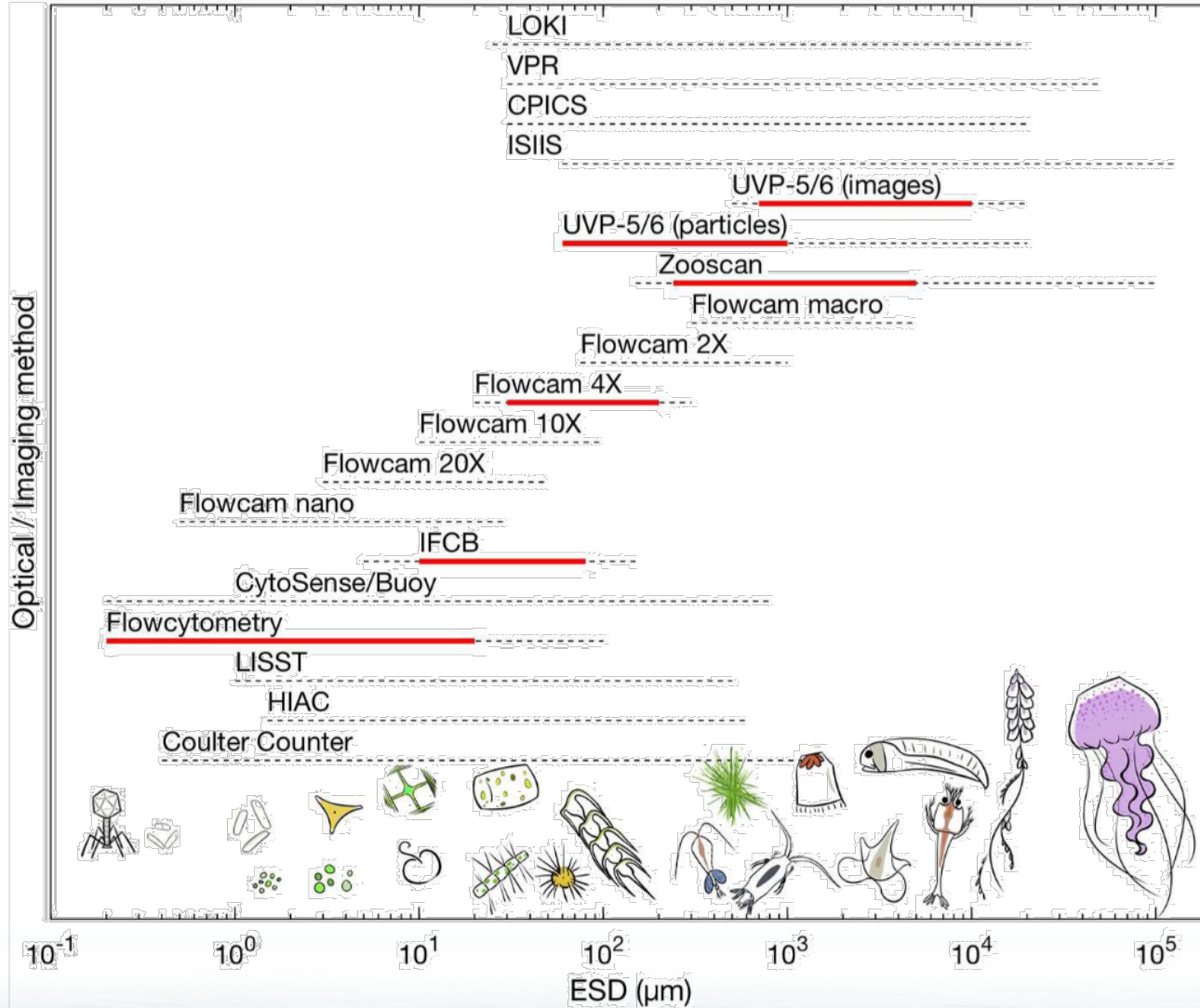
Jules Jaffee – Scripps Institution of Oceanography

Gulf of Alaska ecosystem



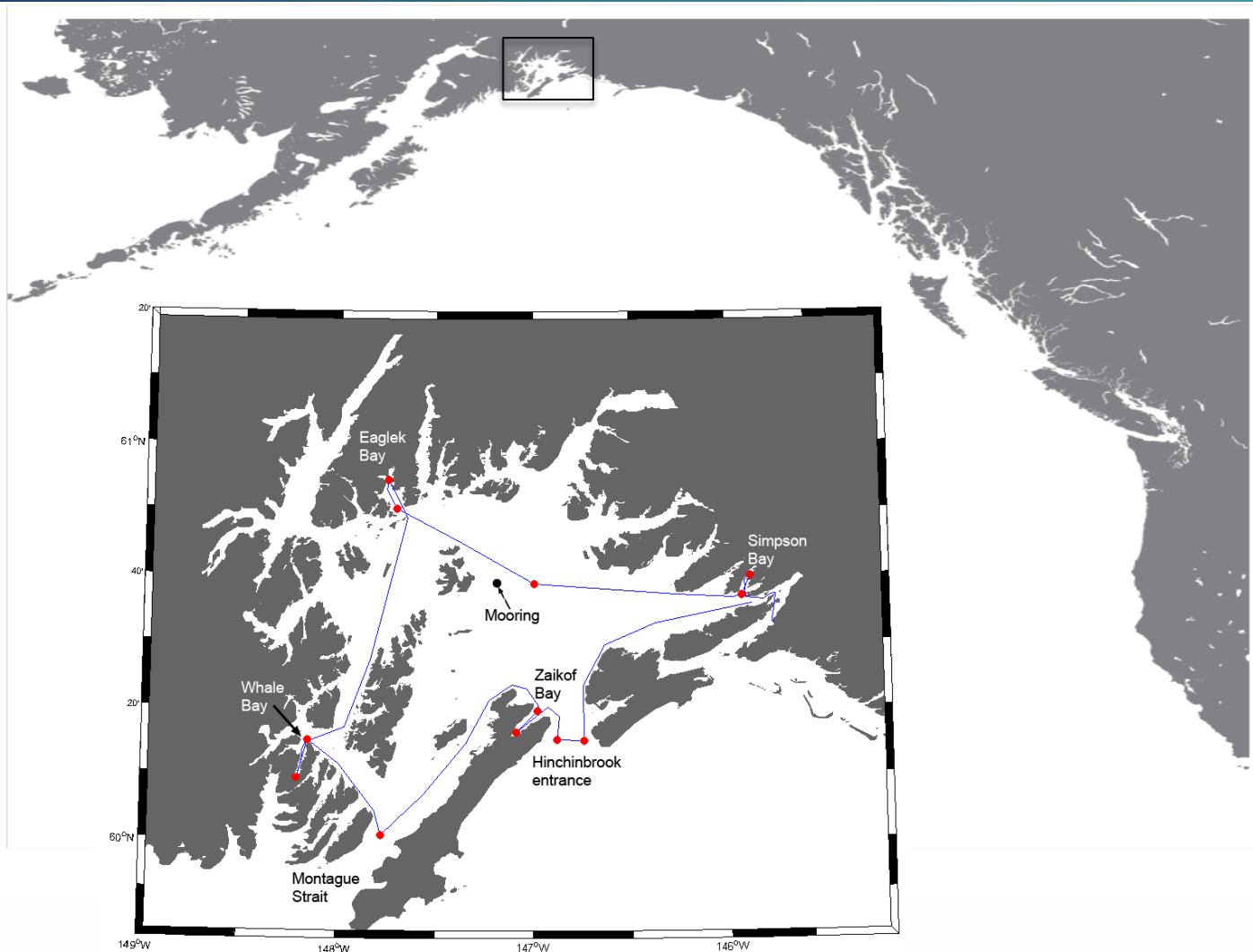
Gaichas *et al.*, 2012, Can. J. Fish. Aquat. Sci.

