

Plankton in focus: from microscopy to semi-automated imaging techniques

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Marine Observation Center (MOC)

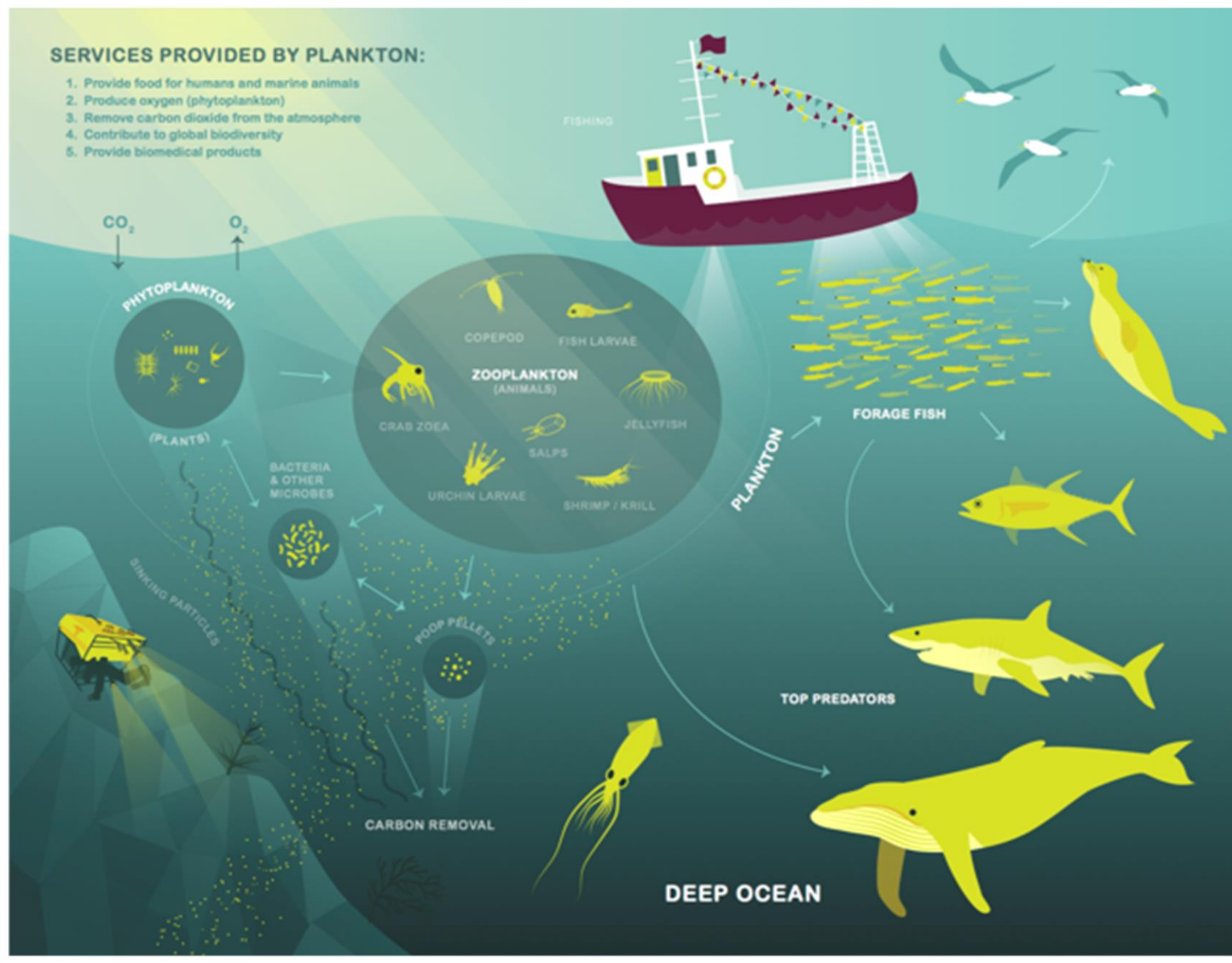
LifeWatch Biodiversity Day 2021





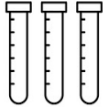
SERVICES PROVIDED BY PLANKTON:

