

12th FerryBox Workshop
1-2 October 2024

Spatio-temporal development of cyanobacteria bloom in the Baltic Sea during summer 2023

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Kielosto, Jukka Seppälä



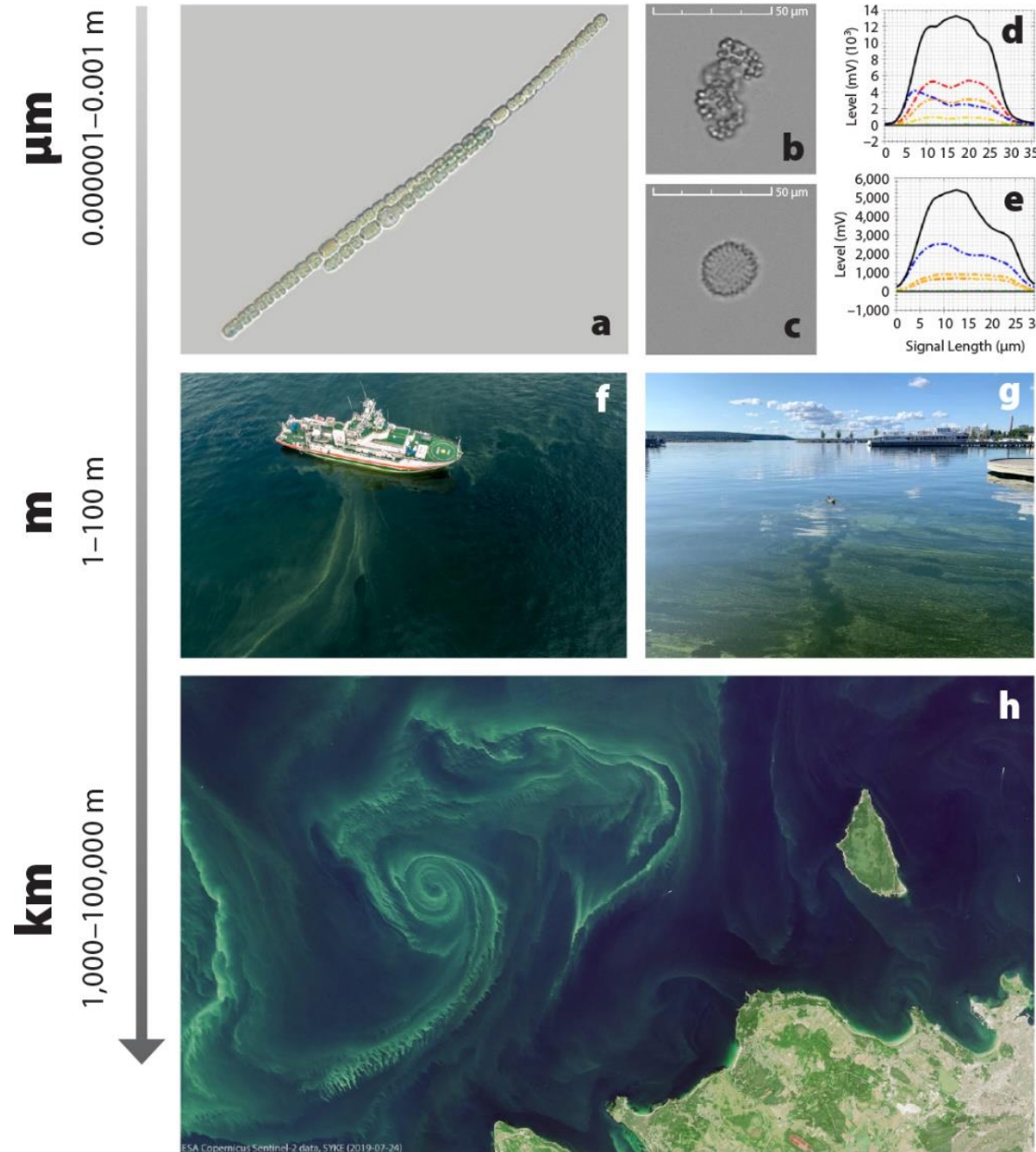
Suomen ympäristökeskus
Finlands miljöcentral
Finnish Environment Institute

Baltic Sea

Issues:

