

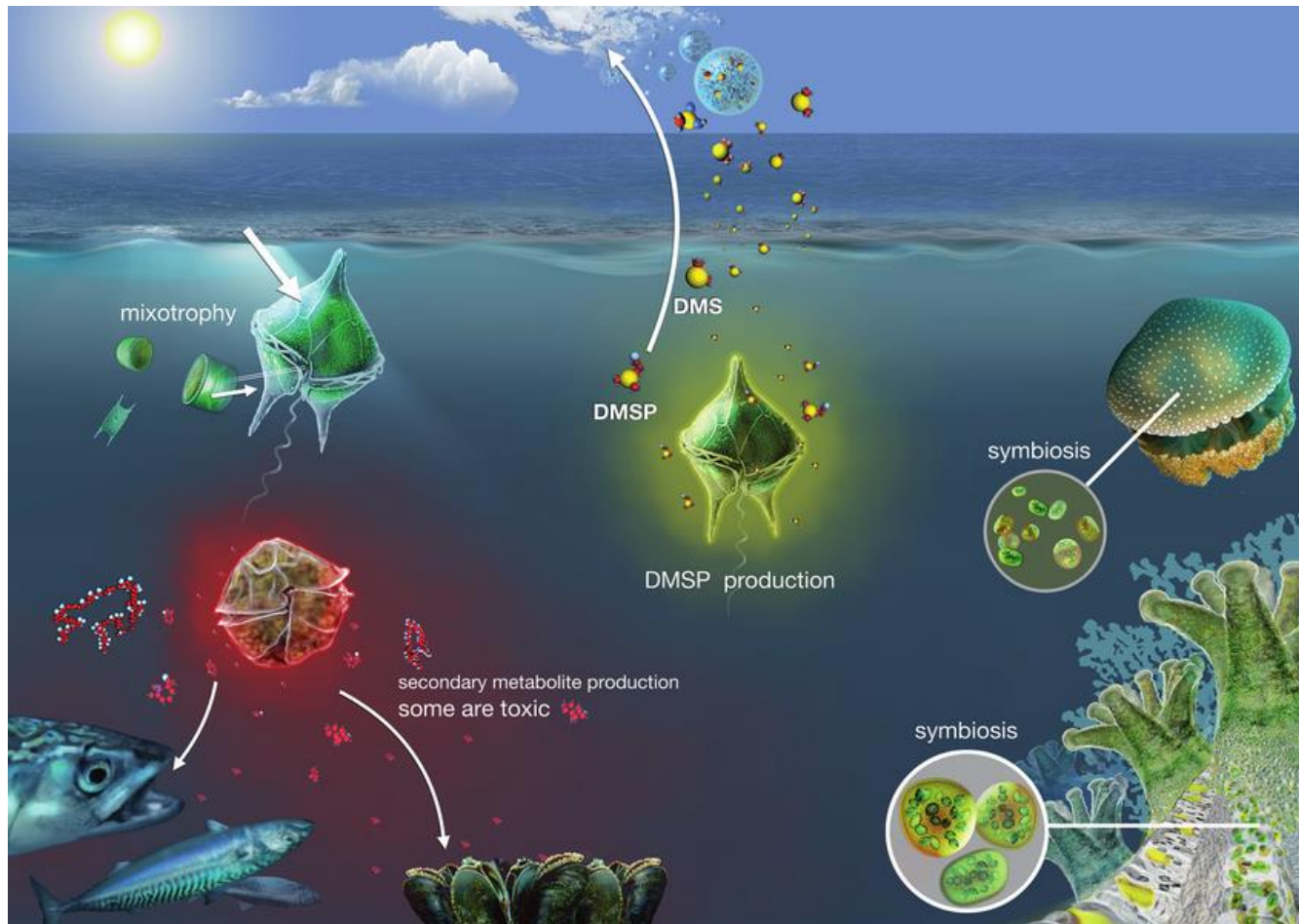
# High-resolution monitoring of toxic dinoflagellate species and their biogeographic distribution in the North Atlantic and Polar Seas

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## Major ecological niches of dinoflagellates