1. Provide food for humans and marine animals
2. Produce oxygen (phytoplankton)
3. Remove carbon dioxide from the atmosphere
4. Contribute to global biodiversity
5. Provide biomedical products






Plankton monitoring in the BPNS




Phytoplankton: FlowCam
(2017-ongoing)

Zooplankton: ZooSCAN
(2014-ongoing)



Abundance
Taxonomic information
Biomass
Size



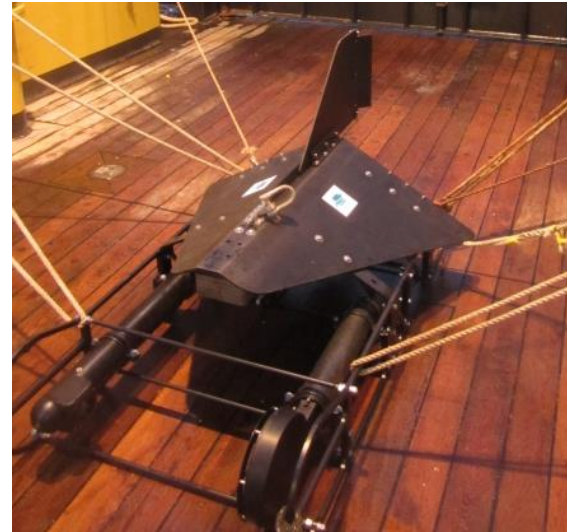
Policy
Industry
Fundamental research



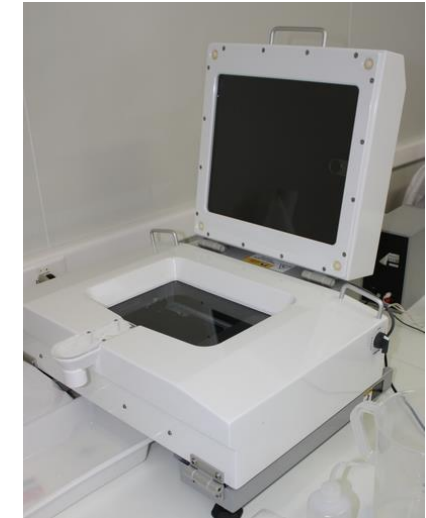
Sampling plankton

Automated imaging sensors

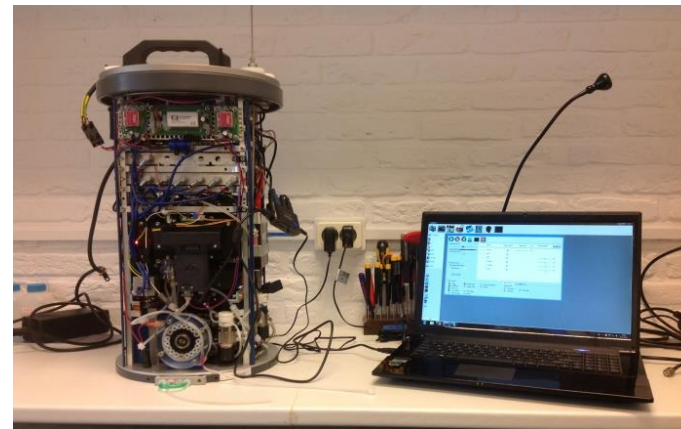
Traditional methods



Video Plankton Recorder



ZooScan



Flow Cytometer

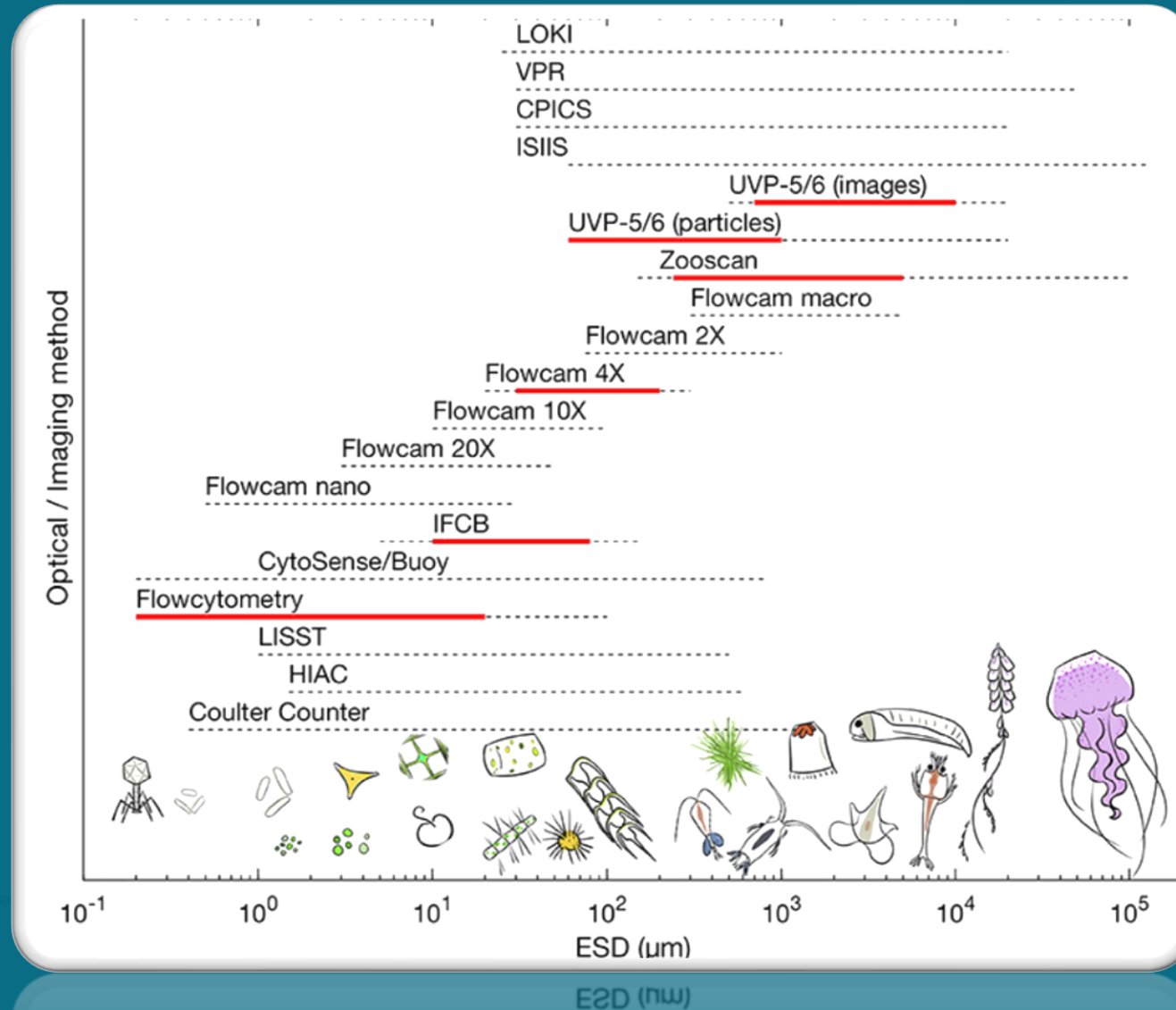


FlowCAM