Plankton imagers



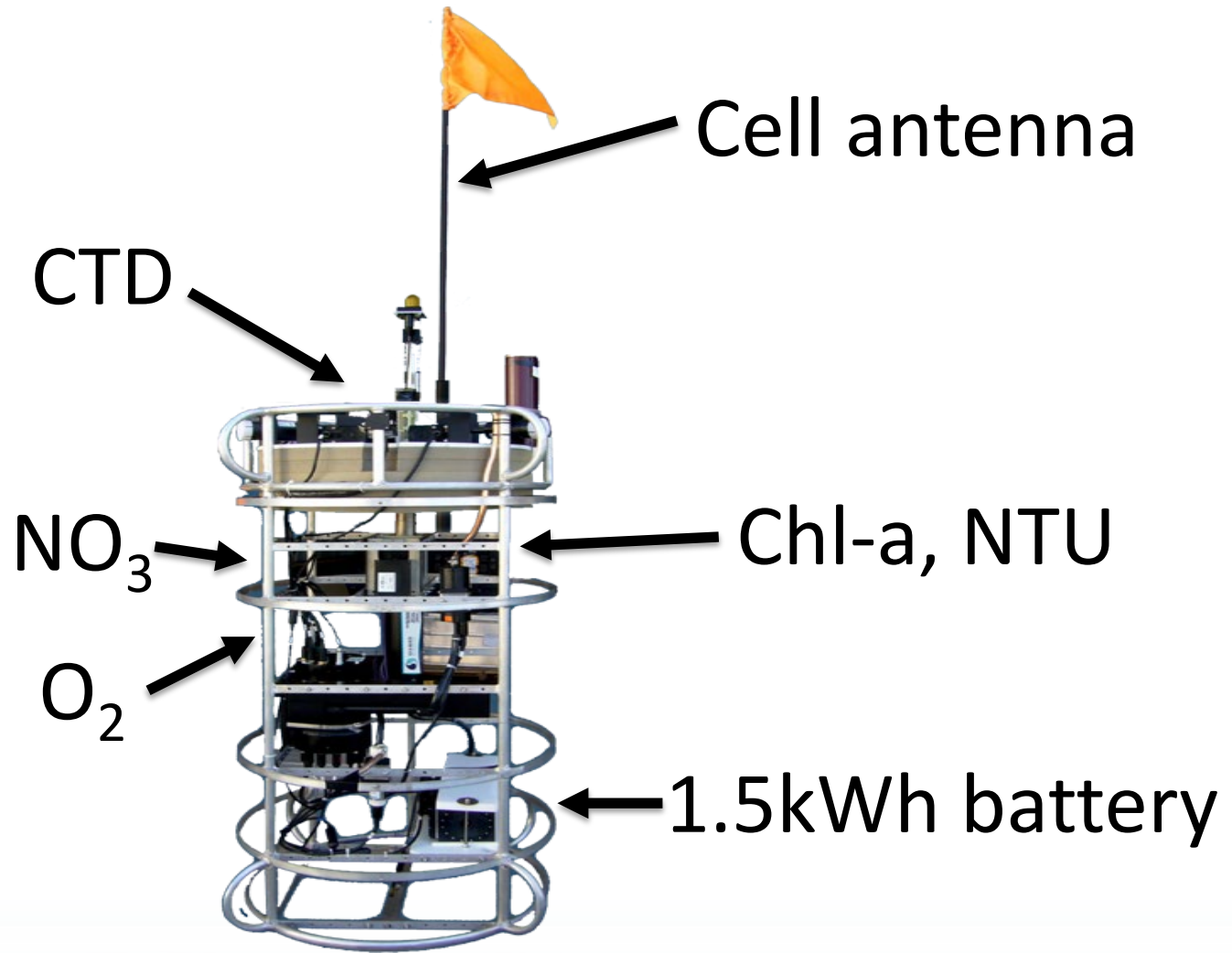
Lombard *et al.*, 2019, *Front. Mar. Sci.*