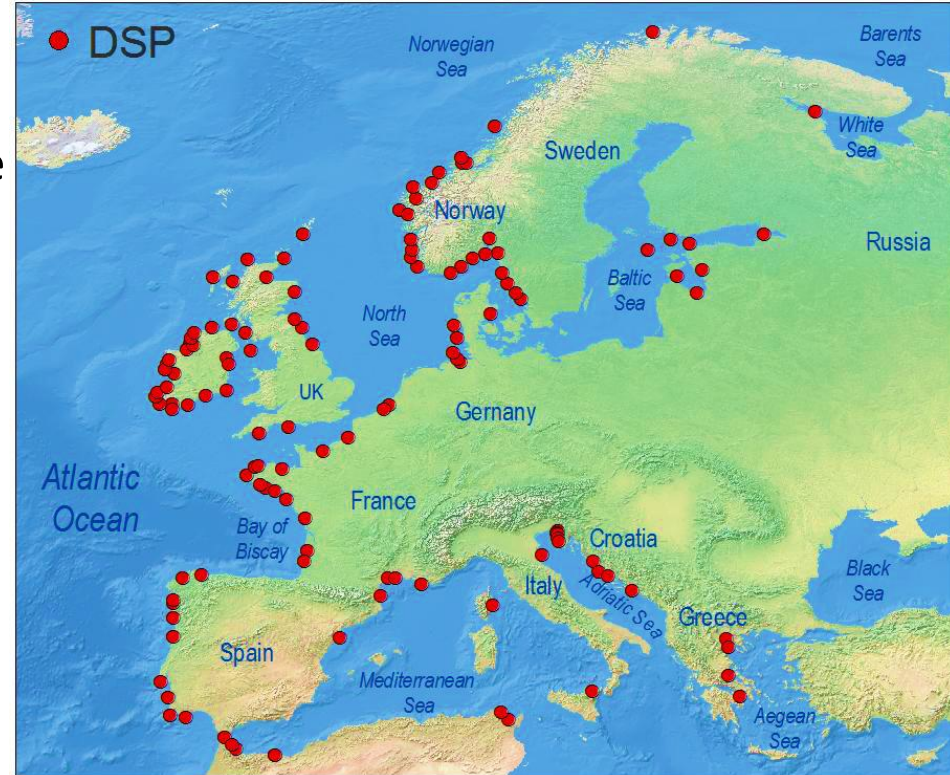


Murray et al. 2016

- Dinophysis species can produce lipophilic shellfish toxins
- Diarrhetic Shellfish Poisoning (DSP)
- Main threat to aquaculture in Europe
- Low cell abundances ( $<10^3$  cells/L)
- Spatial heterogeneity
- Variability in toxin profiles



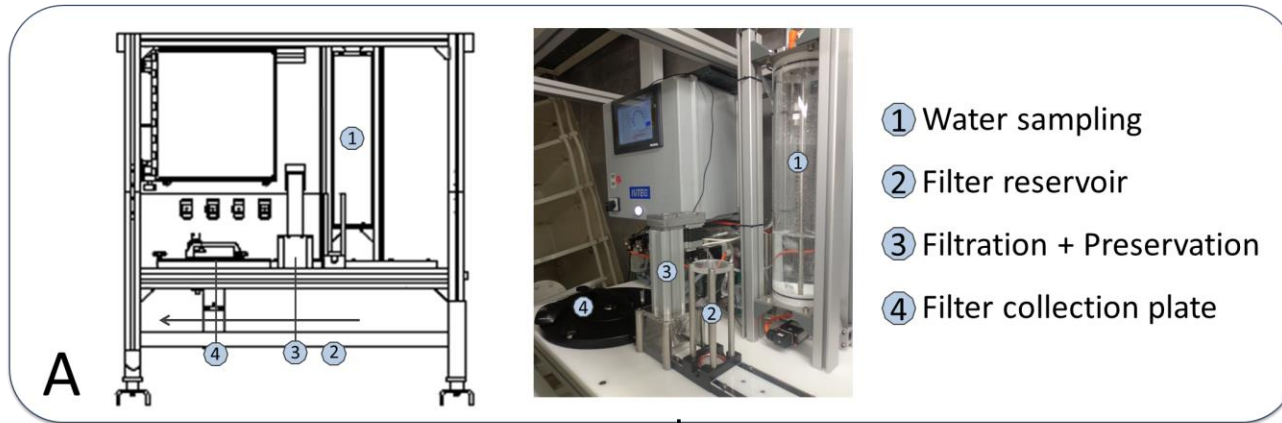
Early warning tool for DSP outbreaks?



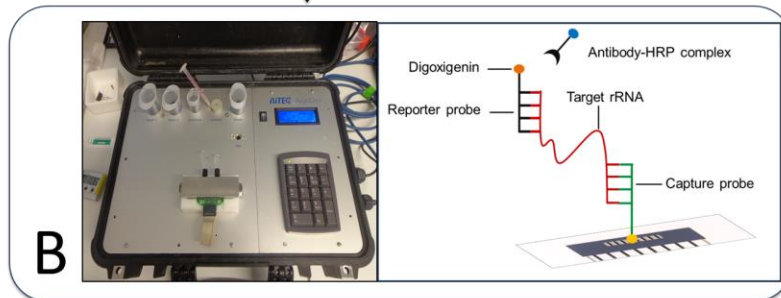
Reguera et al. 2014

# Research aim

- Analyse the occurrence, abundance and dispersal of toxic algae species using an automated observation and monitoring strategy with several subsequent molecular downstream applications