From micro to macro



Plankton imaging analysis pipeline

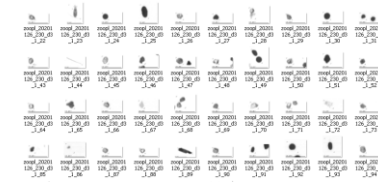
SAMPLING



SCANNING



IMAGE PRE-PROCESSING



BIO-ARCHIVING



DATA INGESTION & ENRICHMENT



DATA PUBLISHING



- LW00_Artifacts
- LW00_Bubbles
- LW00_Debris
- LW00_Fibres
- LW00_Sand
- LW01_Appendicularia
- LW02_Pisces_egg
- LW04_Chaetognatha
- LW05_Cumacea
- LW06_Calanoida
- LW07_Harpacticoida
- LW13_Brachiura_zoe
- LW16_Cirripeda_cypris
- LW17_Cirripeda_nauplius
- LW19_Cnidaria
- LW20_Mollusca_bivalvia
- LW20_Mollusca_gastropoda
- LW21_Annelida
- LW22_Inchiluca
- LW23_Echinodermata
- LW23_Echinodermata_type2
- LW23_Echinodermata_type3
- LW24_Branchiopoda
- LW25_Divers
- valid_202011_TA113133_130_sub0_1