Gulf Watch AK - PWS

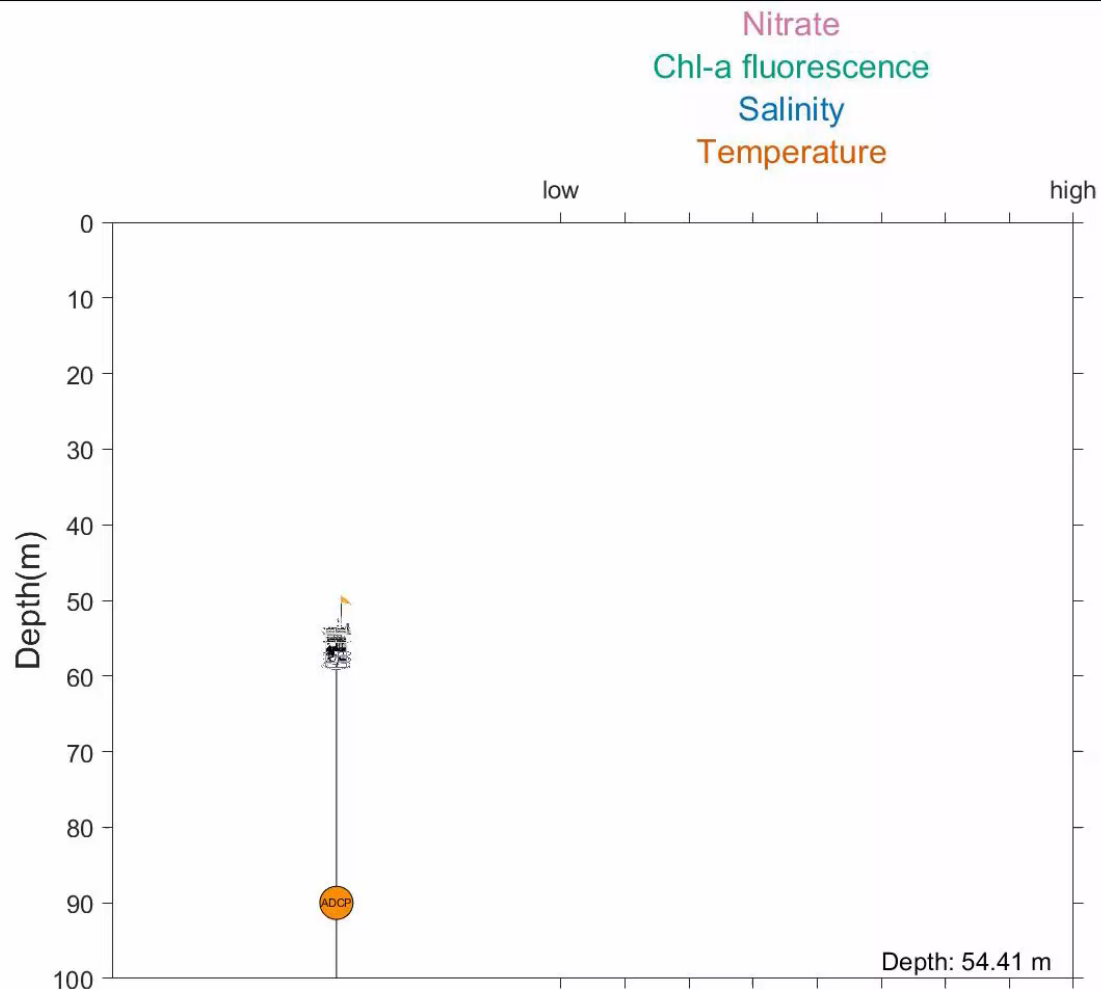


- T,S,O₂
- Plankton
- [Nutrient]
- 6-12 x /year

PAMPr: PWS Autonomous Moored Profiler



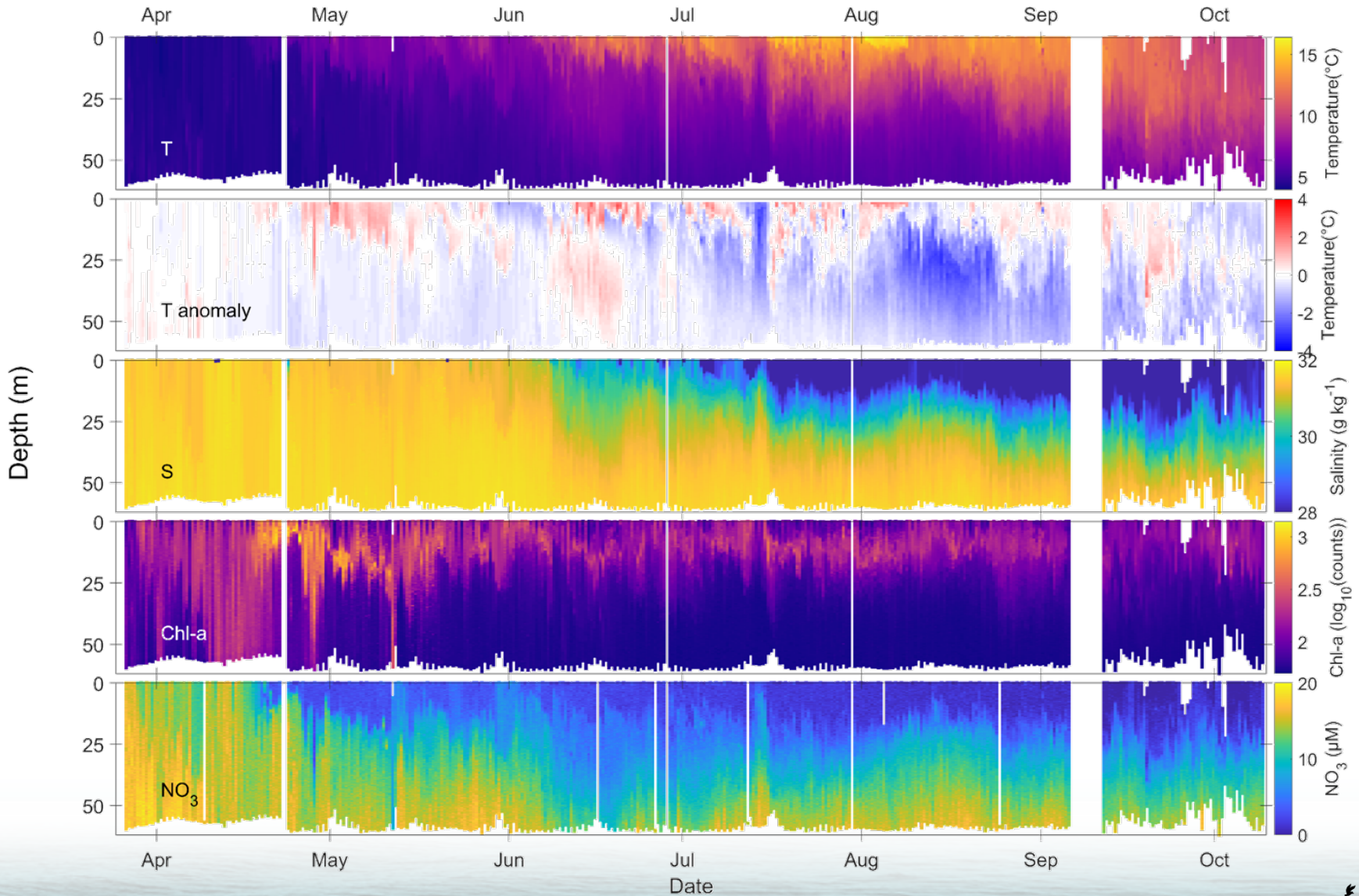
Profiler operation



Advantages:

- Safe
- Full profile
- large payload

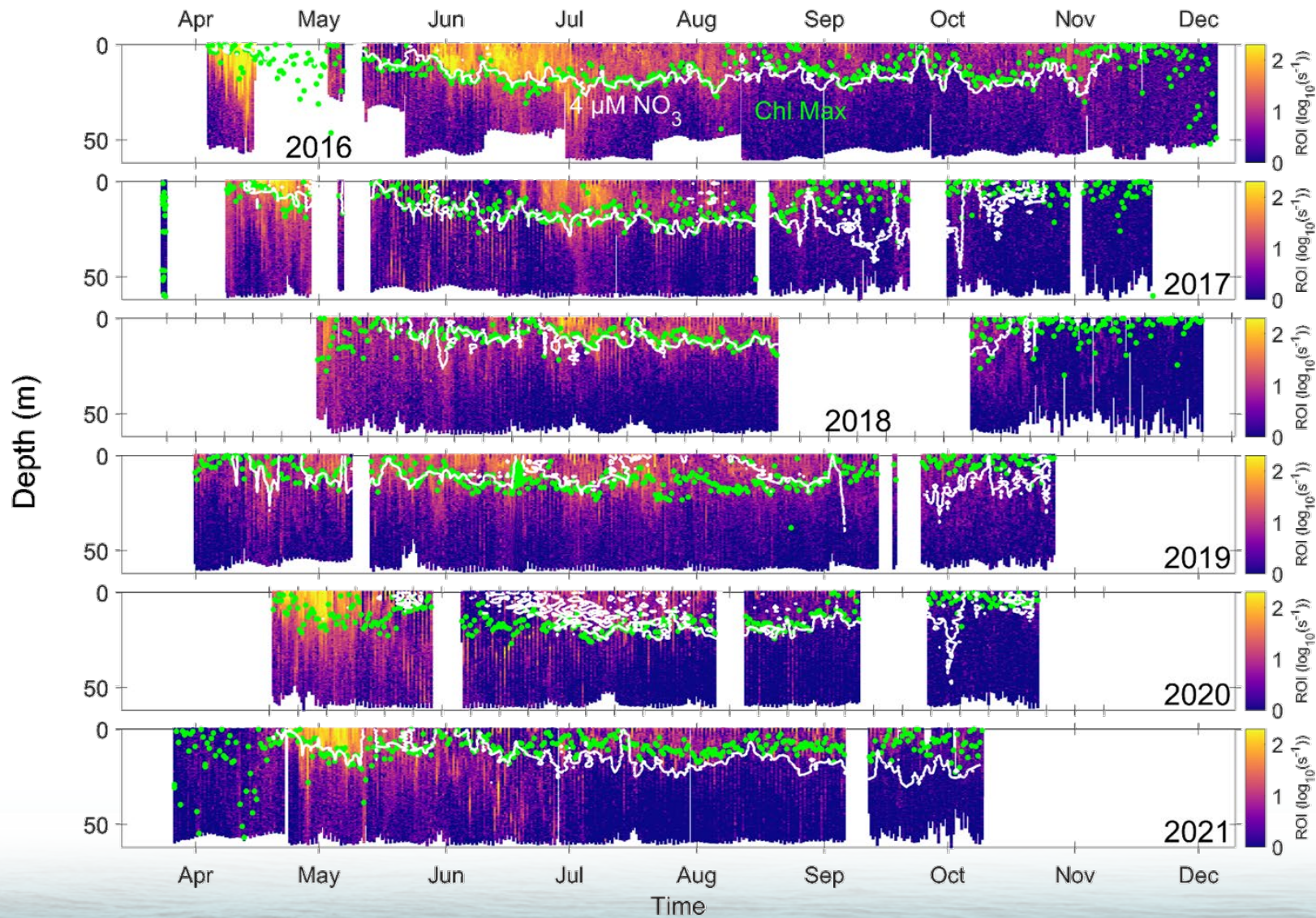
PWS surface oceanography 2021



2016: Plankton camera



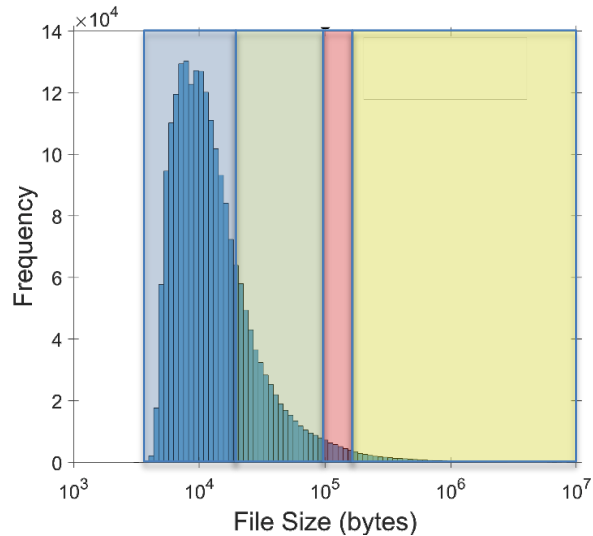
ROIs 2016-2021



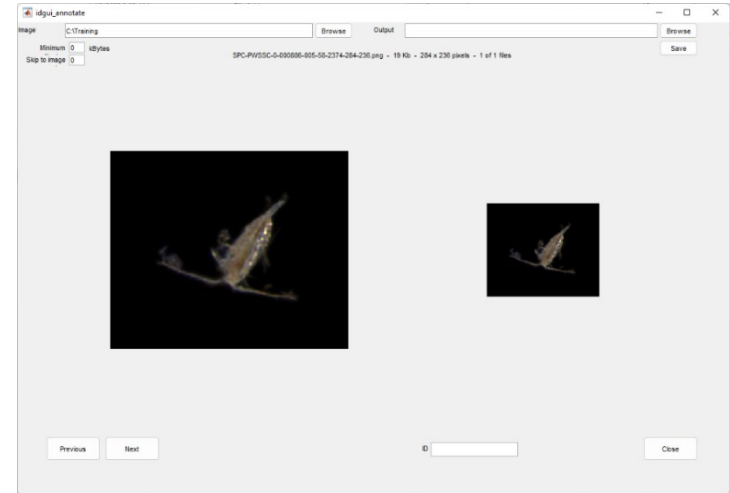
* Note diel banding

Training set workflow

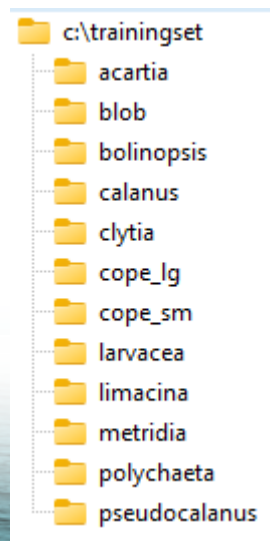
Log scaled size (+ time) stratified random subsample