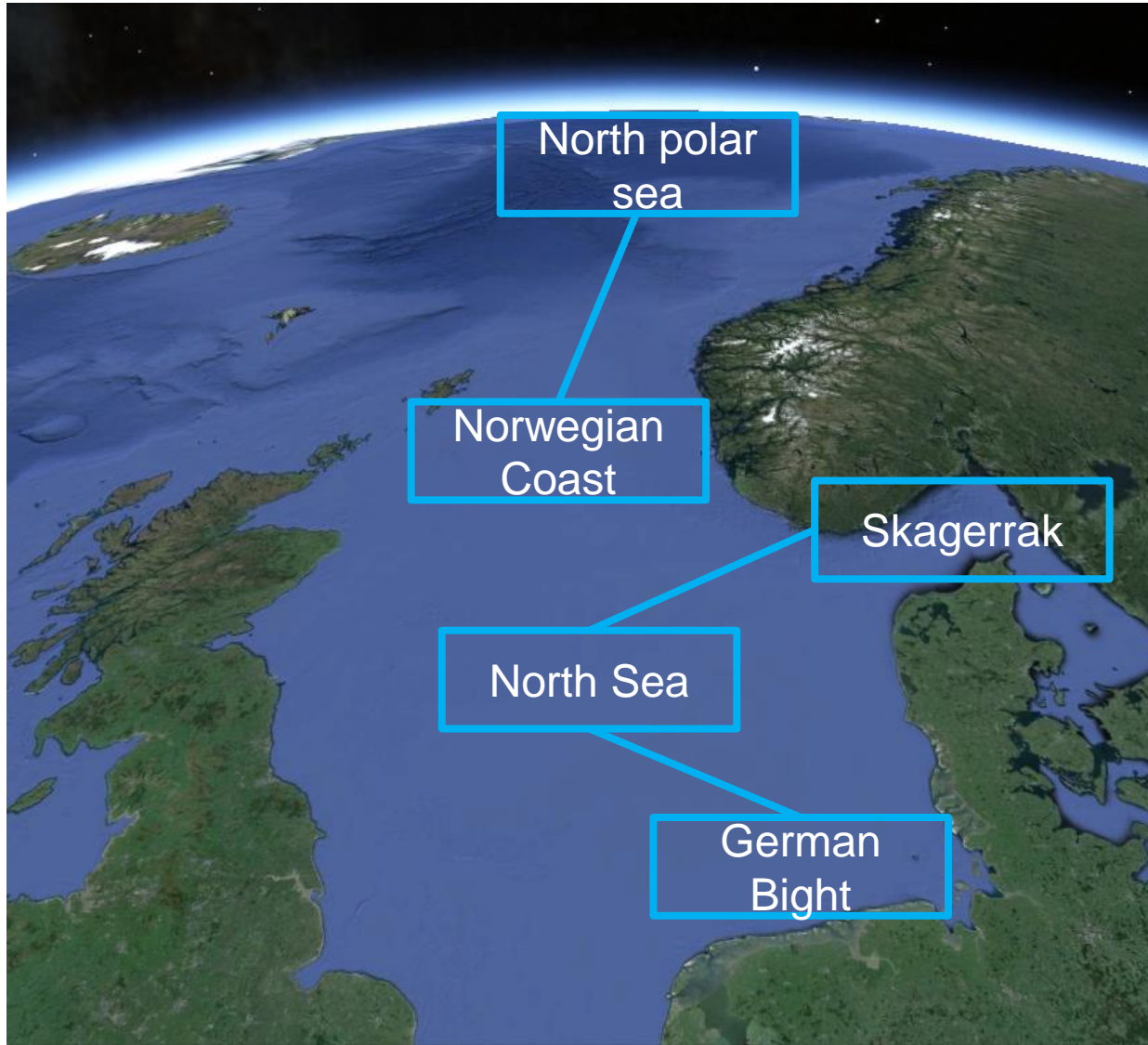
Preservation



- Quantitative real-time PCR (qPCR)
- Genetic Fingerprints (ARISA)
- Next Generation Sequencing (NGS)



# Field Sampling Campaign



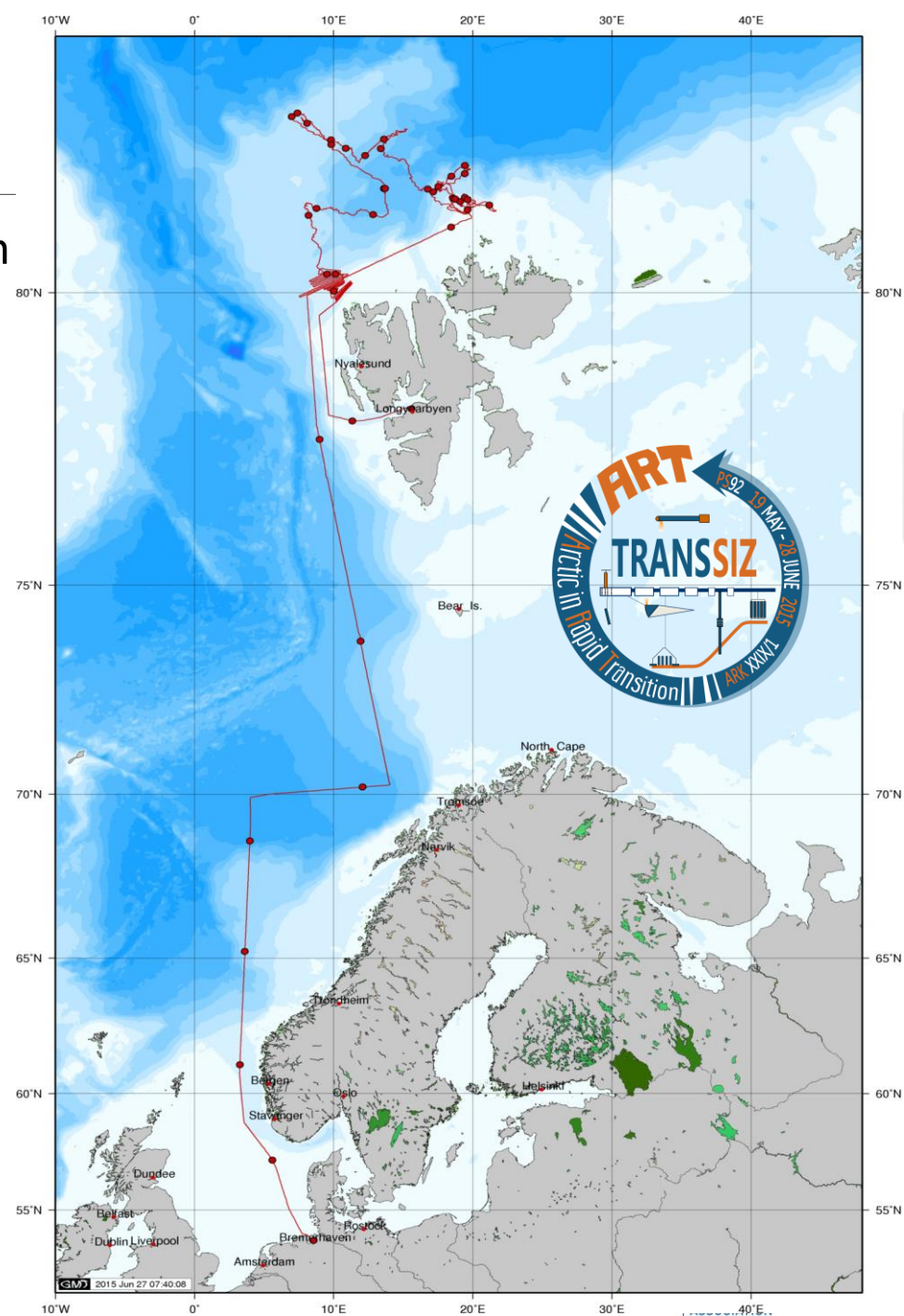
- Transizz – Cruise PS92
- Heinke – Cruise 448
- On – site sampling:  
German Bight  
Orkney Islands

