
Foto: Kim Abel, naturarkivet.no

New monitoring methods

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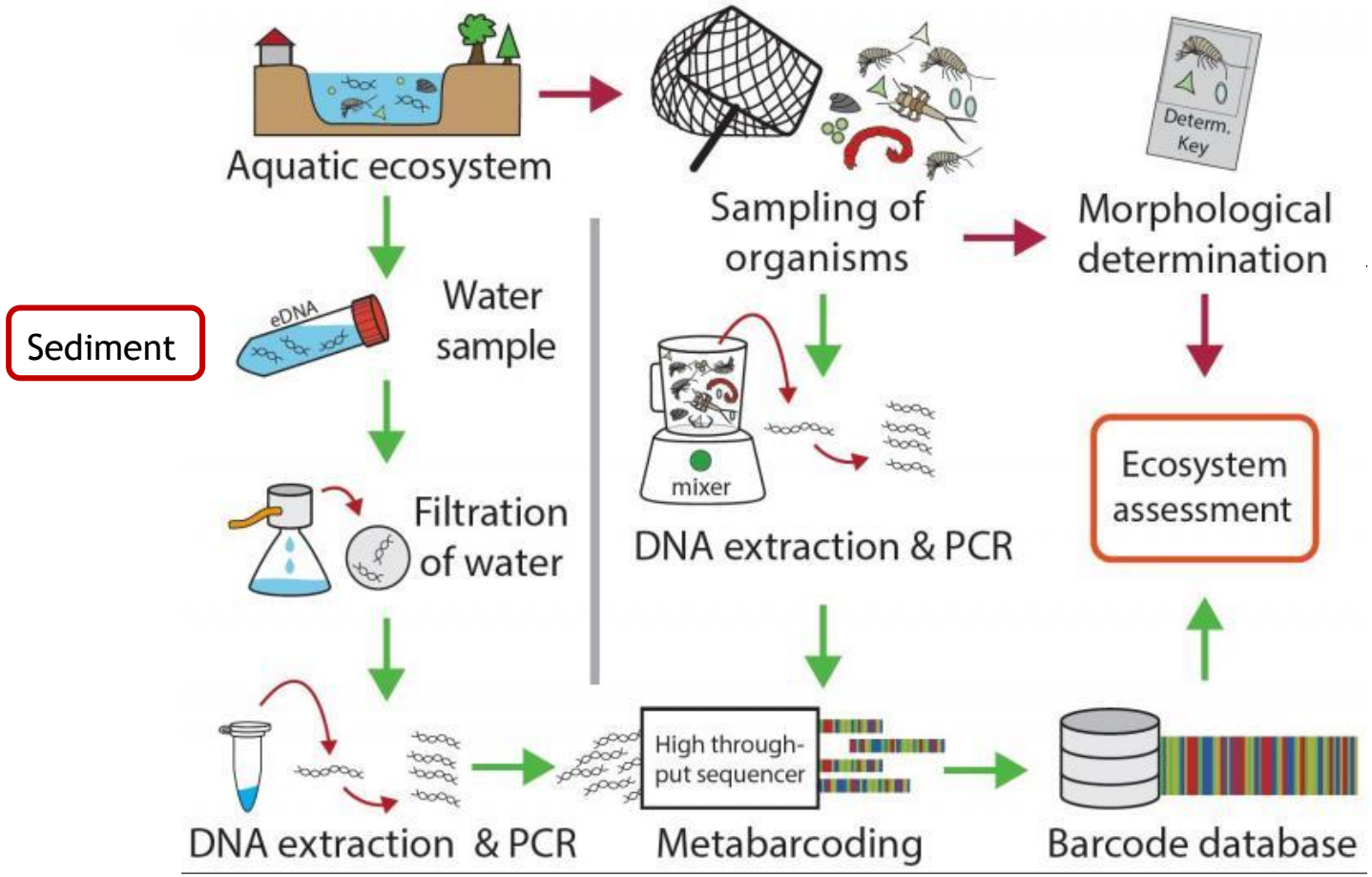
Content – new monitoring methods

- eDNA and DNA(meta)barcoding
- Satellite data for monitoring lakes
- Eccosounding for monitoring fish in large lakes