- Eutrophication
- Cyanobacteria blooms
- Hypoxia

Climate change

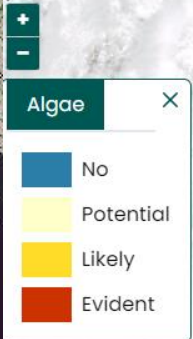


Haraguchi et al. 2021

Baltic Sea – summer 2023

13/Jun

ETRS-TM35FIN: -693118, 6620405
WGS84: N 58.07346° E 6.57567°



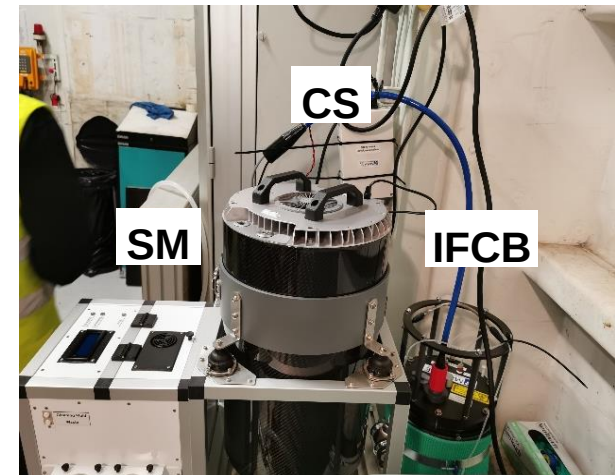
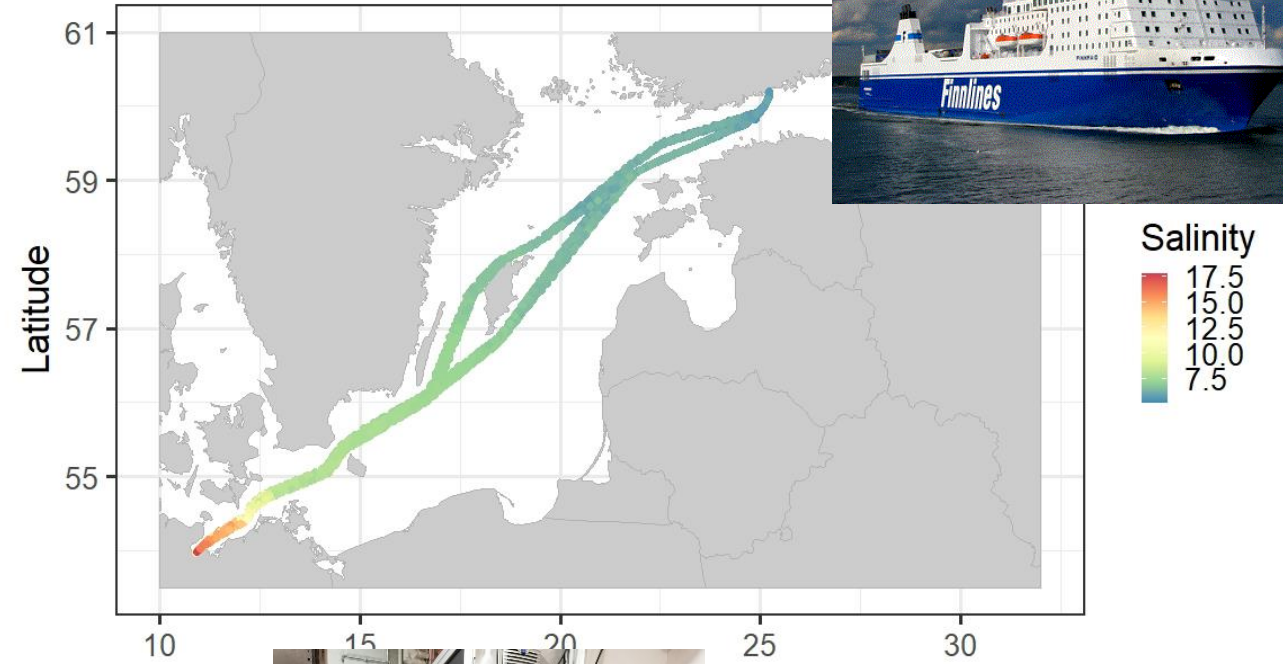
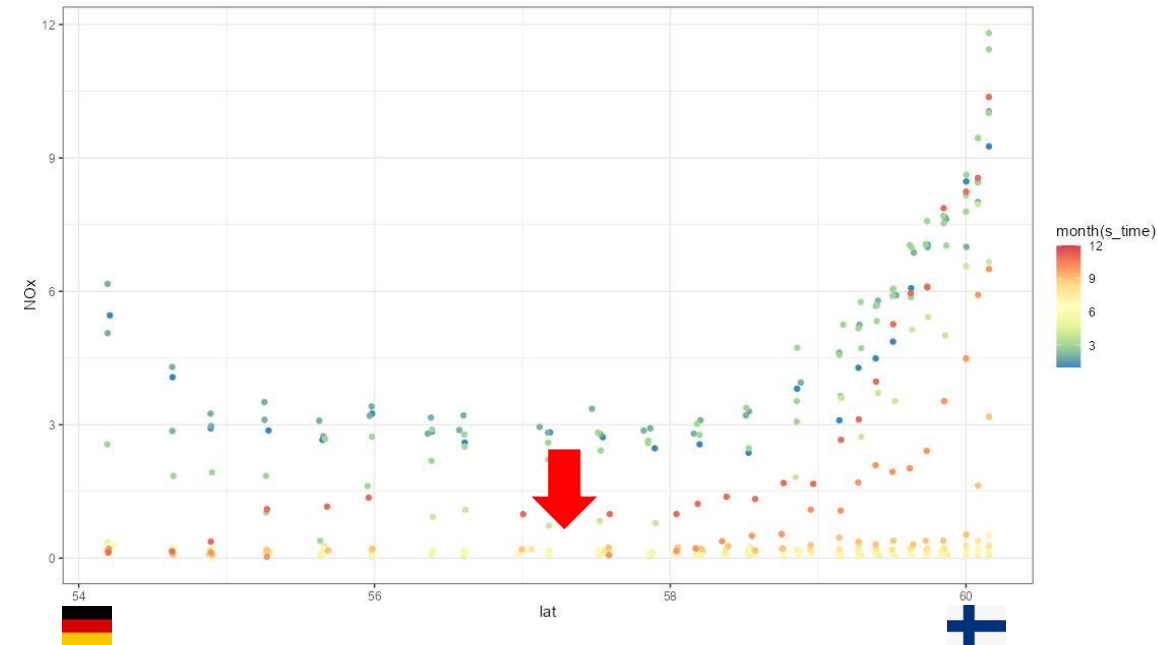
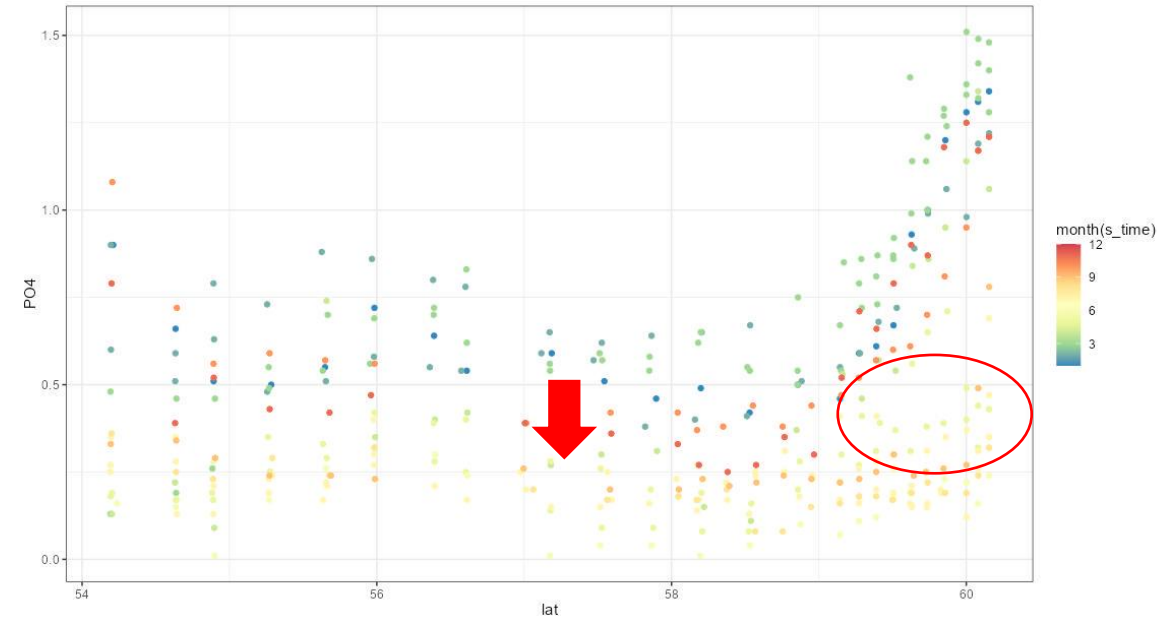
2023-06-29