# Technology approach: AutoFiM

- Connected to the ships pump system
- Samples each 1° latitude/longitude

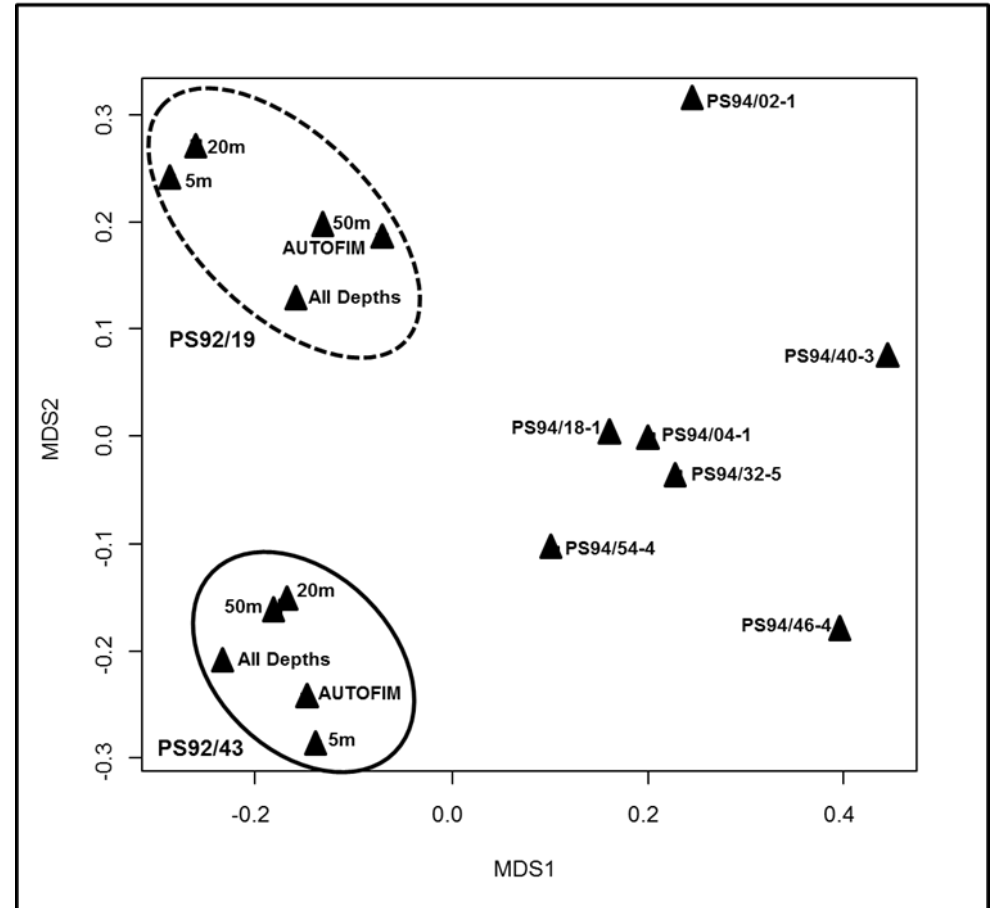


**Automated Filtration System (AutoFiM)**



# Technology approach: AutoFiM

- Community fingerprinting (ARISA): Comparison of AutoFiM field samples and CTD rosette watersamples