Annotation GUI



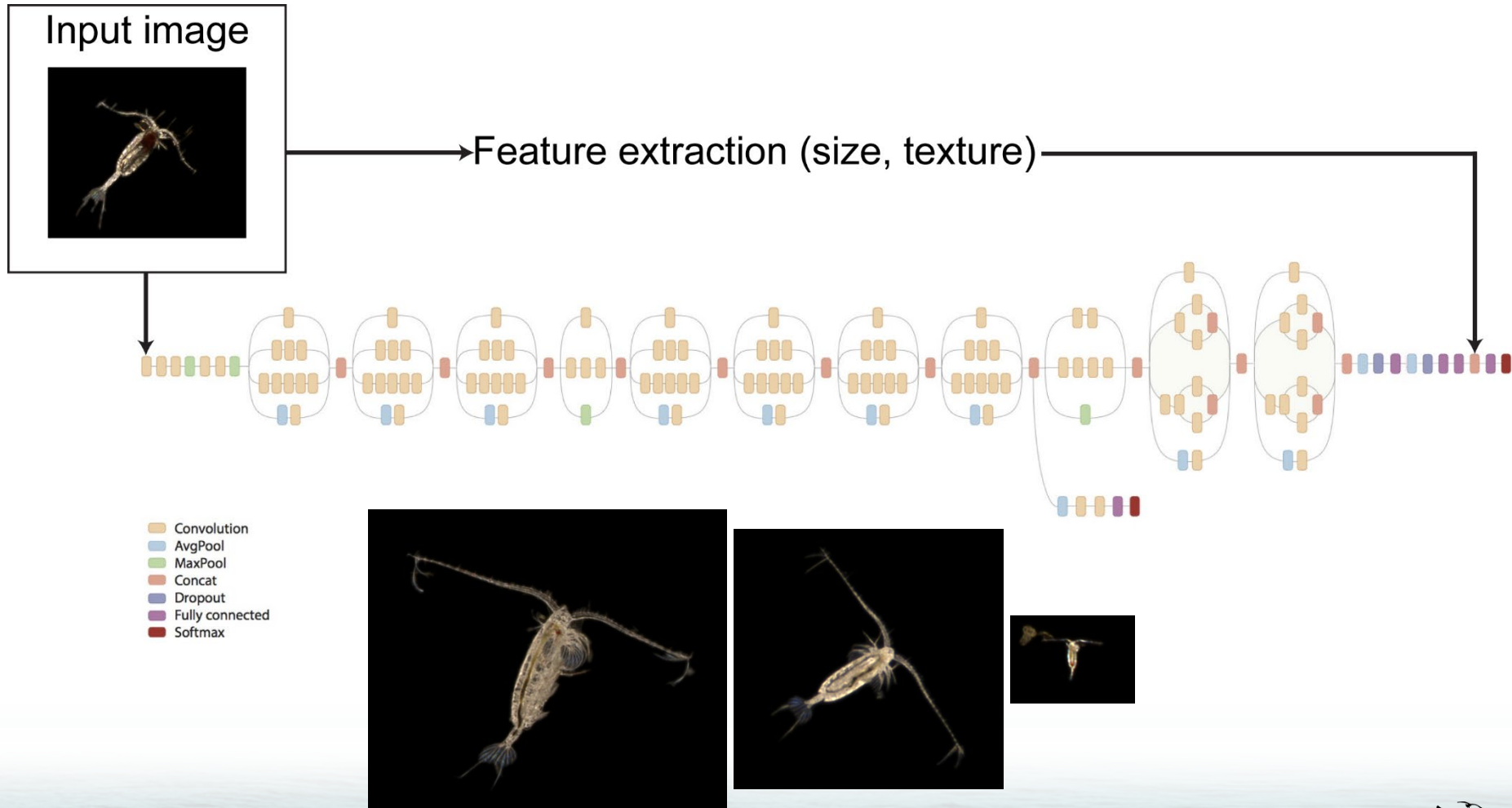
Manually examine size of unique classes, lump some, discard extremely rare types