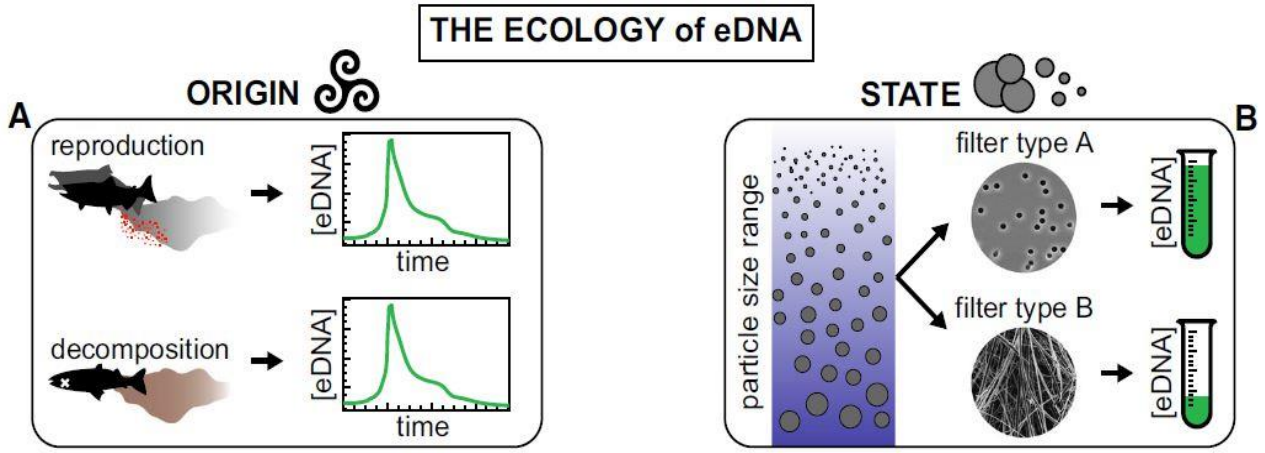
DNA-metabarcoding in water



Figur: Vasco Elbrecht & Florian Leese

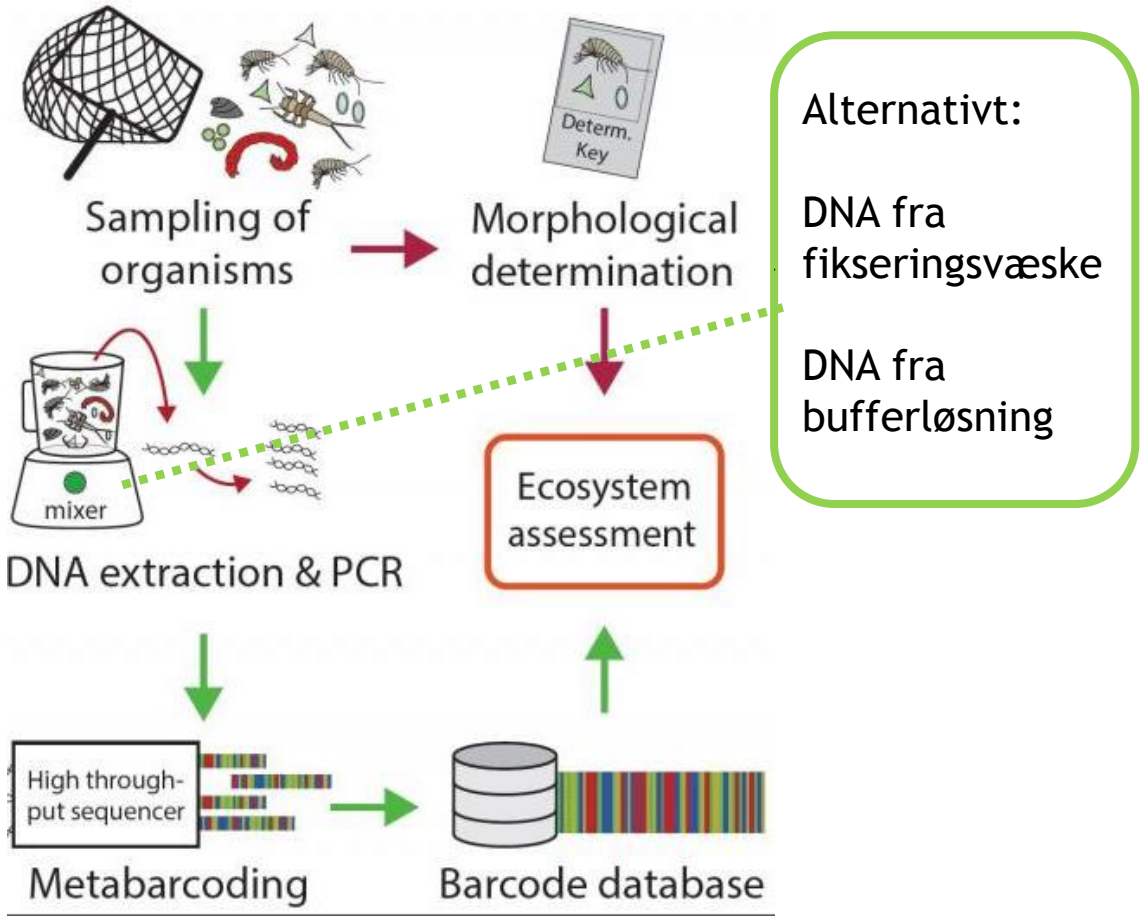
- Sampling DNA from water works well for fish
  - Monitoring invasive fish species