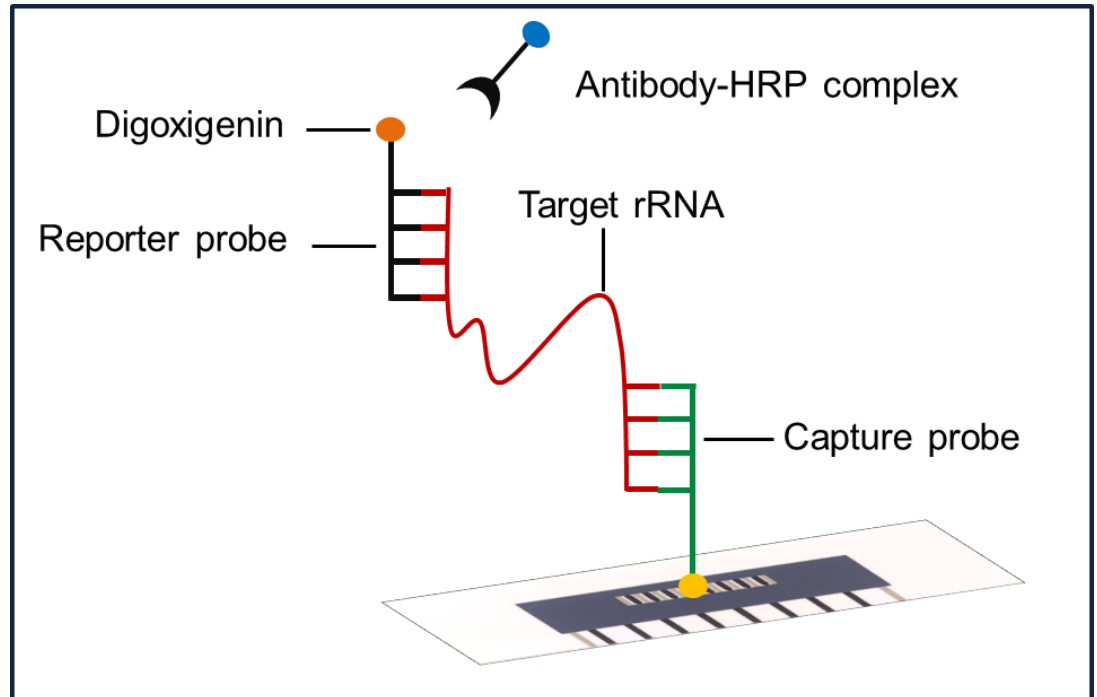
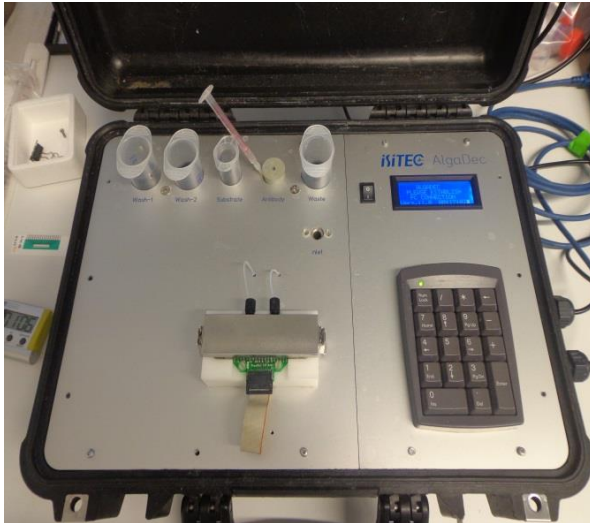
Automated Filtration System (AutoFiM)

Metfies et al. 2016



# Technology approach: rRNA Biosensor

- Molecular detection and quantification: Sandwich Hybridisation Assay

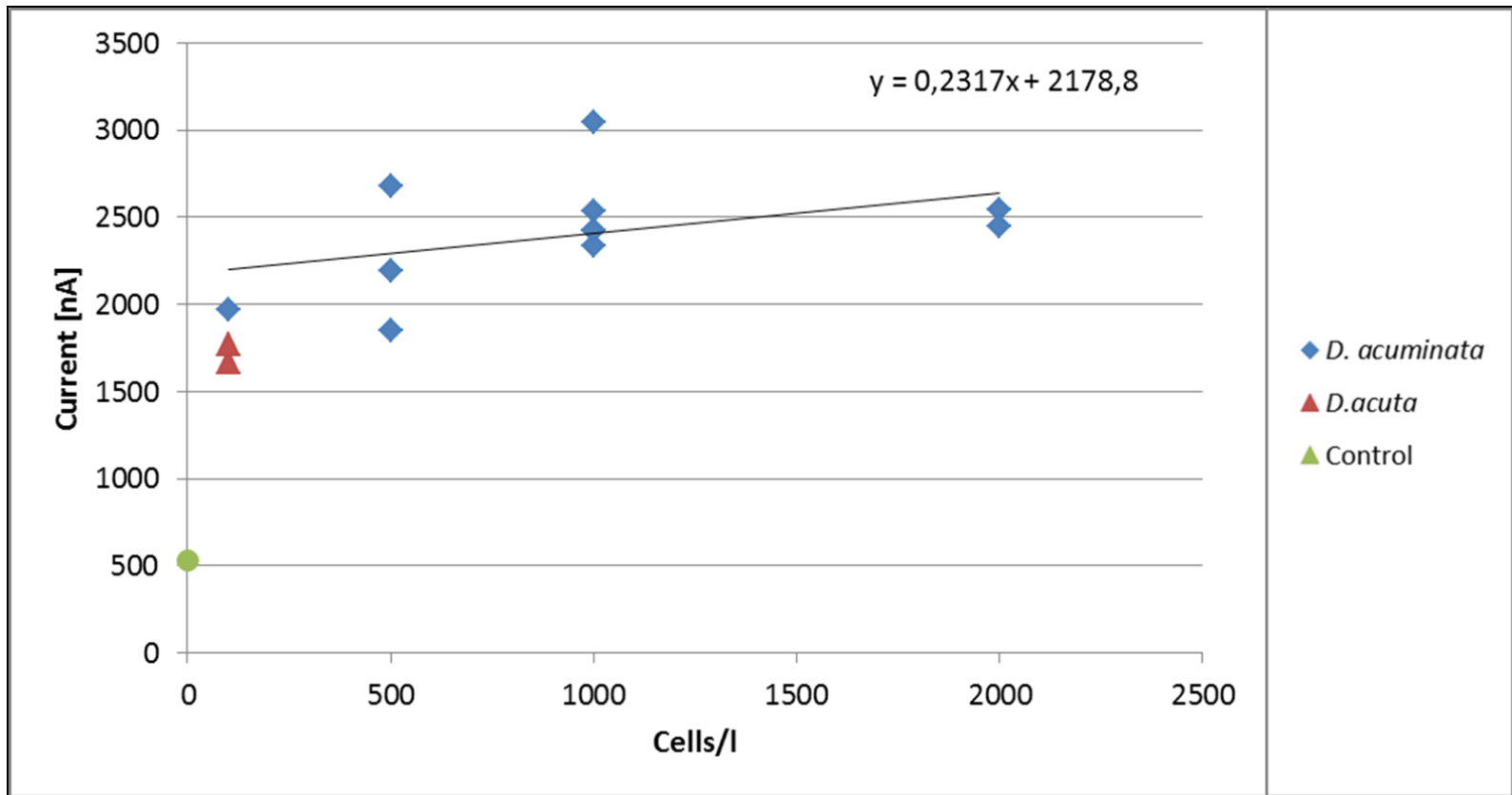


- Redoxreaction measured as electrochemical signal
- Quantification of target species (calibration curves)



# Calibration data

- Prove specificity of the designed probes
- Do cell counts correlate with signal intensity?