Final set: 43 classes, ~20K images

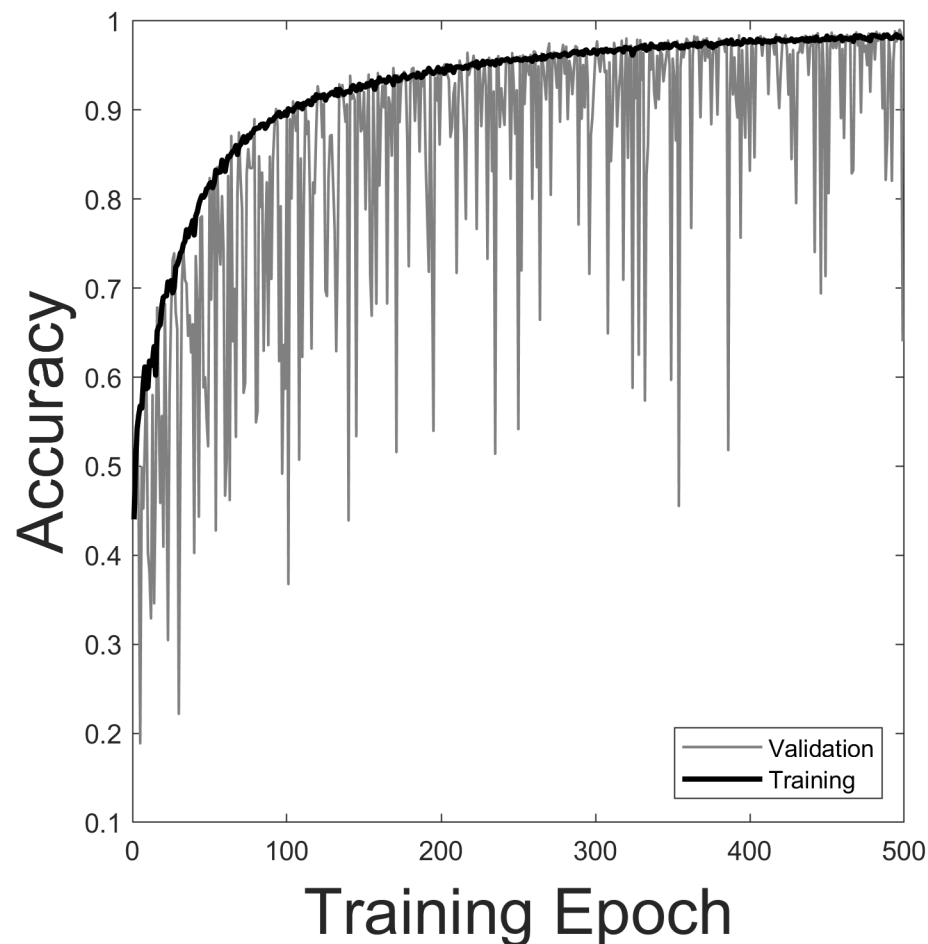


Classification: Inception v3 neural net

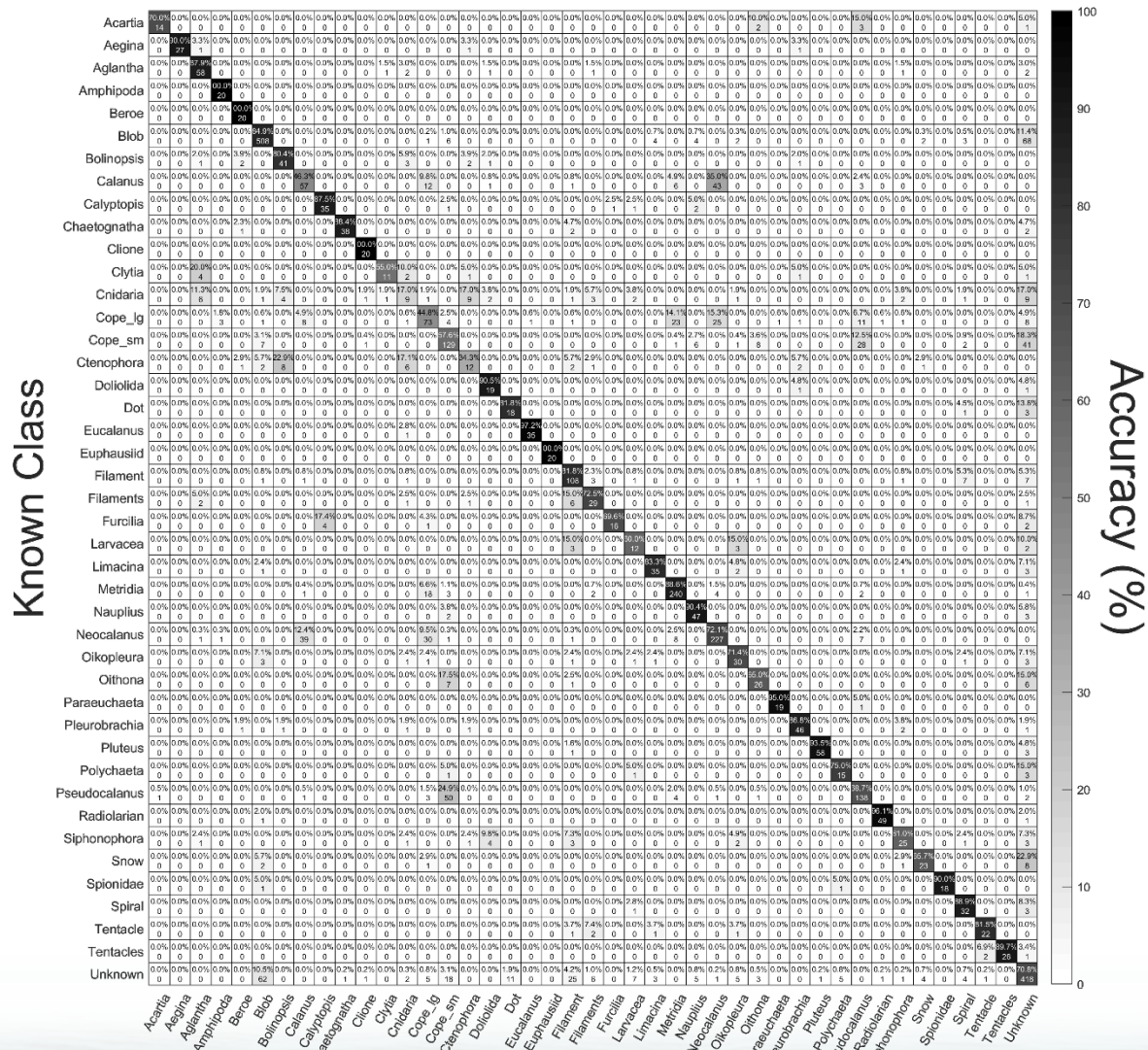


Model training

- 90:10 Train:test split
- 90:10 Train:validation
- Random augmentation
 - flipped
 - scaled ($\pm 20\%$)
 - rotated ($\pm 90^\circ$)
 - sheared ($\pm 8^\circ$)



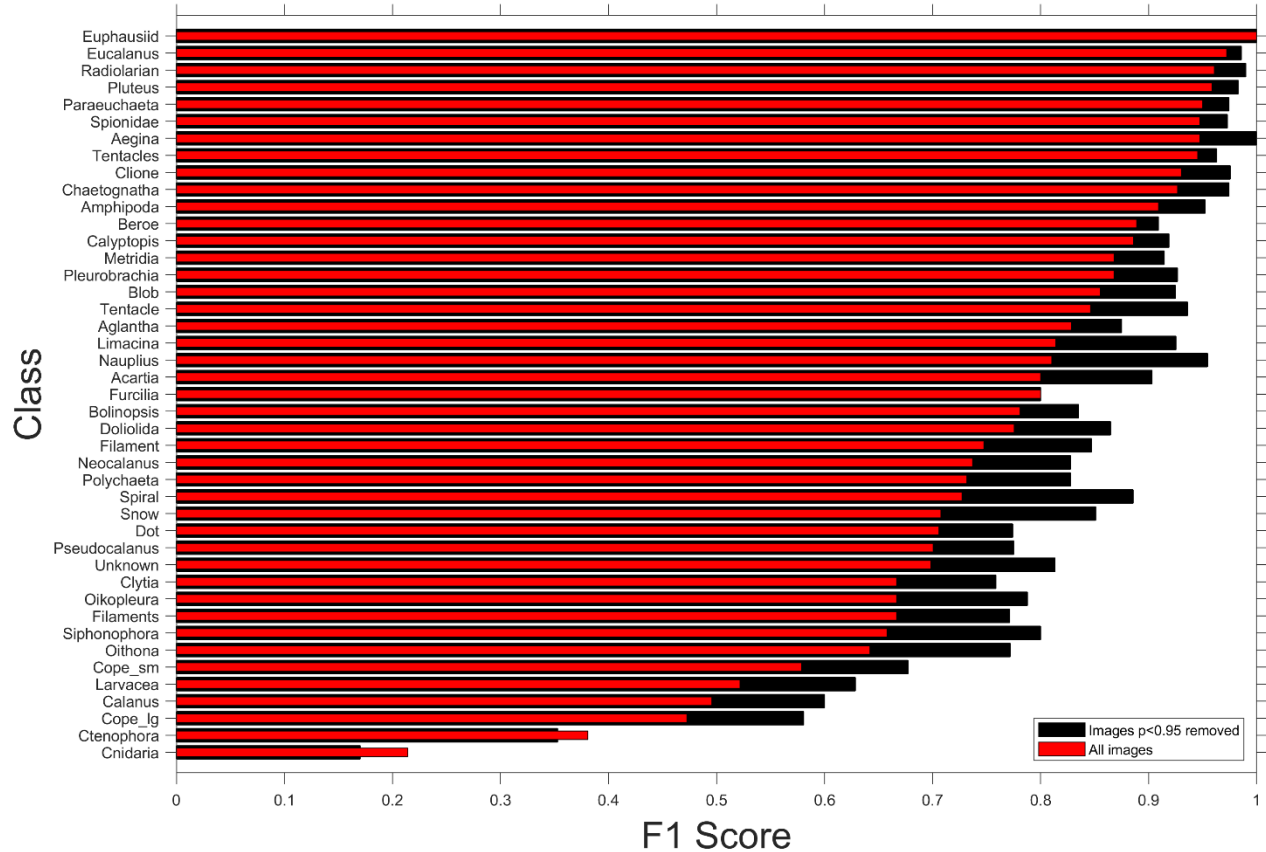
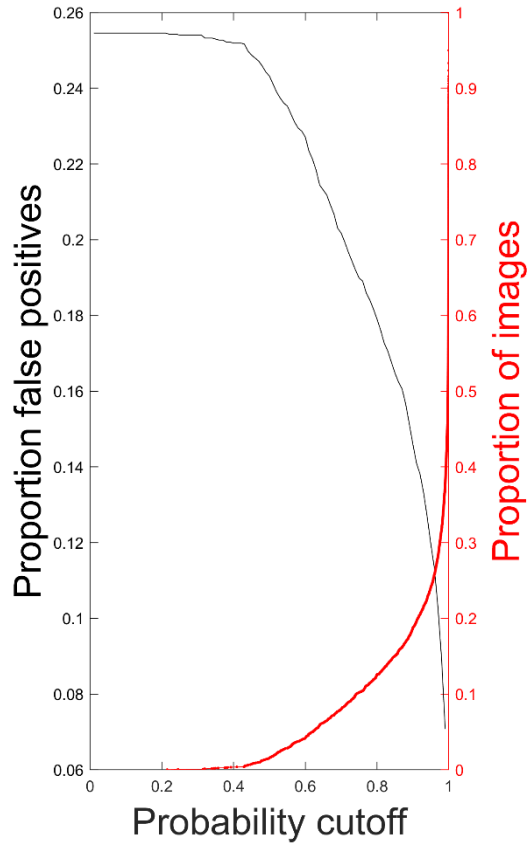
Classification results – test set