28/Jun

0 50 km 100 km

USGS/NASA Landsat Program Contains modified Copernicus Sentinel-2 data, Syke

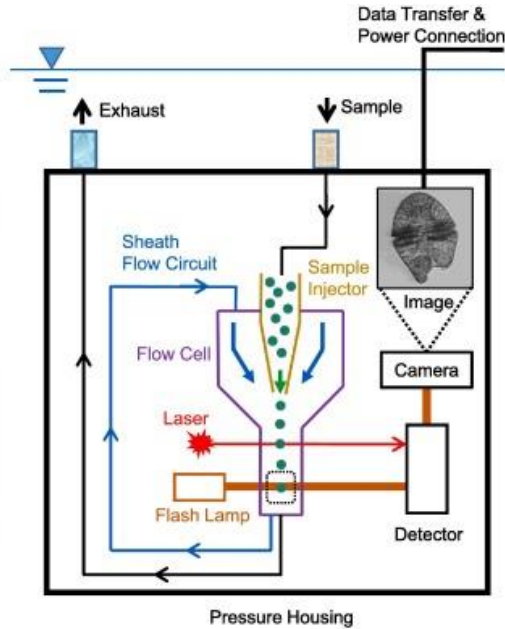
Baltic Sea – summer 2023



Imaging FlowCytobot (IFCB)



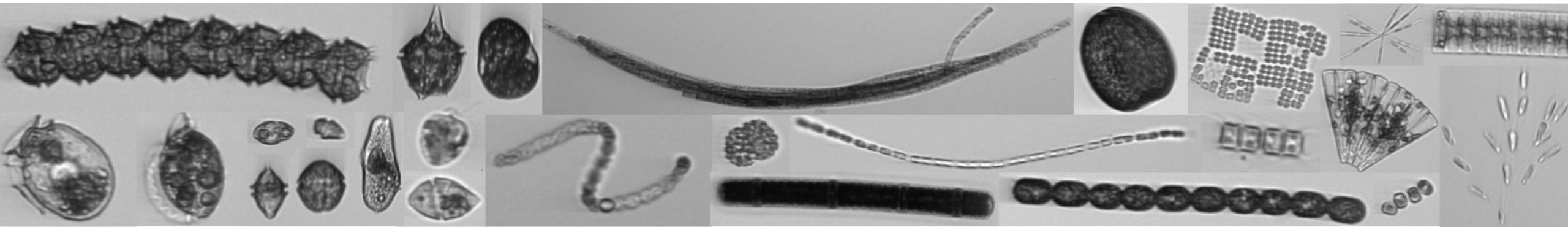
(a) IFCB (mclanelabs.com)