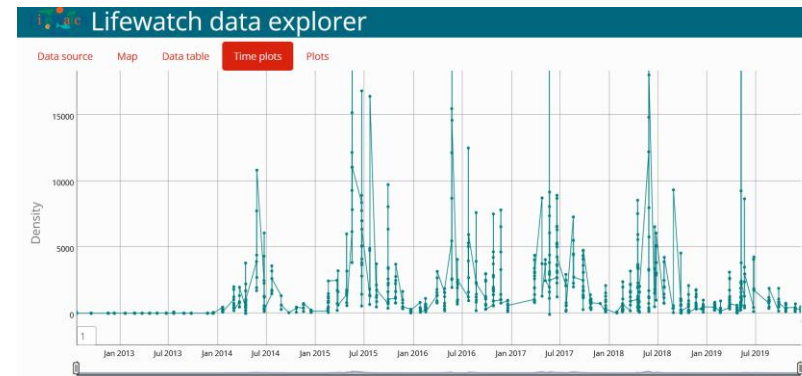
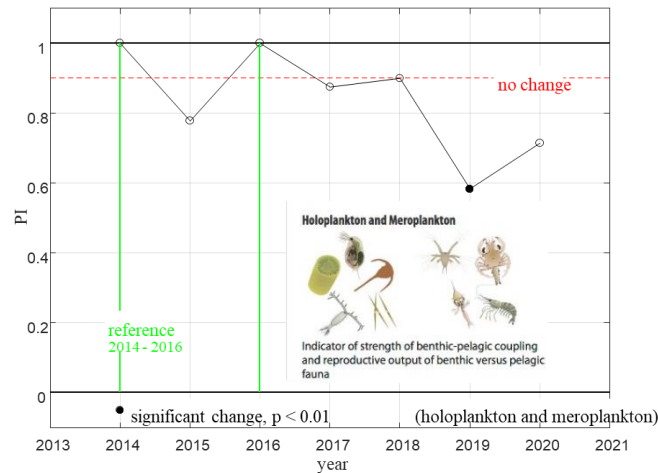