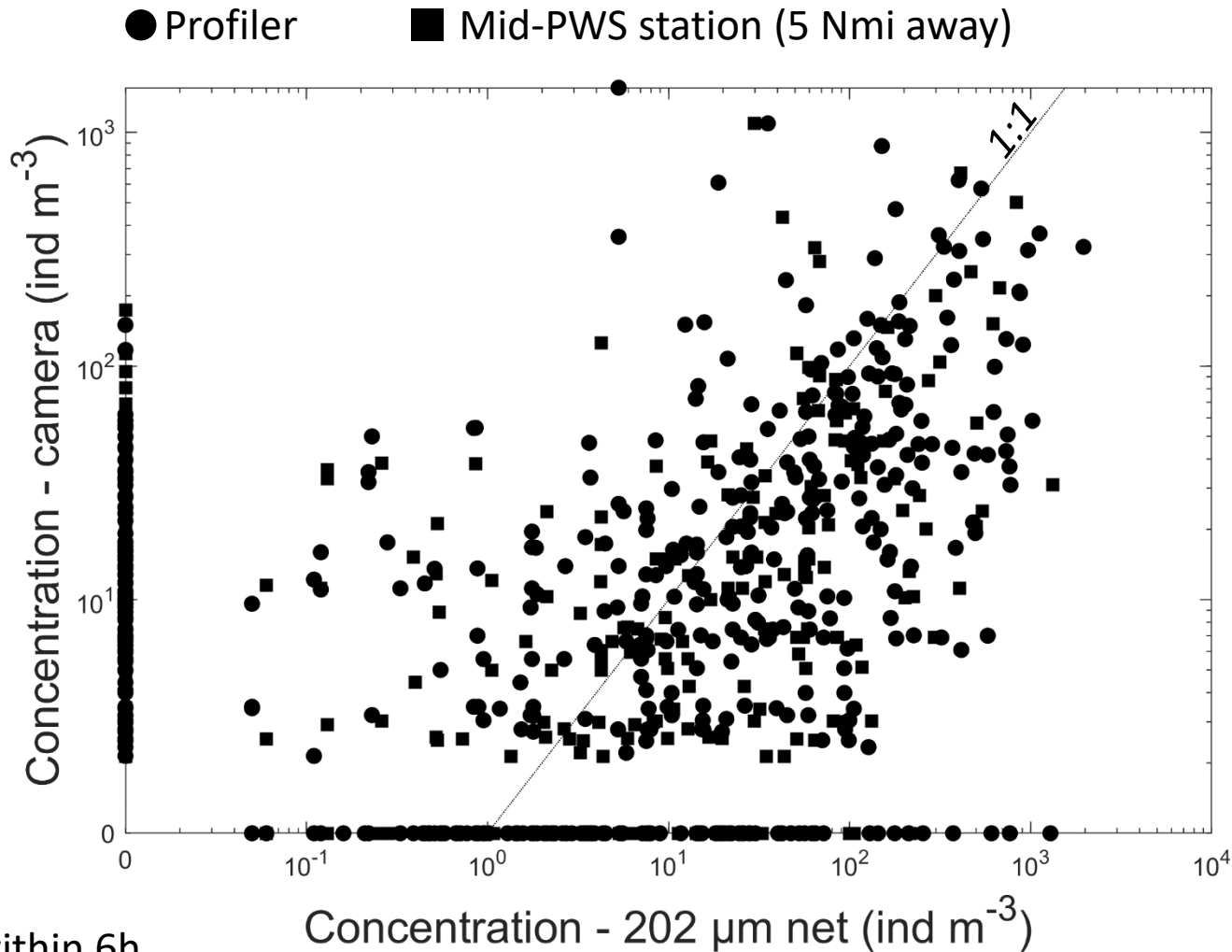
Classifier Prediction



Classification results w/wo probability filtering



Camera vs 202 μm net comparison



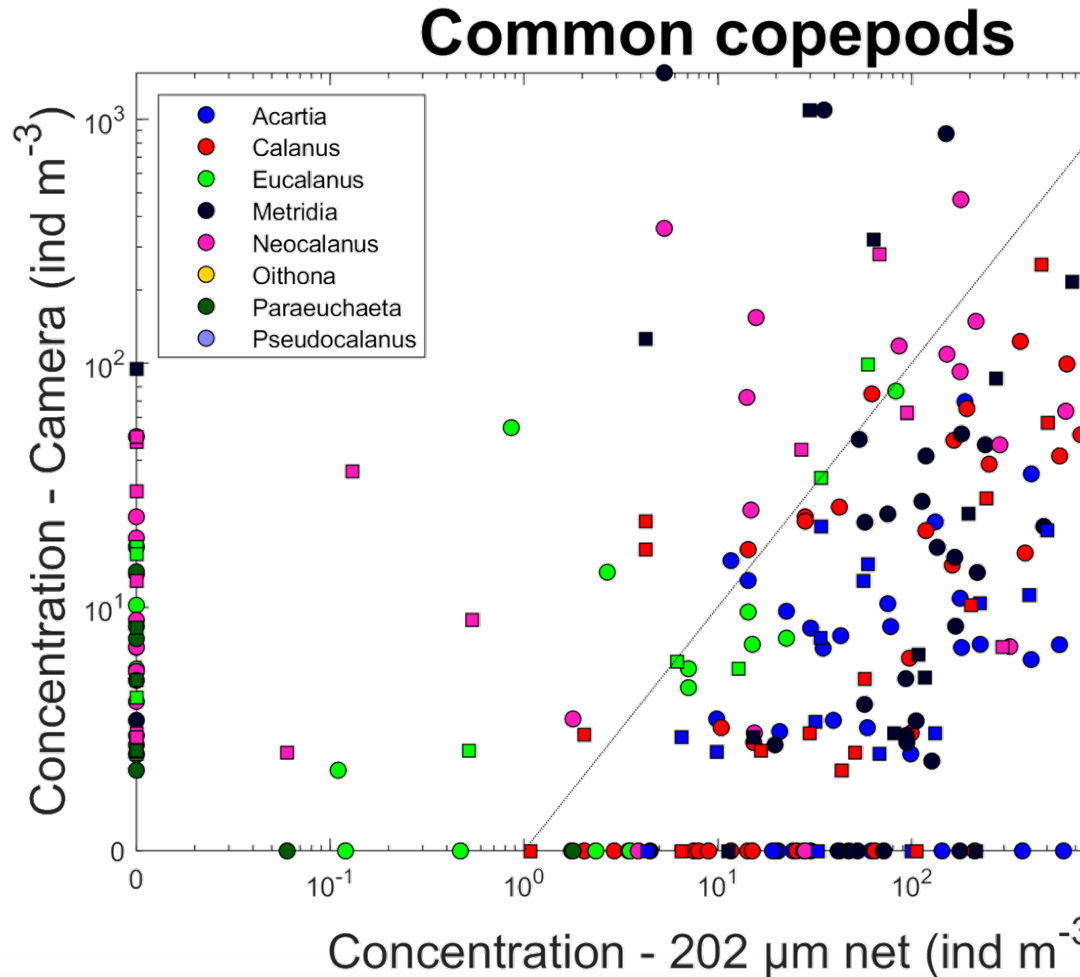
Tows done within 6h

n=35 at profiler, n=18 at PWS

95% probability threshold (highest confidence)