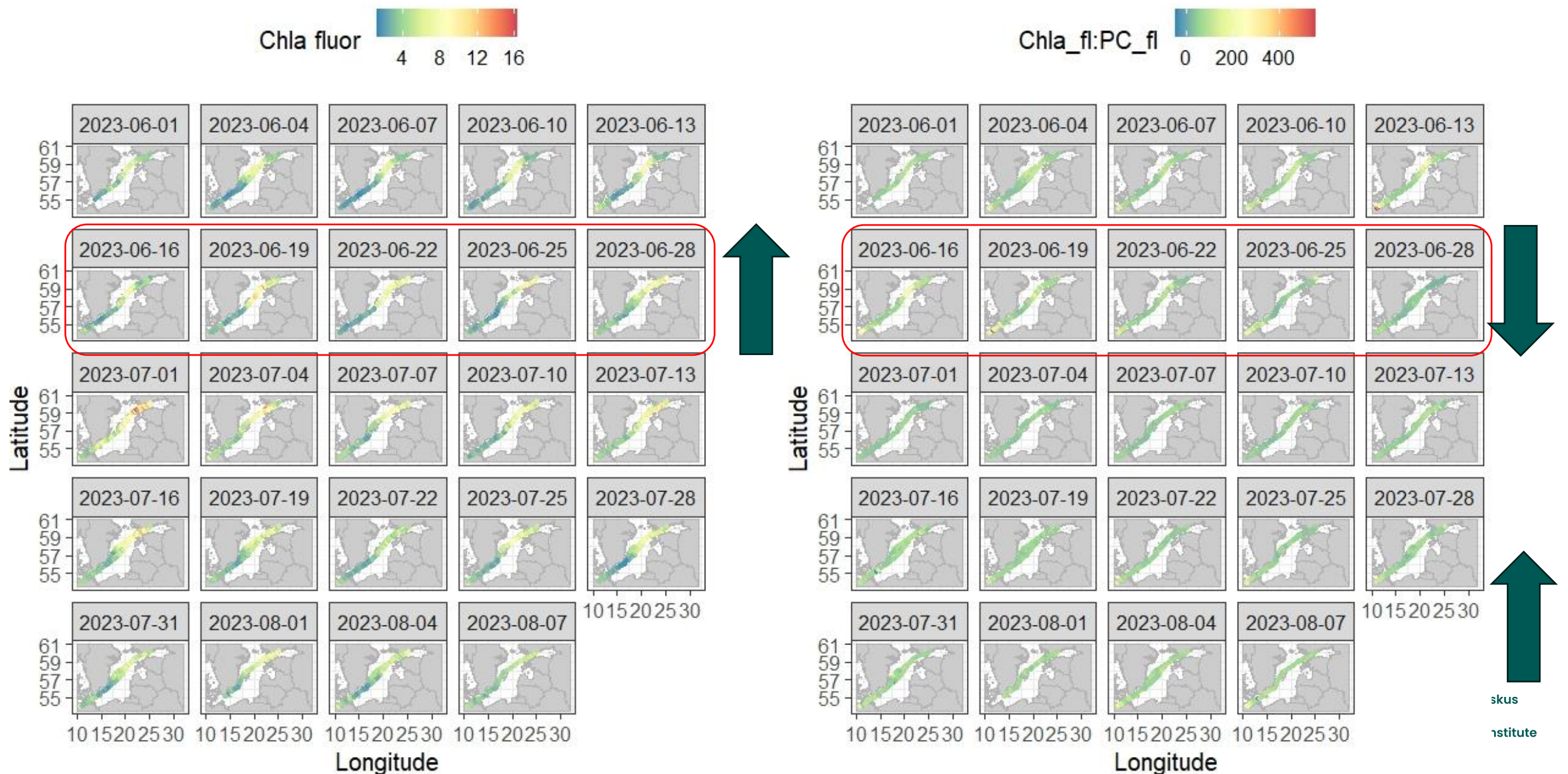
(b) Image capturing using hydrodynamic focusing

Guo et al., 2021

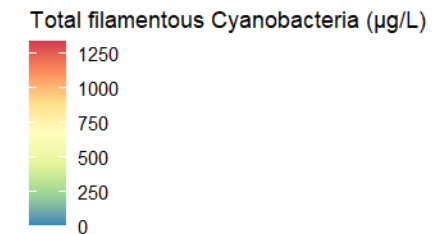
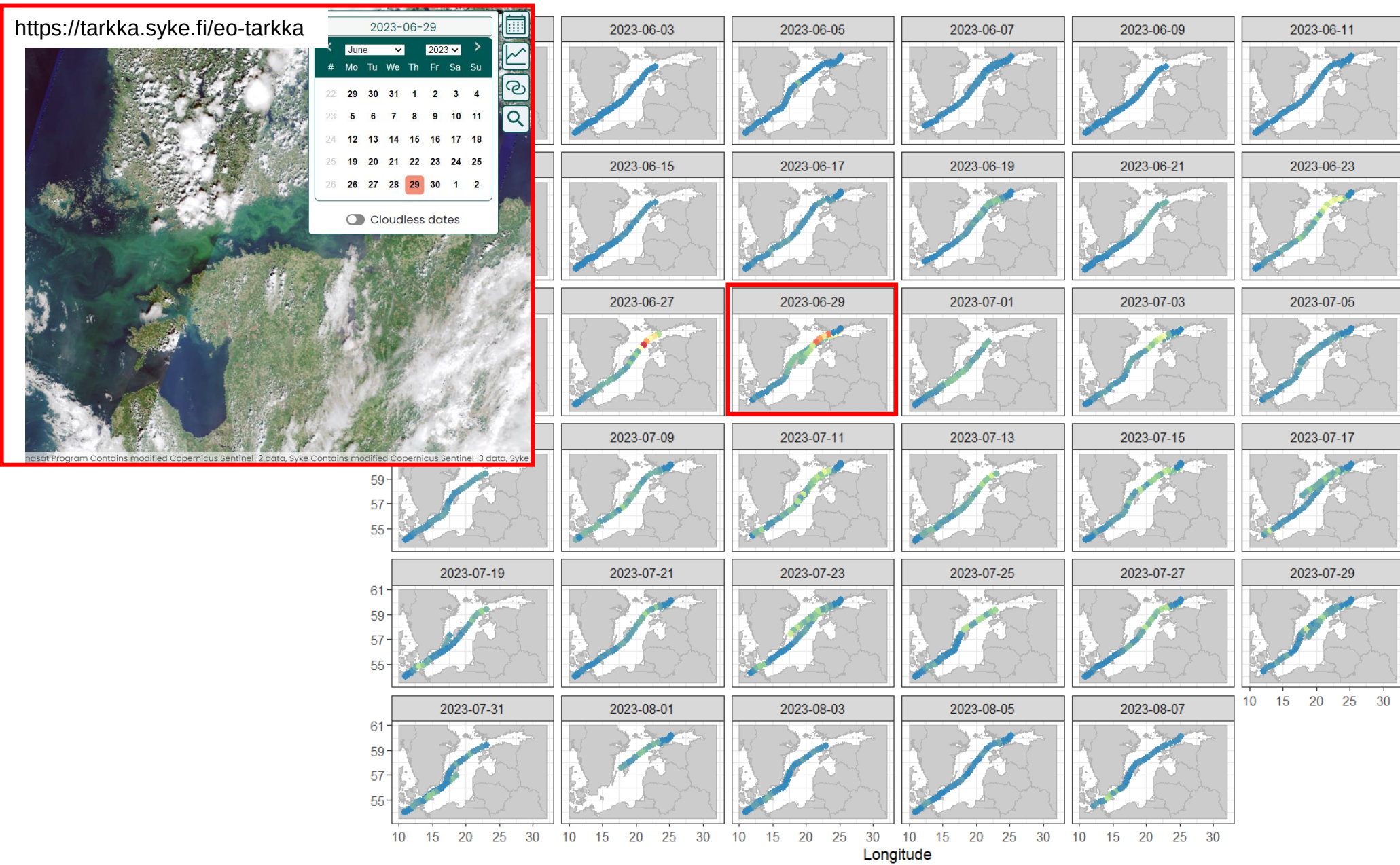
- Imaging flow cytometer
- 1 laser
- 2 optical sensors
- Images particles inside size range $\sim 10\text{-}150\mu\text{m}$
- Sample of 5ml with approx. 20 min interval
- Camera triggered by chlorophyll-a or scatter
- Even $\sim 30\,000$ images / hour
- $150\,\mu\text{m}$ mesh in IFCB inlet to prevent it from clogging