- We are more reluctant to the possibilities of getting quantitative monitoring data on fish, due to stagnation periods and temporal variations in dilution of lake water

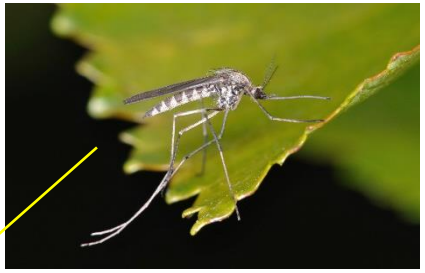


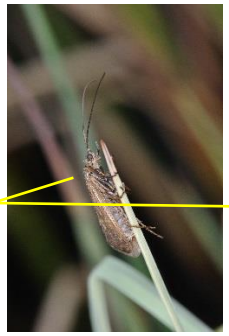
Barnes MA & Turner CR. 2016. The ecology of environmental DNA and implications for conservation genetics. Conserv Genet 17: 1

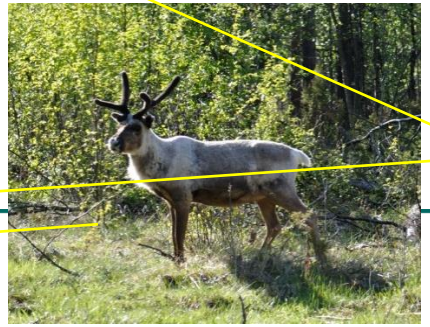
DNA-metastrekkoding i vann



Figur: Vasco Elbrecht & Florian Leese







Reference library

- Barcoding of biological samples from monitoring are dependent on a good library of DNA-barcodes from known species
- 93% av 250 invertebrate-species used in WFD-classification