IMAGE RECOGNITION

PREDICTION VALIDATION



INDICATOR CALCULATION

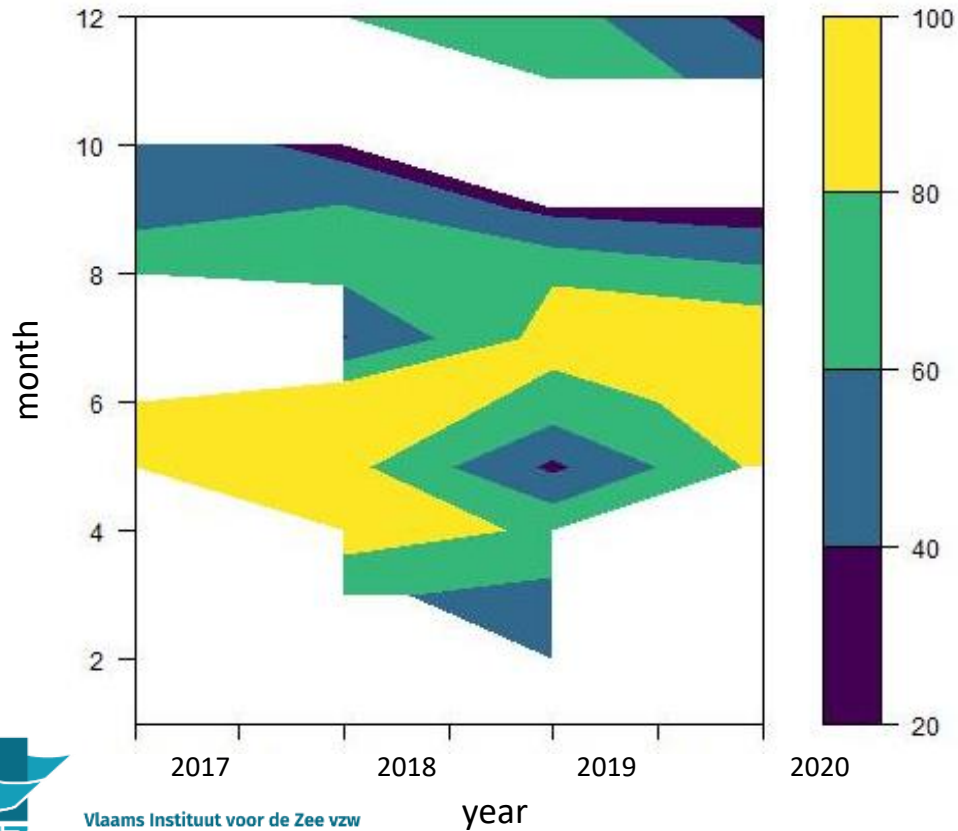




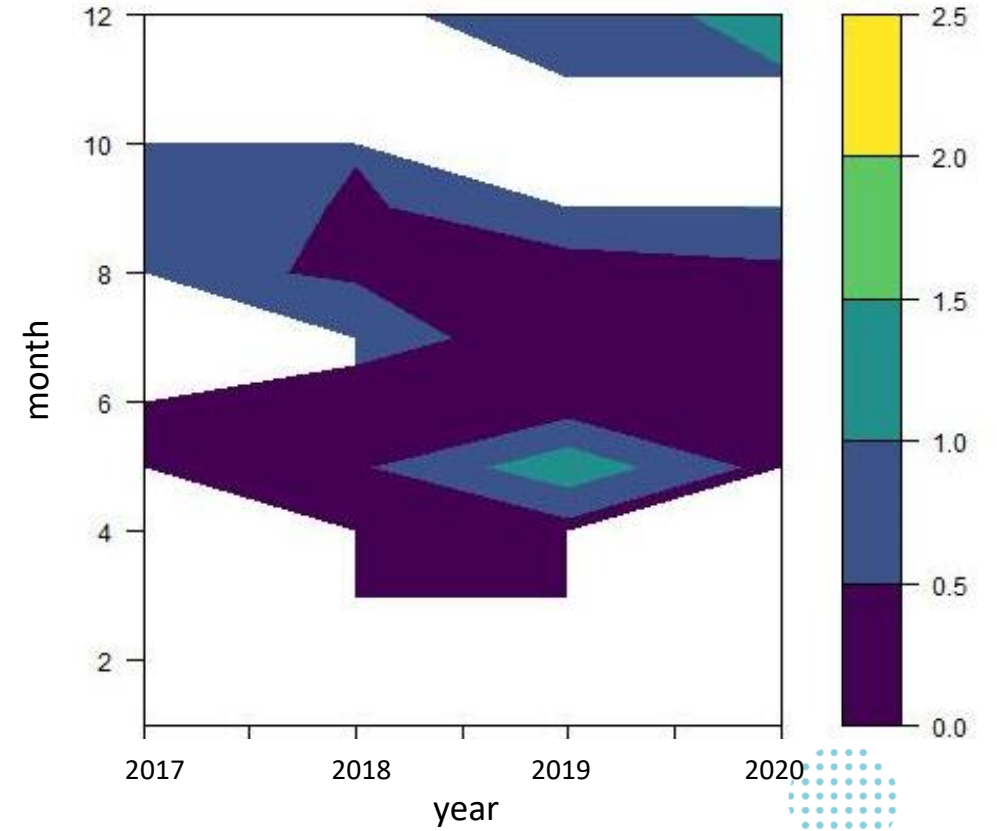
Plankton diversity indicator

Phytoplankton station 215

Dominance (Hulburt Index)



Richness (Menhinick index)