High spatio-temporal resolution

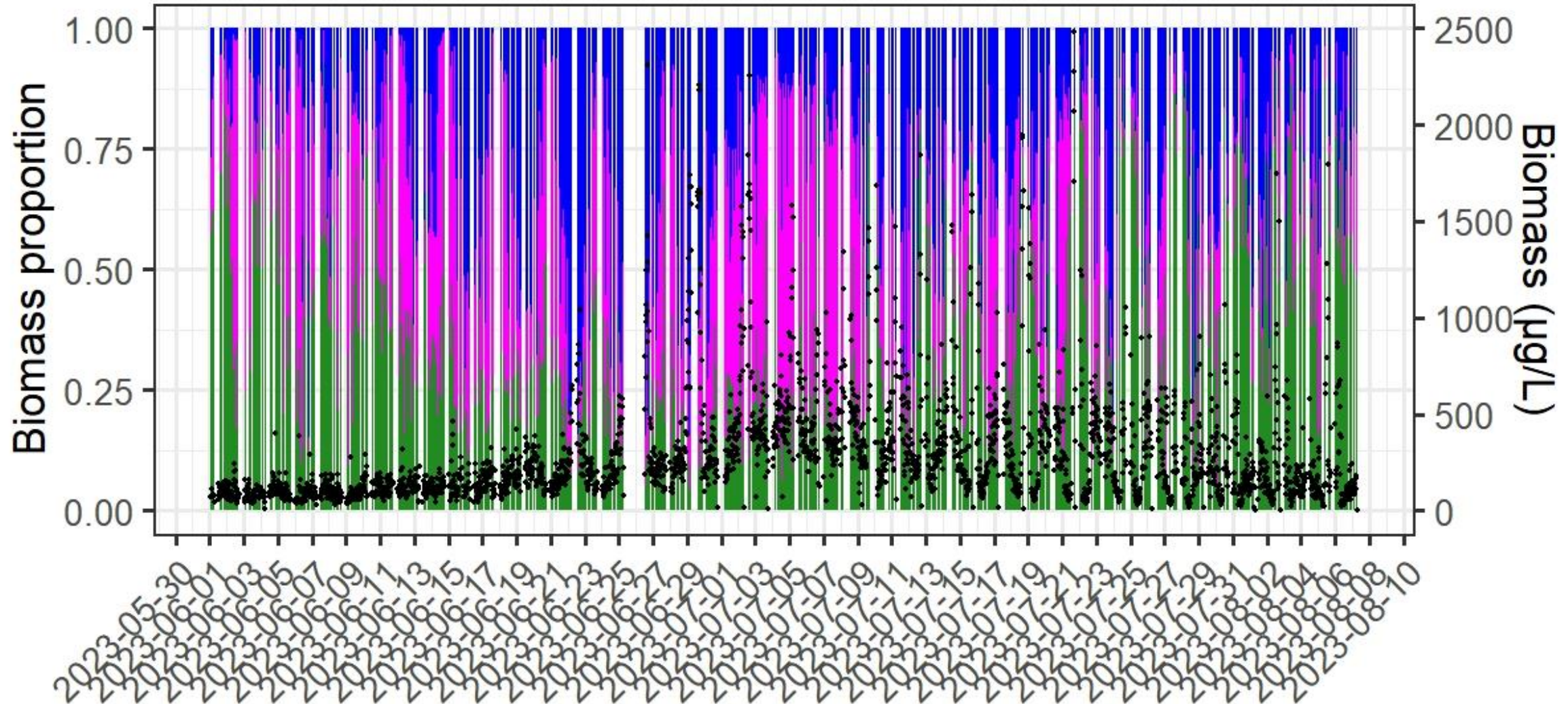


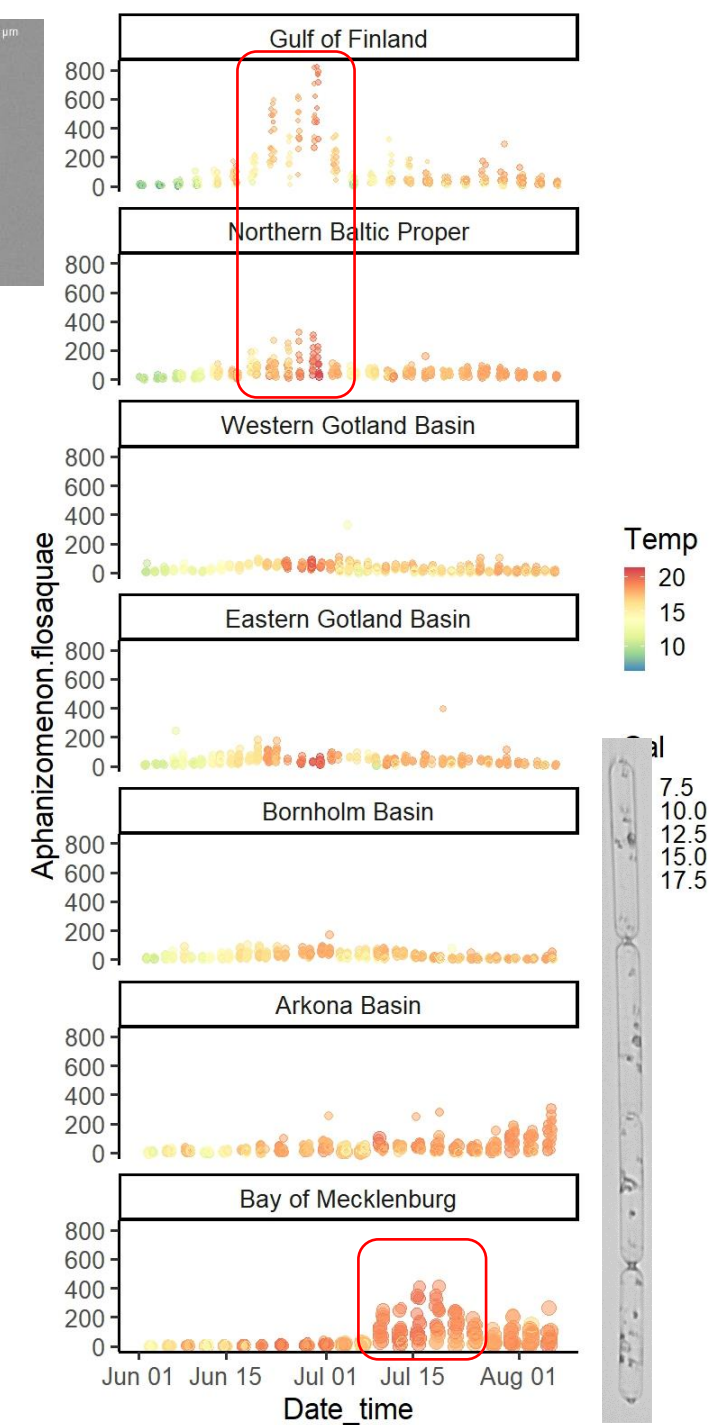