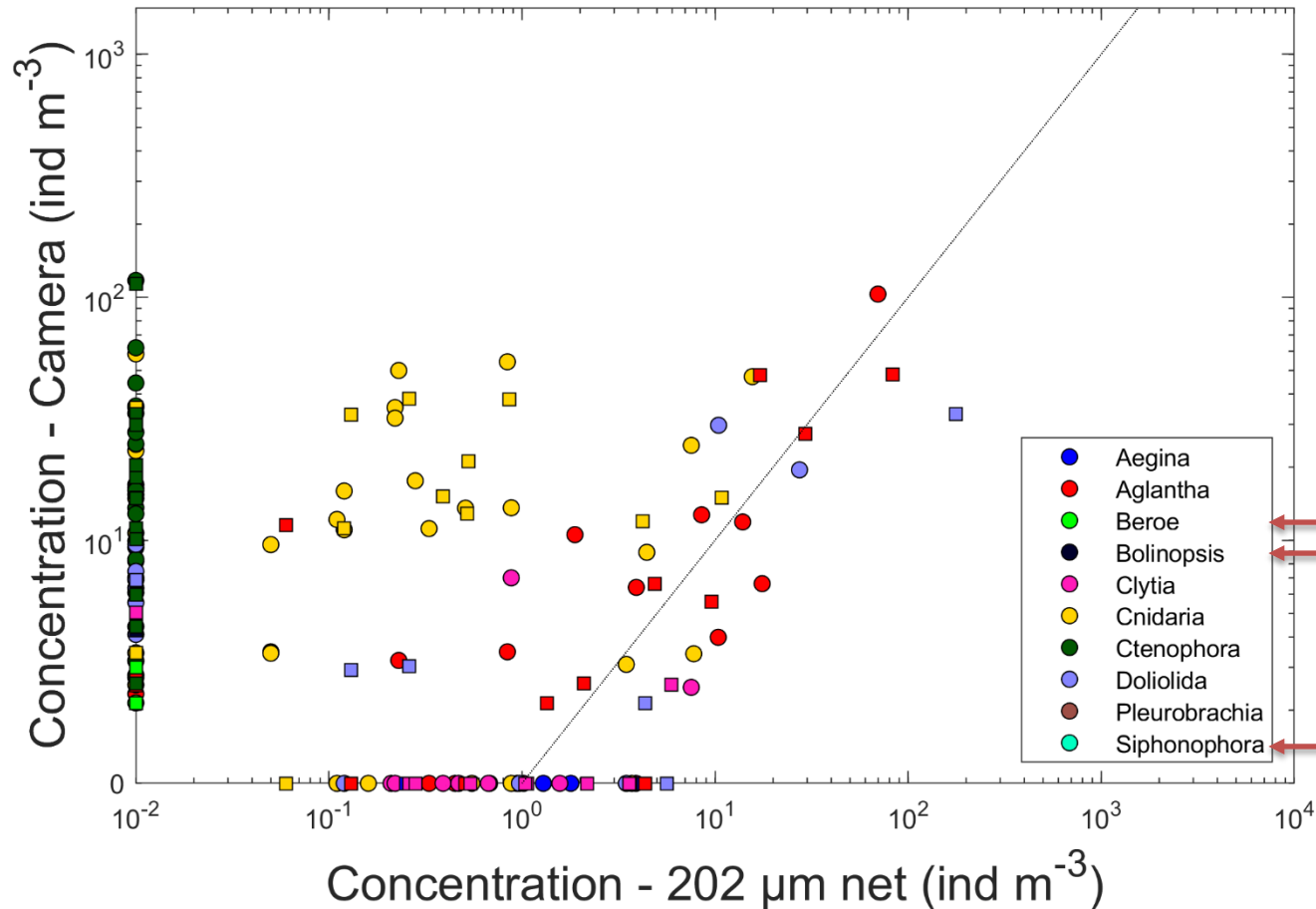
Same technician

Camera vs 202 μm net comparison



Camera vs 202 μm net comparison

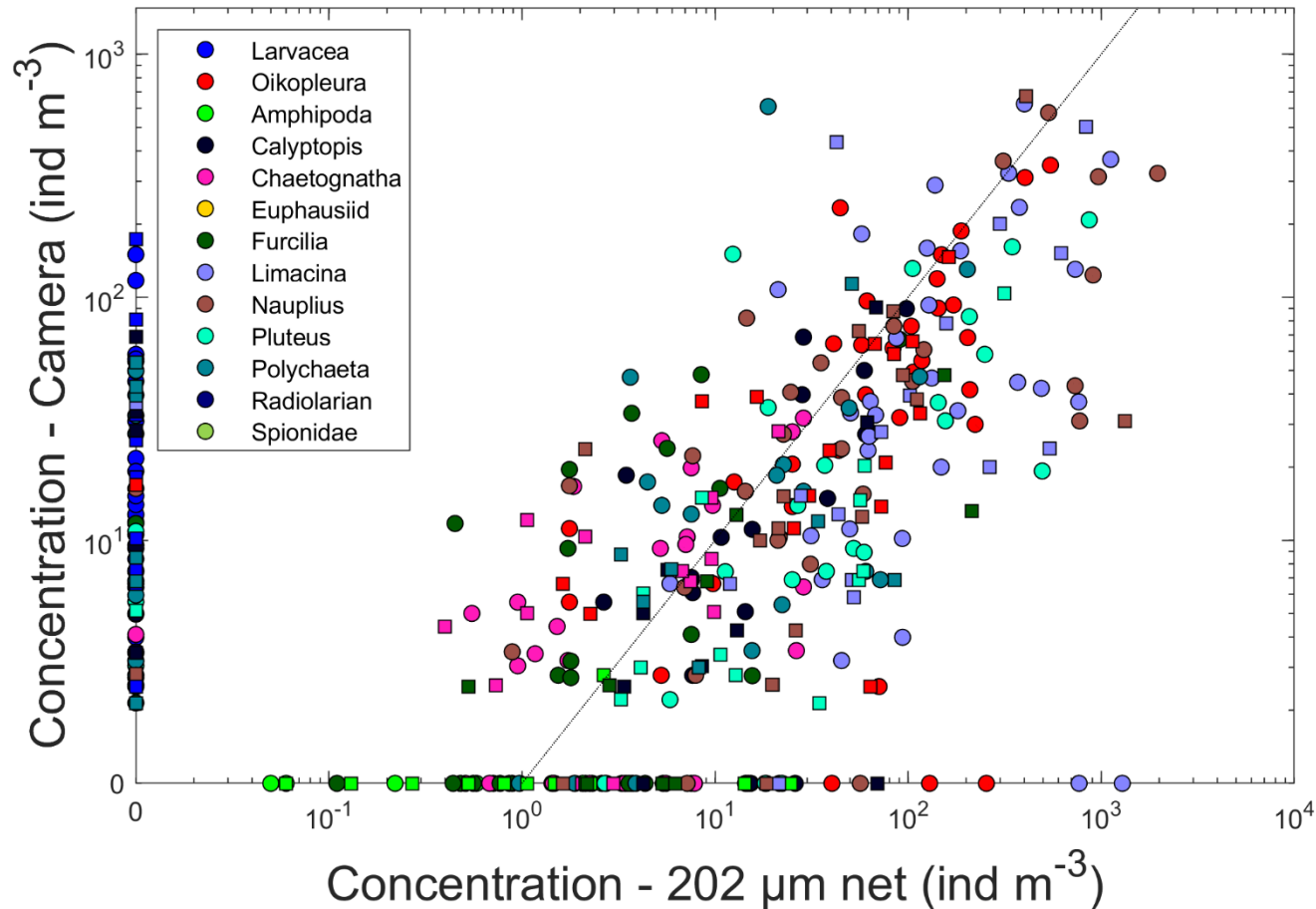
Gelatinous taxa



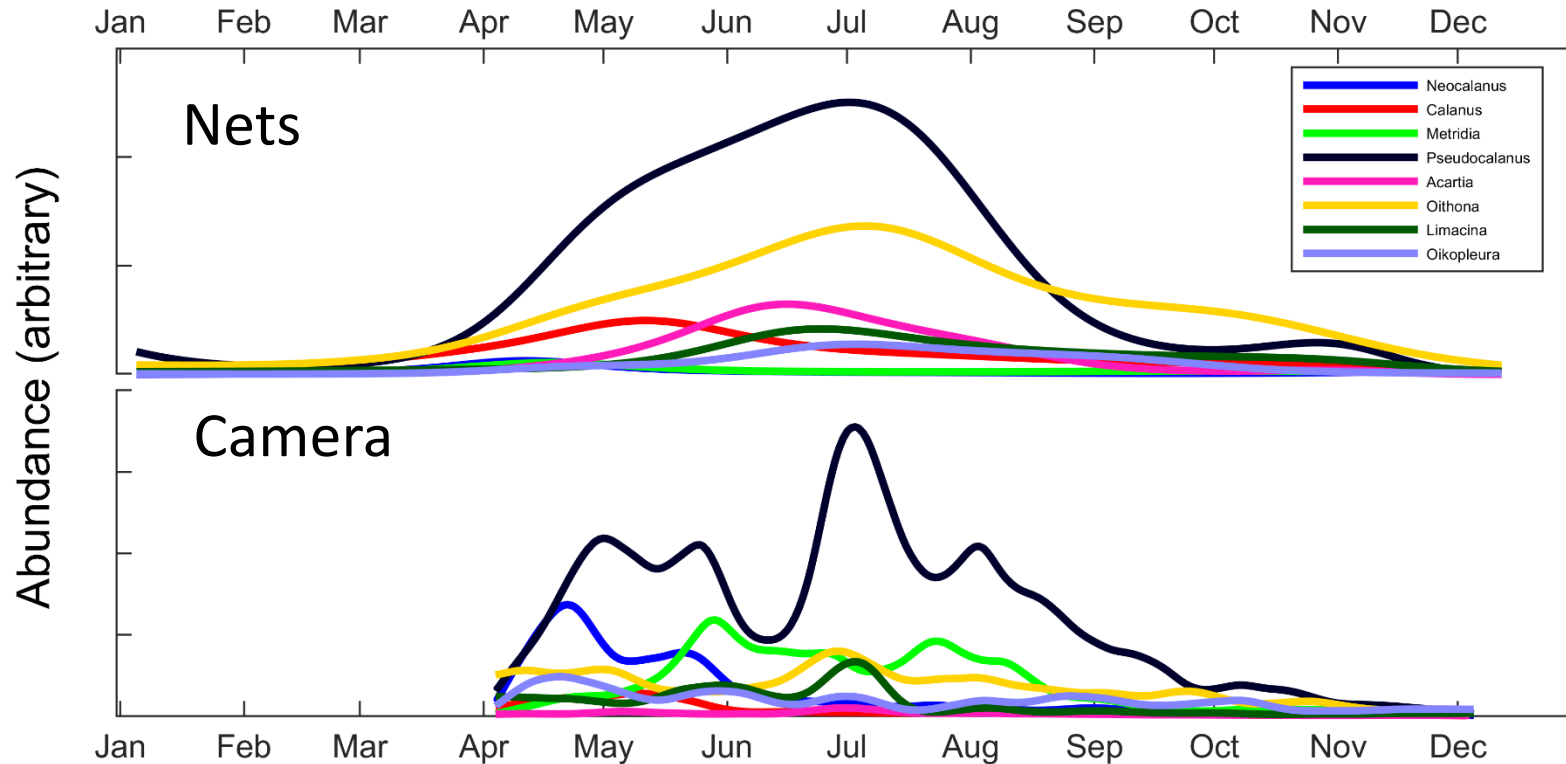
Never
in
nets