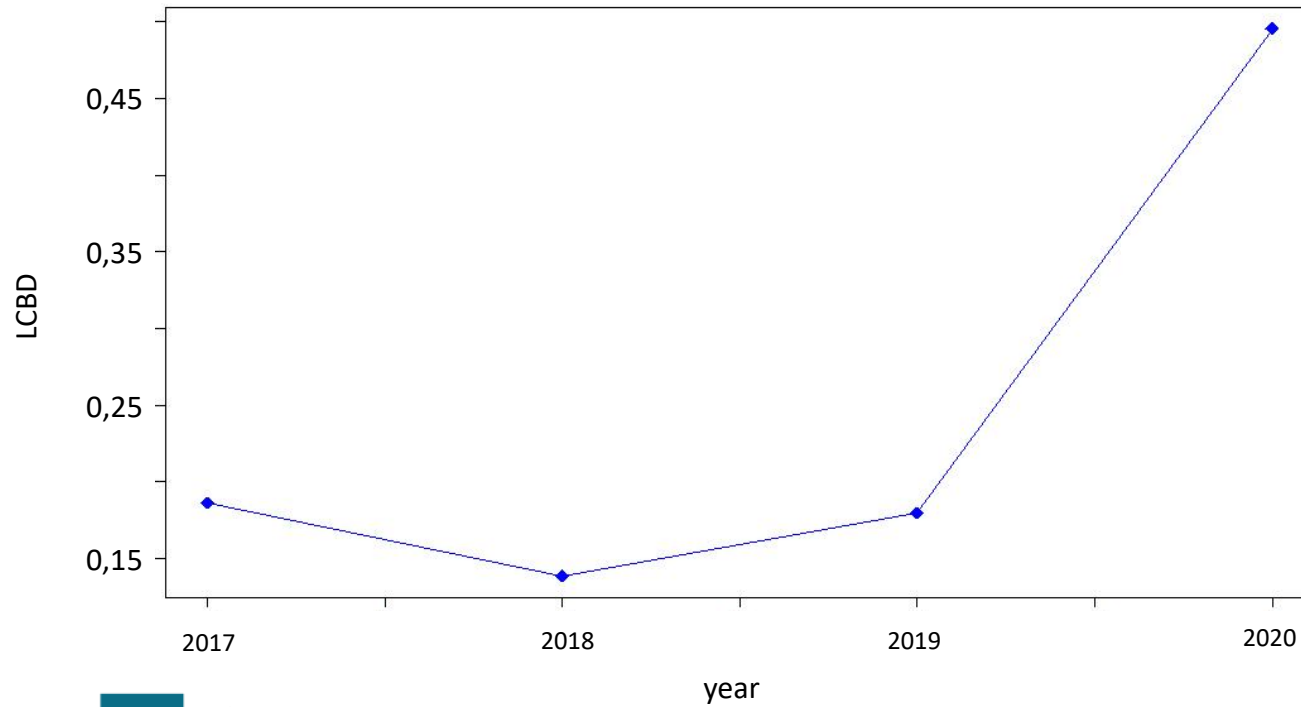




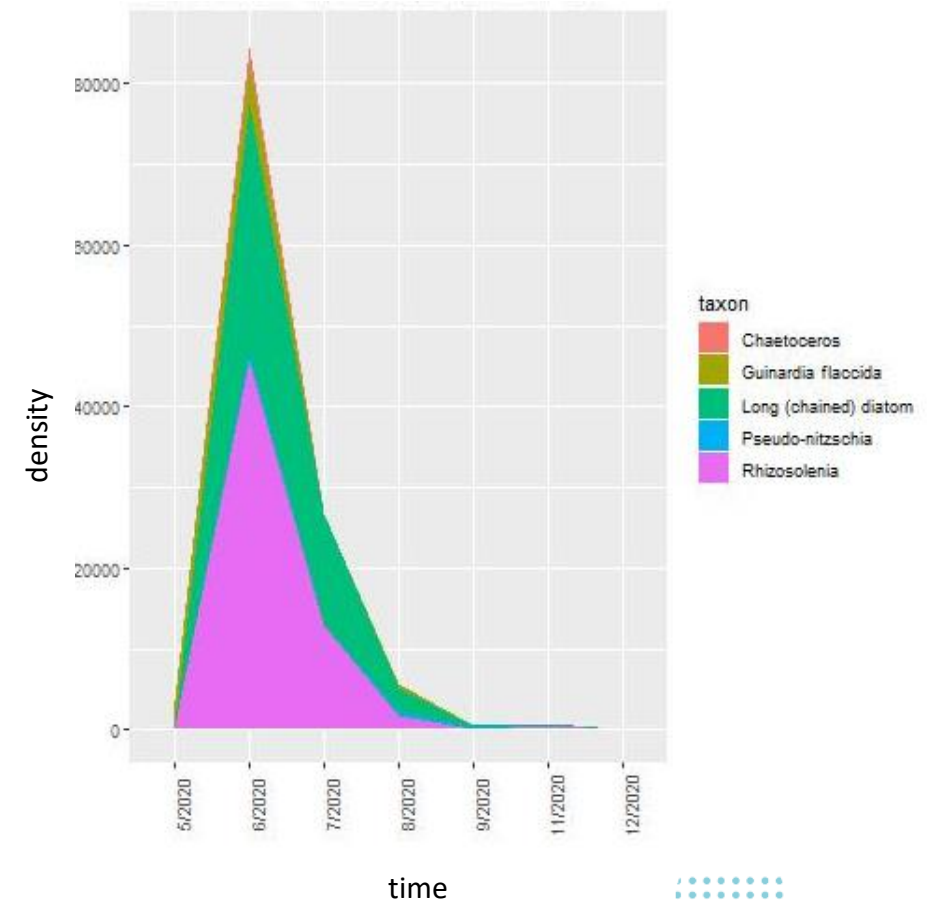
Plankton diversity indicator

Phytoplankton station 215

Local contribution to diversity (LCBD)