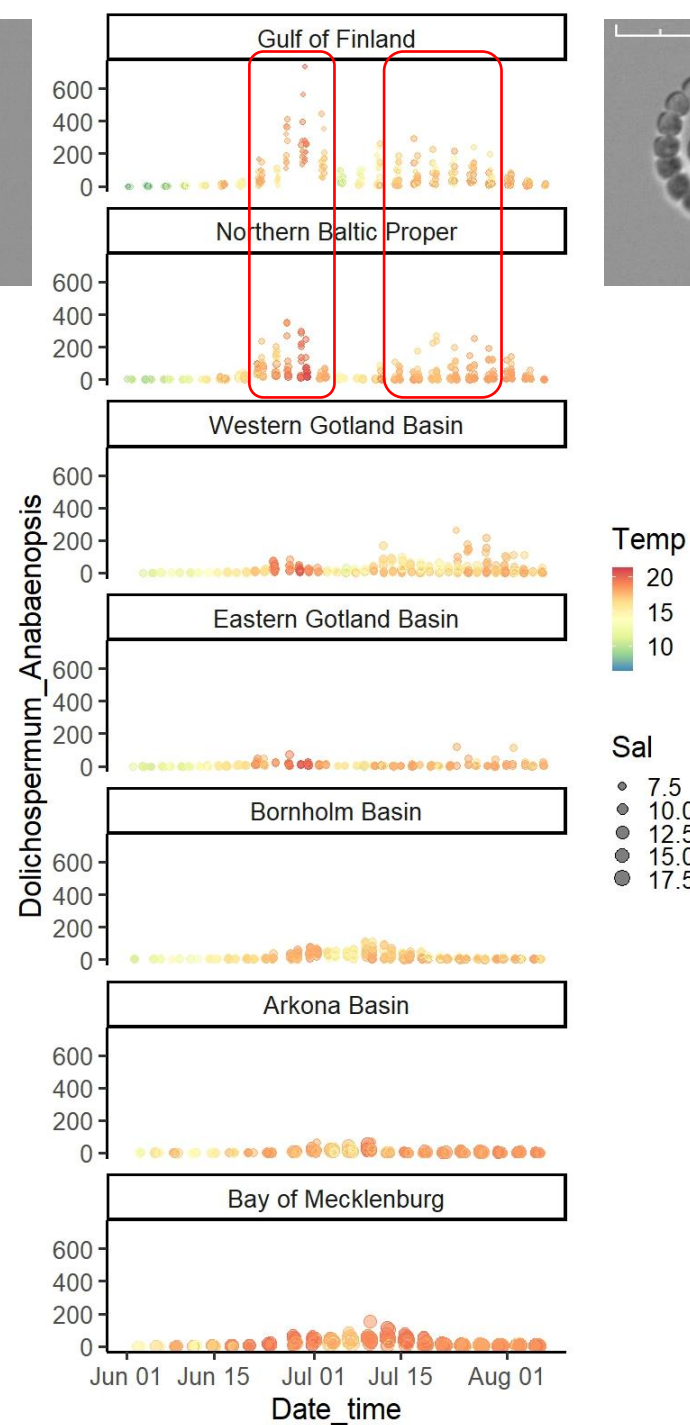
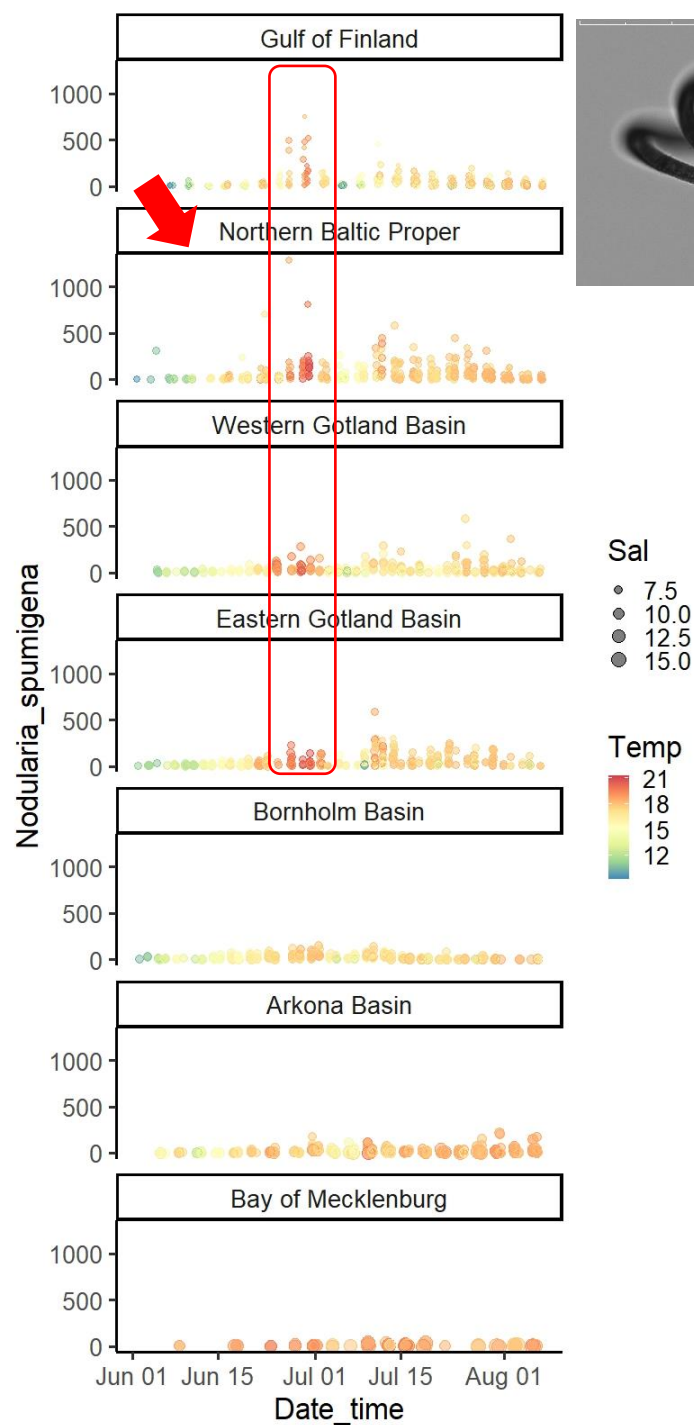
High spatio-temporal resolution