# AutoFiM-BioSens

Filtration system



Biosensor system



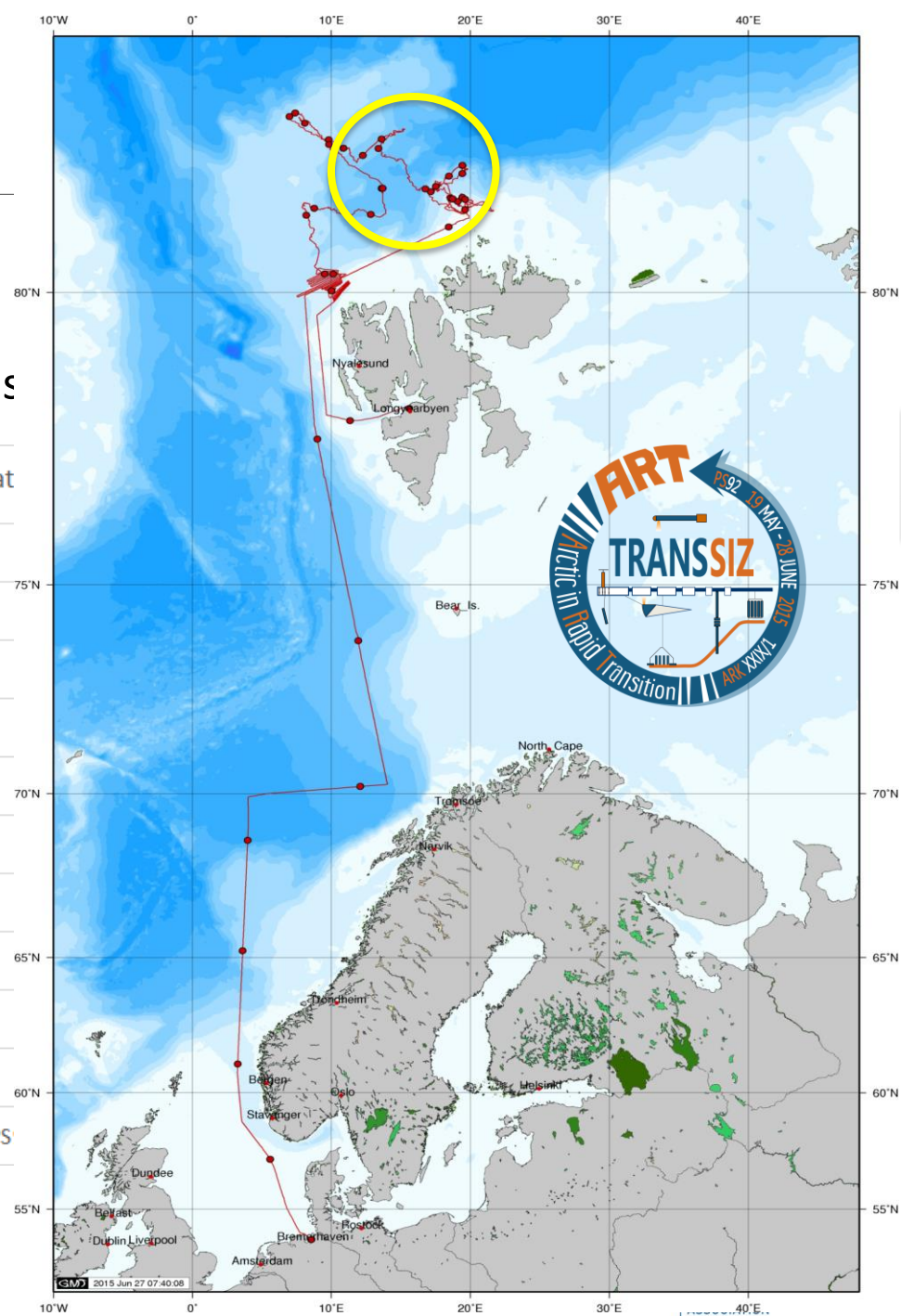
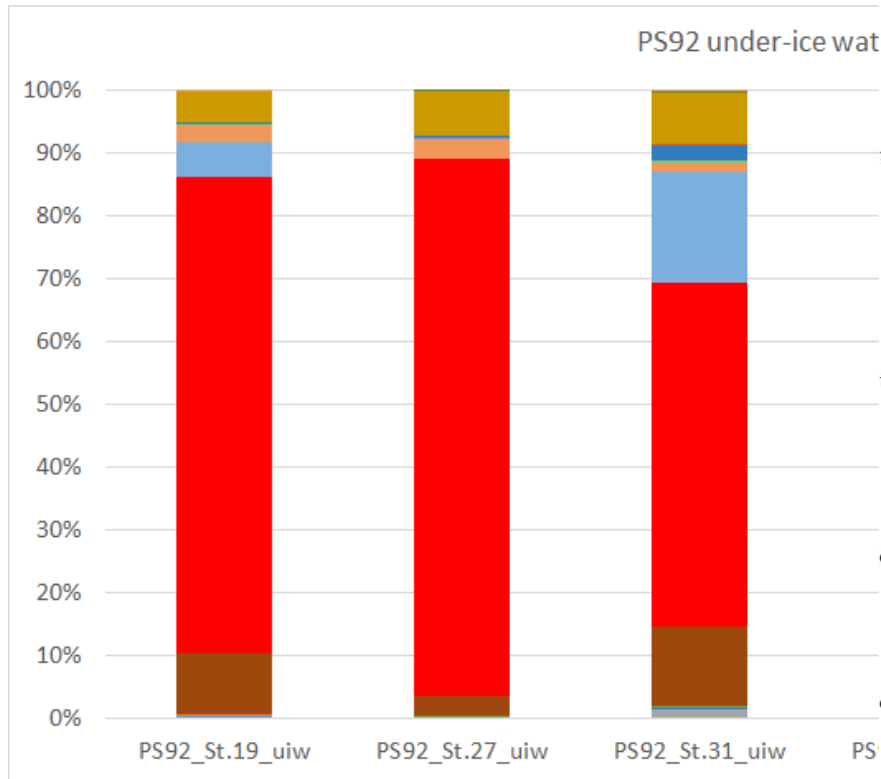
Filtration and  
Sample preparation