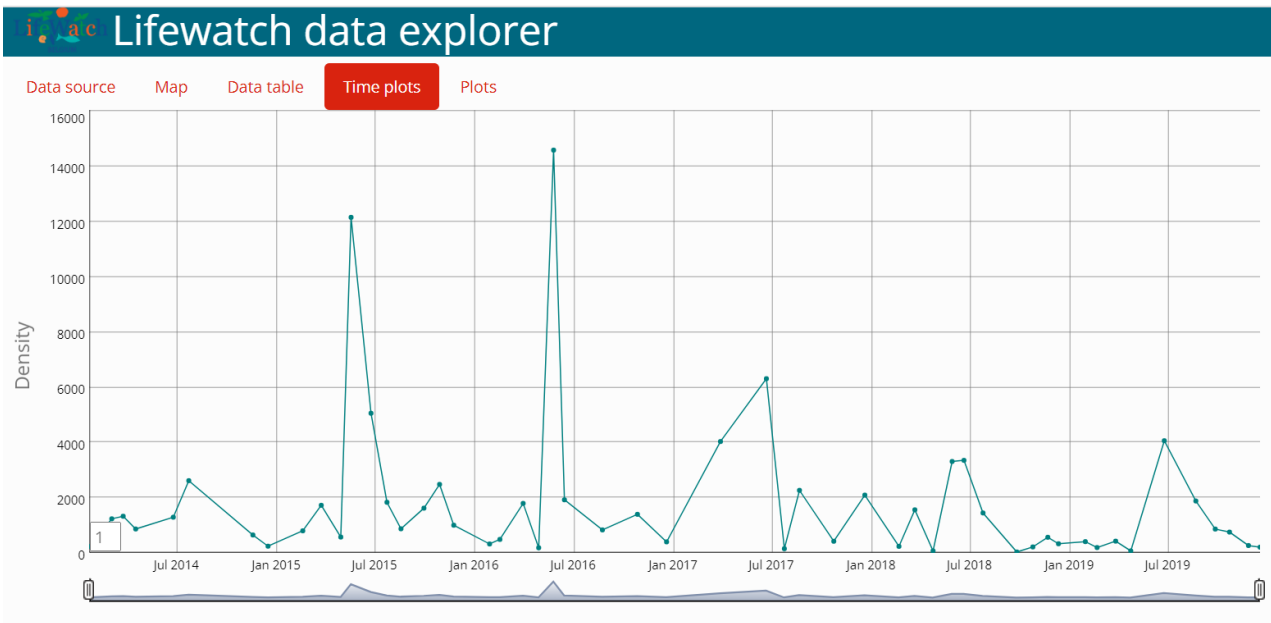
Important Value Index





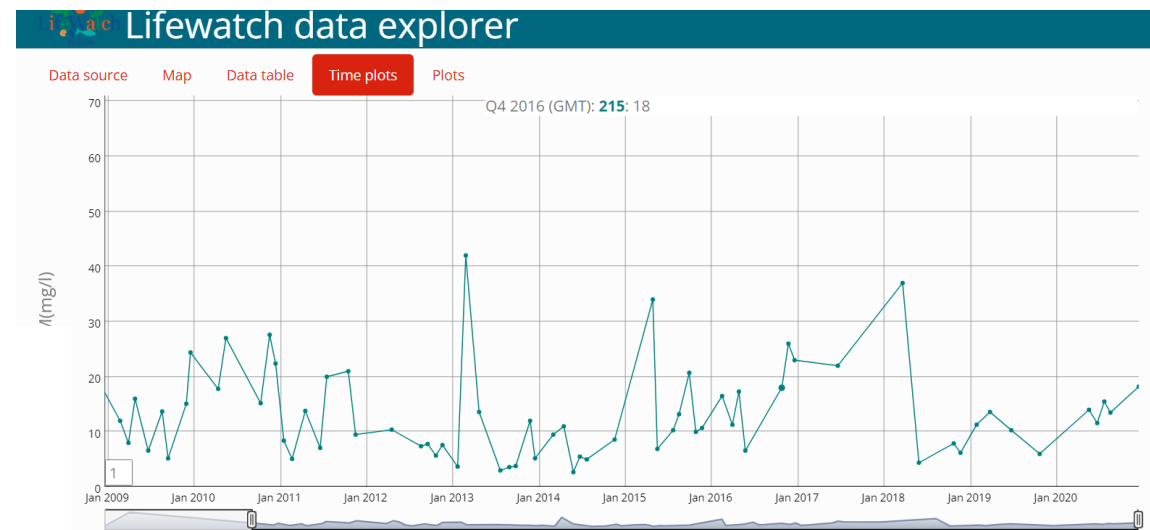
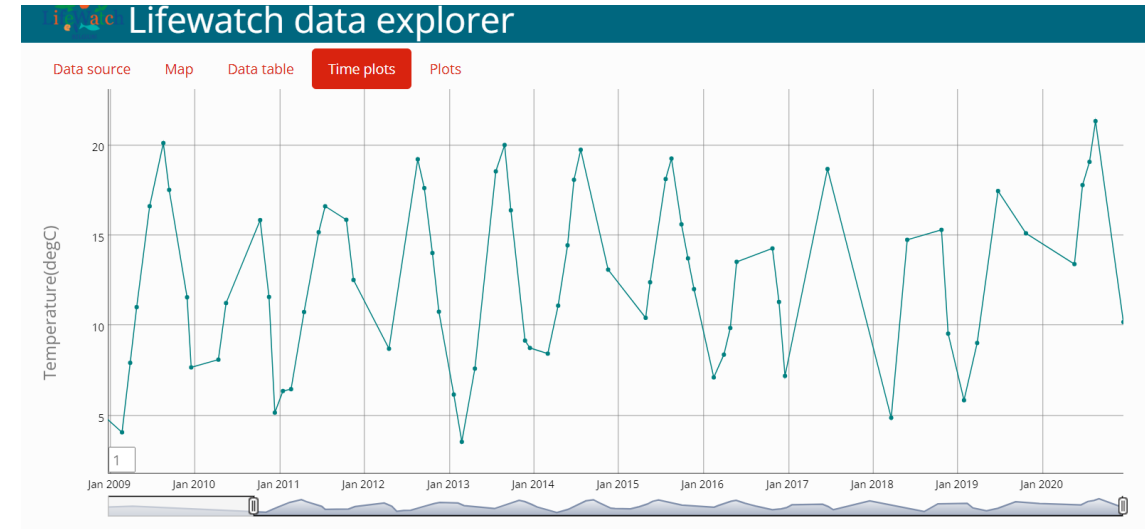
Timeseries analyses

Plankton observation data



- Marine spatial planning and habitat protection
- Ecosystem-based management
- Modelling impacts of climate-induced changes
- etc.

Abiotic data





Summary

Advantages	Limitations
➤ different groups of plankton	➤ taxonomic resolution output: quality of the images
➤ rapid assessment: high frequency sampling	➤ classification accuracy: training set and image classification algorithms
➤ biomass, size spectra	➤ human validation
➤ digital archive of images	
➤ fresh and fixed samples	

Protocols for best practice, standardisation of methods for data comparison
(JERICO-S3; Joint European Research Infrastructure of Coastal Observatories: Science, Service, Sustainability)





Thank you for your attention!