Camera vs 202 μm net comparison

Other common taxa

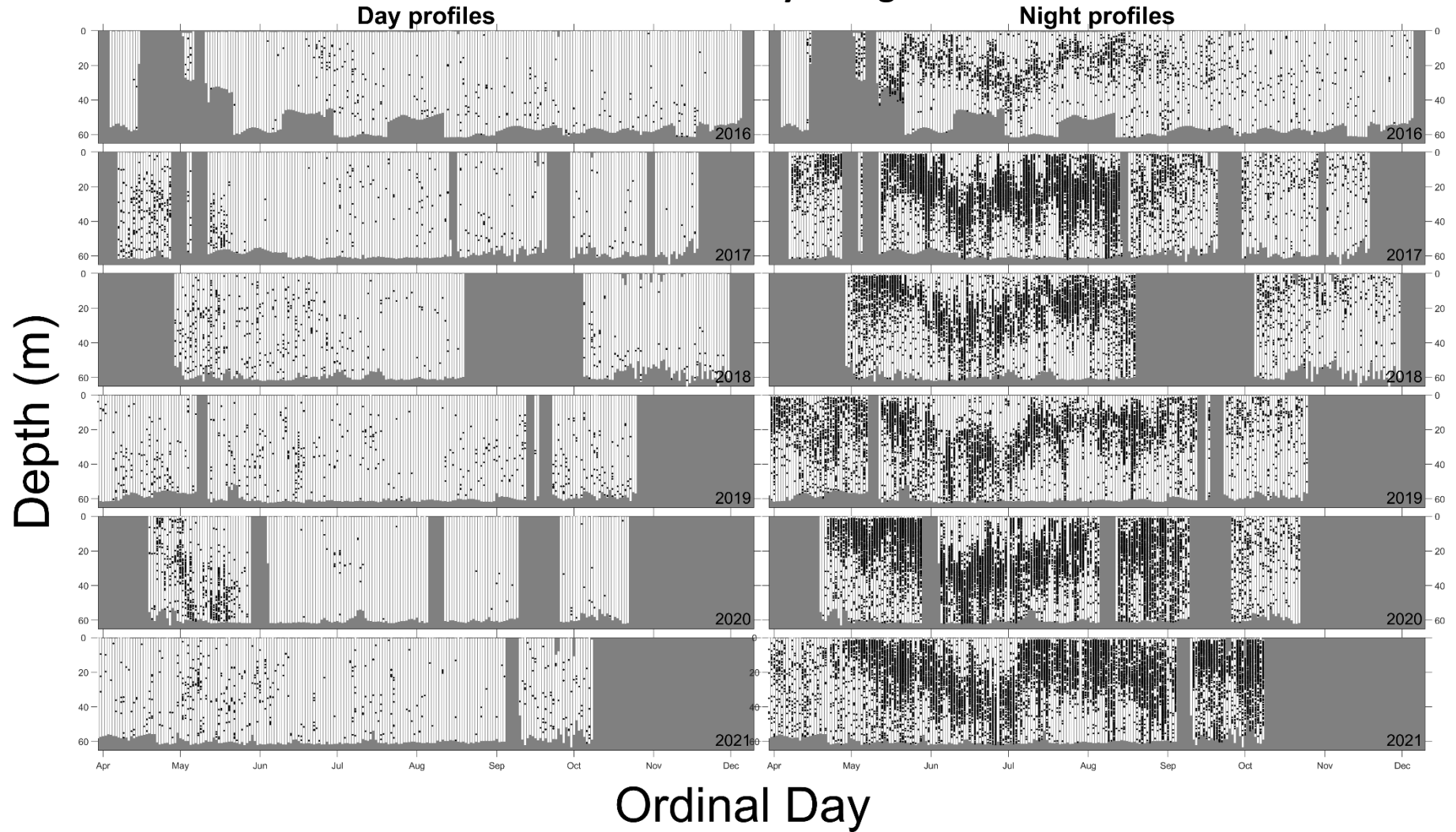


Annual cycles

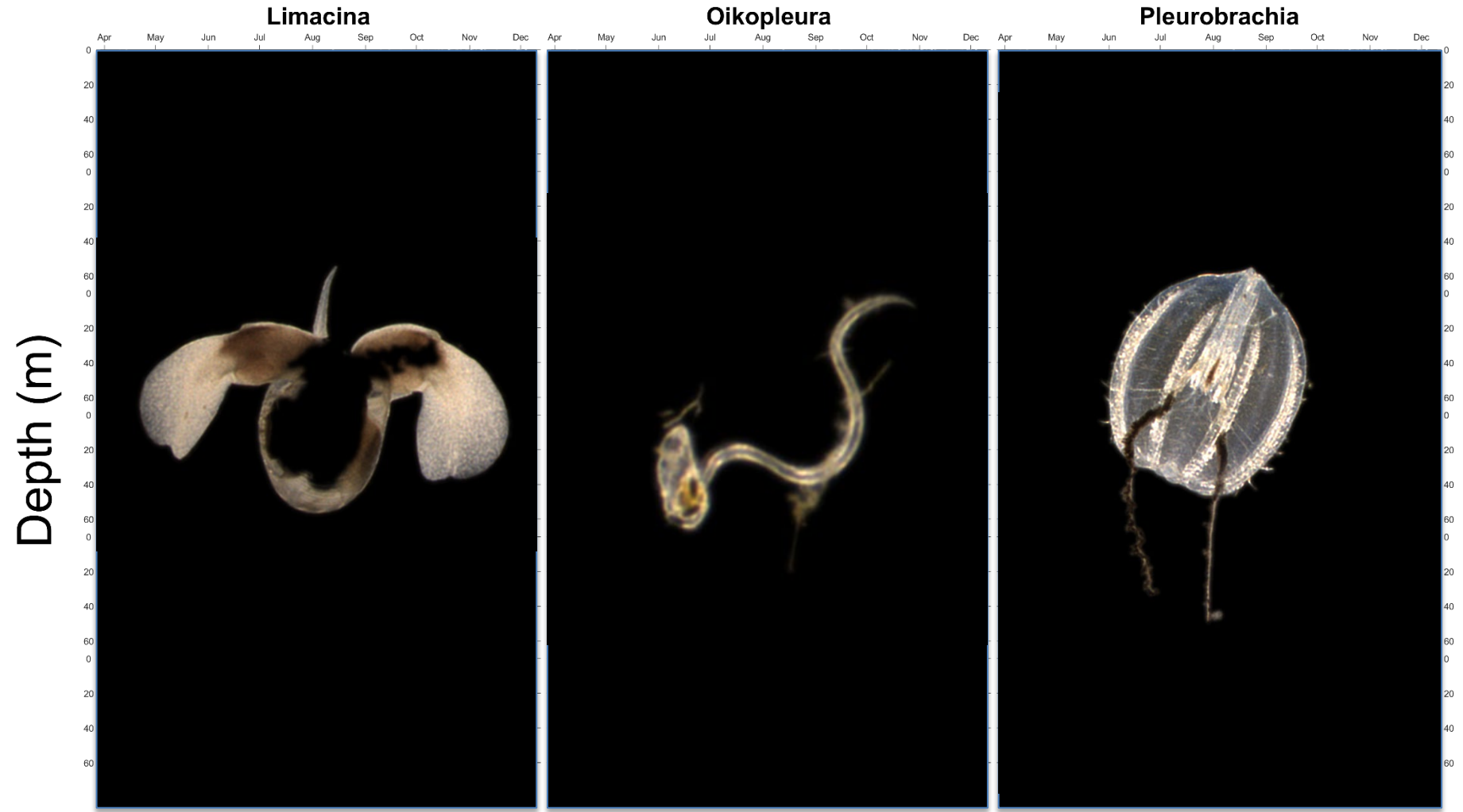


Distributions – Large copepods

Metridia – day vs night



Observations – other taxa



Next steps / spinoffs