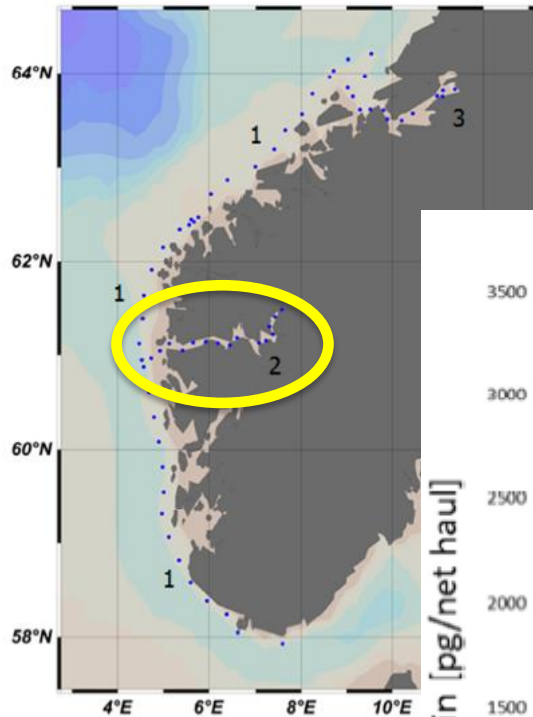
Detection/  
Quantification

# Sequencing: Arctic Sea Ice Zone

- CTD samples (May/June 2015)
- Are potential toxic dinoflagellates



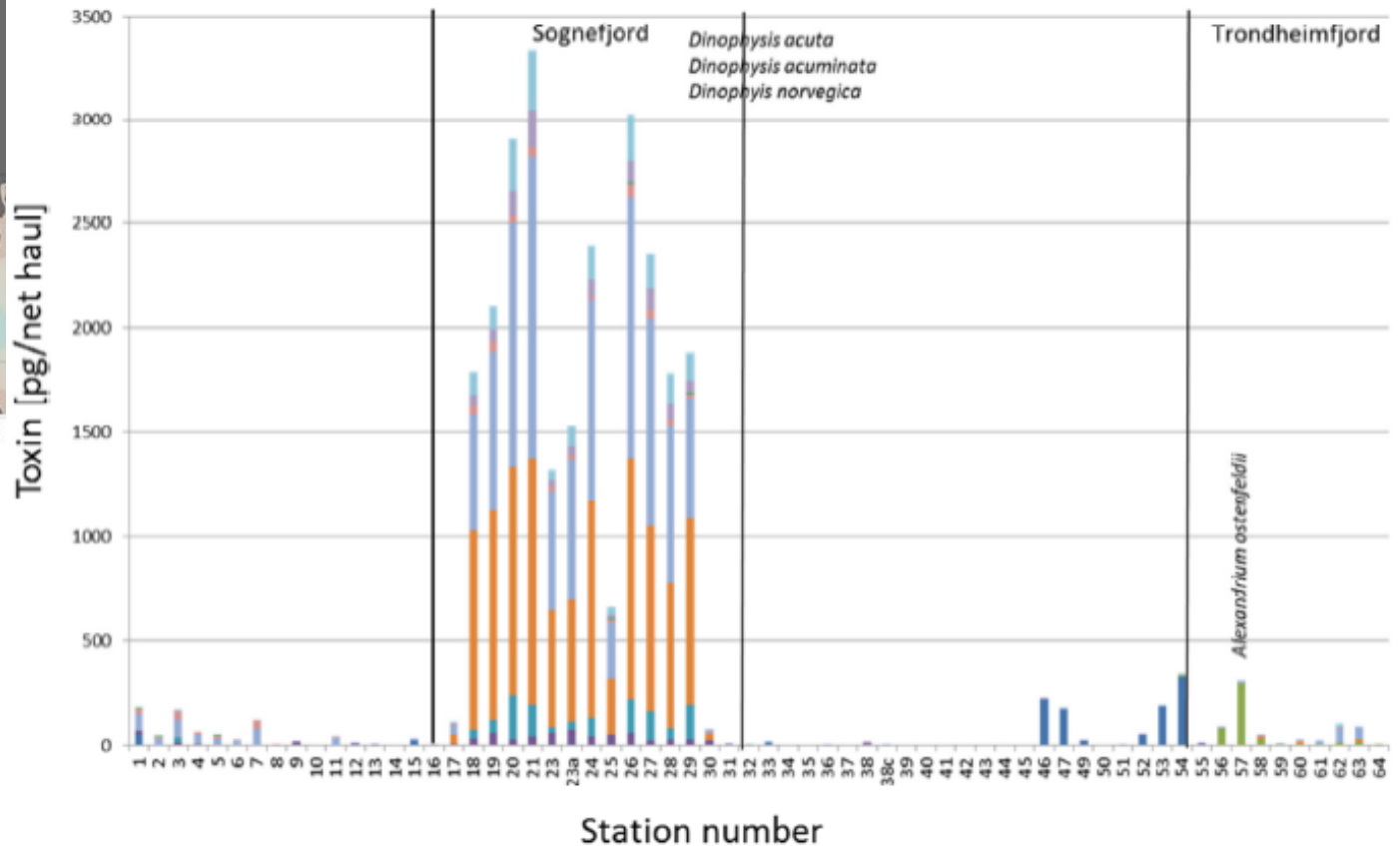
# Toxin profiles: Fjord systems



## Investigated areas:

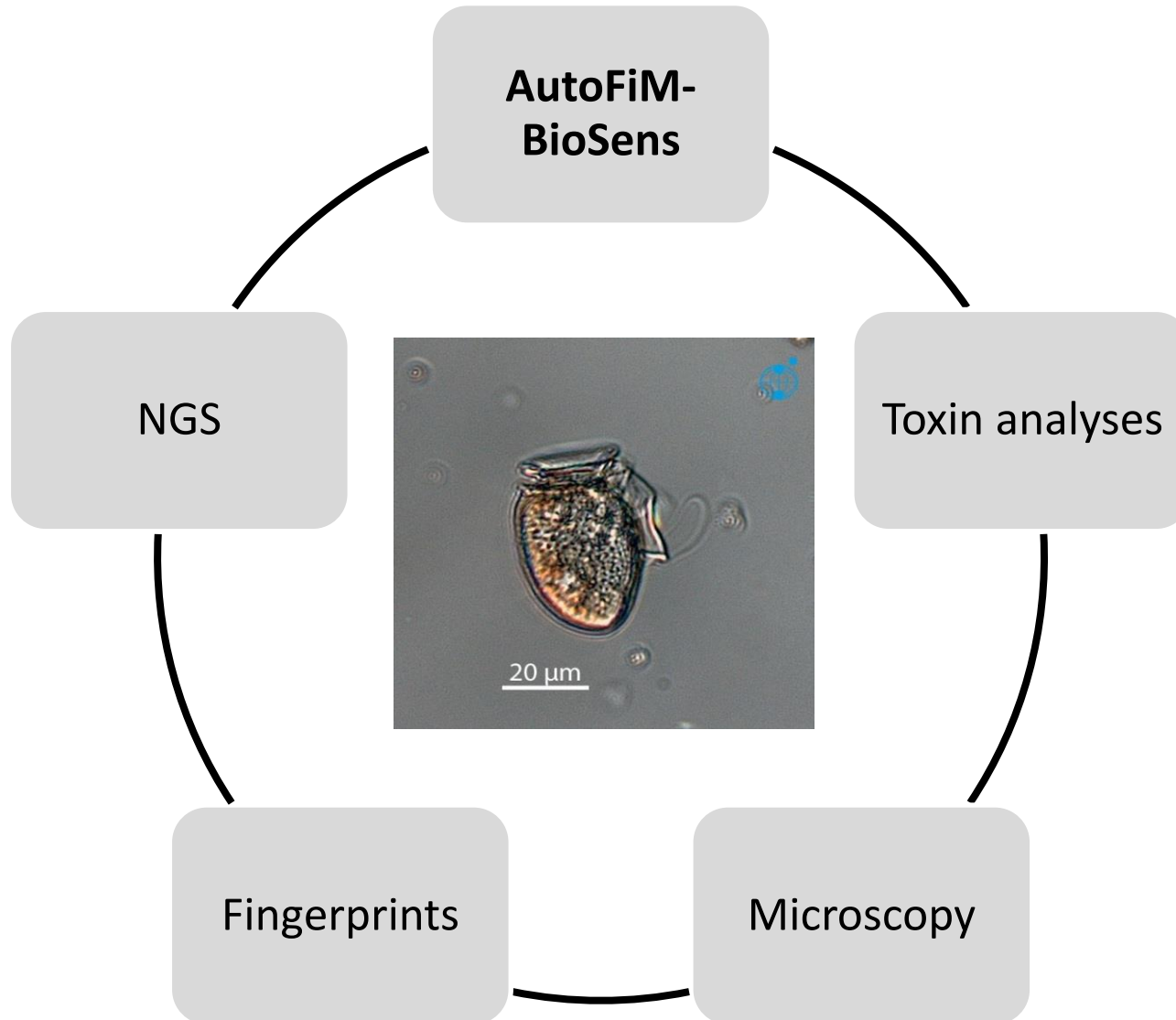
1. Norwegian Coast
2. Sognefjord
3. Trondheimsfjord

■ DA 
 ■ GYM 
 ■ SPX1 
 ■ YTX 
 ■ OA 
 ■ DTX1 
 ■ PTX2 
 ■ PTX2sa 
 ■ PTX11 
 ■ 36-S-PTX12 
 ■ 36-R-PTX12



Voß et al. 2016





Many thanks to...



Innovative  
System- and  
Information  
Technologies



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