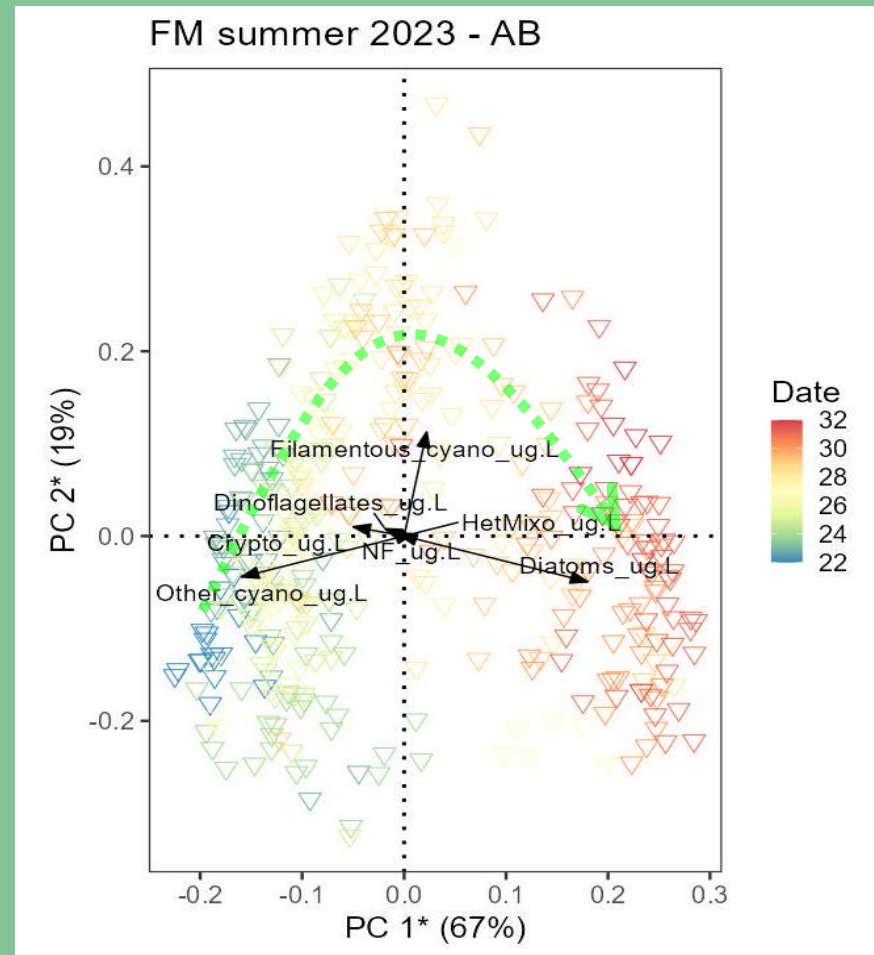
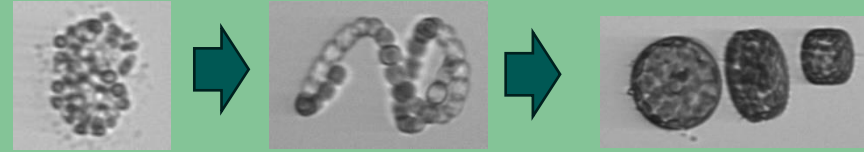
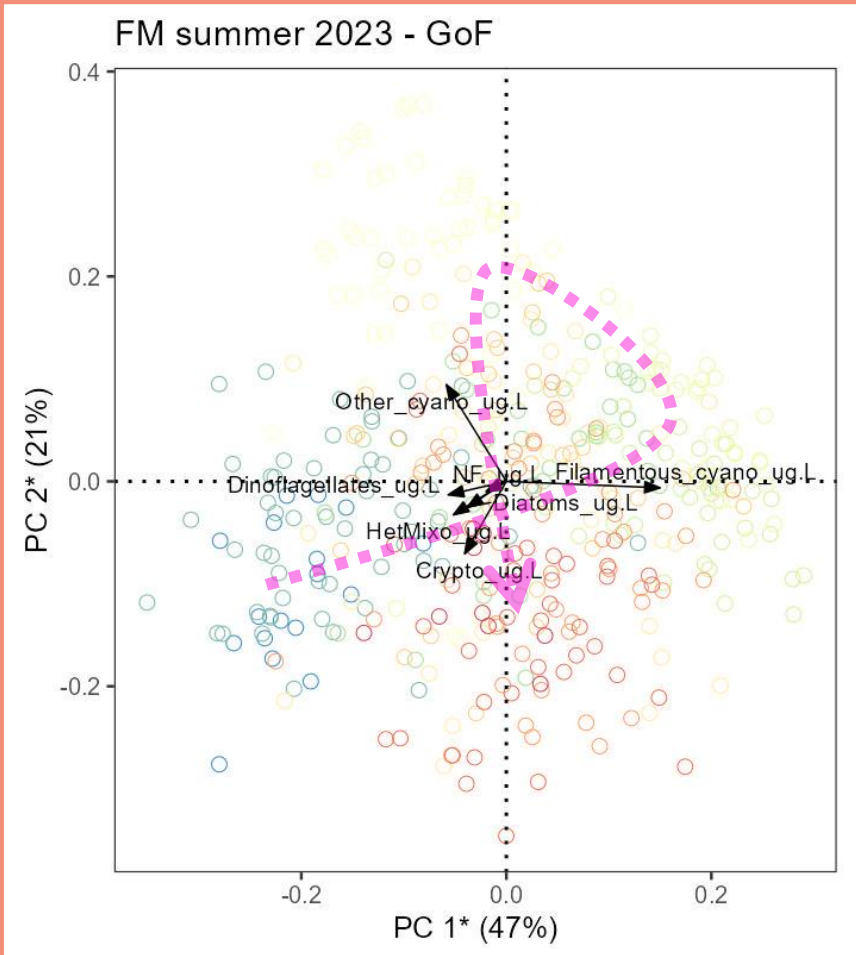
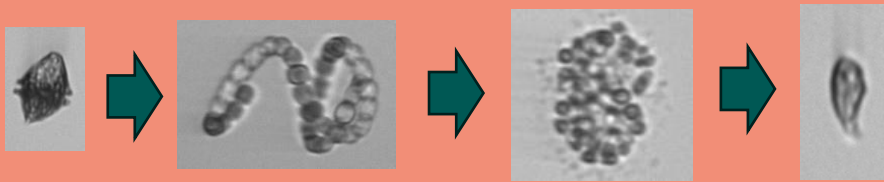
High spatio-temporal resolution

■ Filamentous_cyano_ug.L ■ Other_cyano_ug.L ■ Other_phyto_ug.L





Summer phytoplankton succession



Summary

- FerryBox on SOOP: spatio-temporal variability
- Different niches:
 - *Aphanizomenon*:
 - Earlier bloomer
 - Highest biomass
 - *Dolichospermum*:
 - Following *Aphanizomenon*
 - Quick response to temp increase late July
 - *Nodularia*:
 - Modest and spoty biomass build up
 - Gotland Basin
- Community composition: different succession patterns sub-basins
 - Changes in functionality
 - Other phytoplankton can benefit from the fixed N₂

Team:



- Jukka Seppälä
- Kaisa Kraft
- Pasi Ylöstalo
- Sami Kielosto
- Annaliina Skyttä
- Sebastian Ehrhart
- Petri Maunula



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Thank you!

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