Pisidium pseudosphaerium
Foto Michal Horsák CC-BY 3.0

Gyraulus laevis.
Foto Roy Anderson CC-NC-ND 3.0

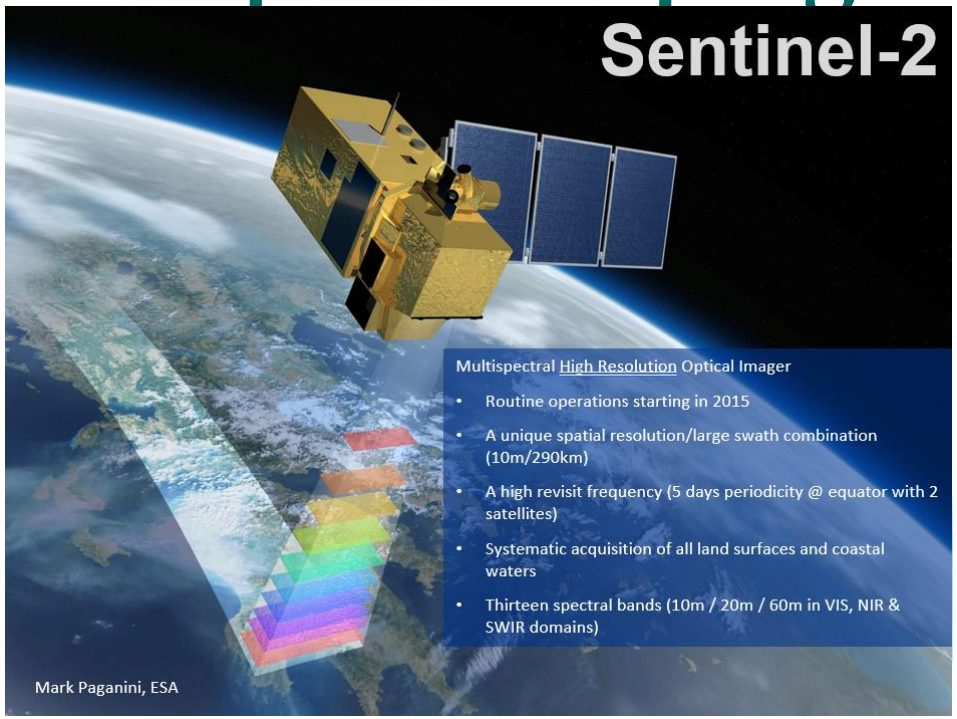
SCANDNAnet

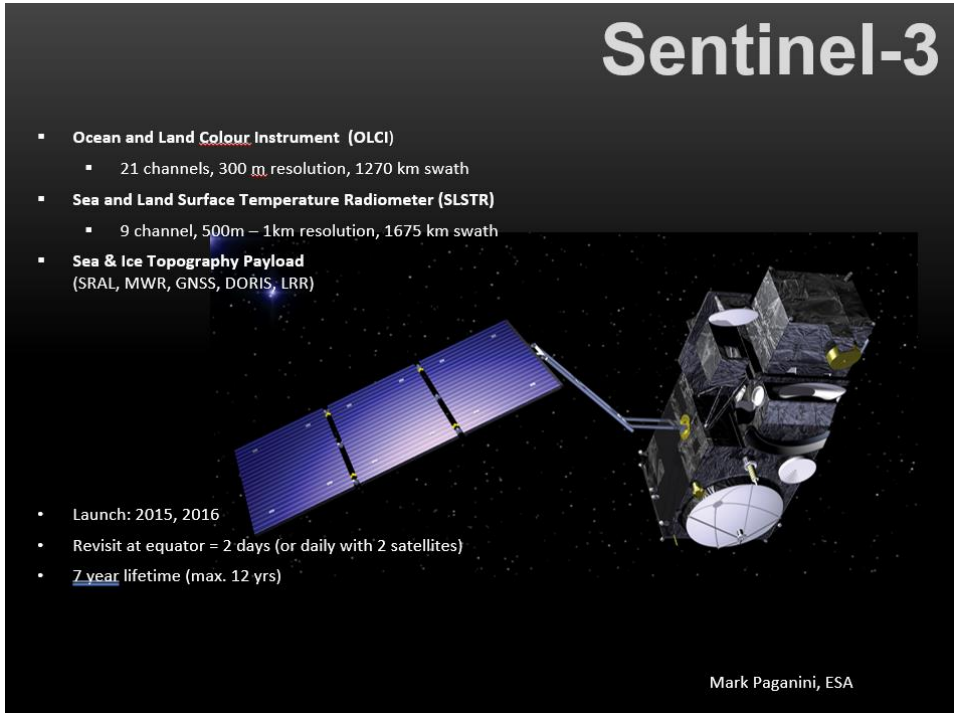
- DNA-metabarcoding of samples from monitoring programs in freshwater
- All Nordic countries participating
- Compare traditional morphological taxonomy and DNA-metabarcoding

Conclusions - DNA

- DNA-methods are promising
- eDNA from water samples can show presence of fish (invasive species) in lakes and rivers
- DNA-metabarcoding for species composition of invertebrates
- Abundance - more research
- Development of reference library
- Classification methods based on DNA-barcoding in forseeable future

Optic satellites for monitoring Copernicus programme



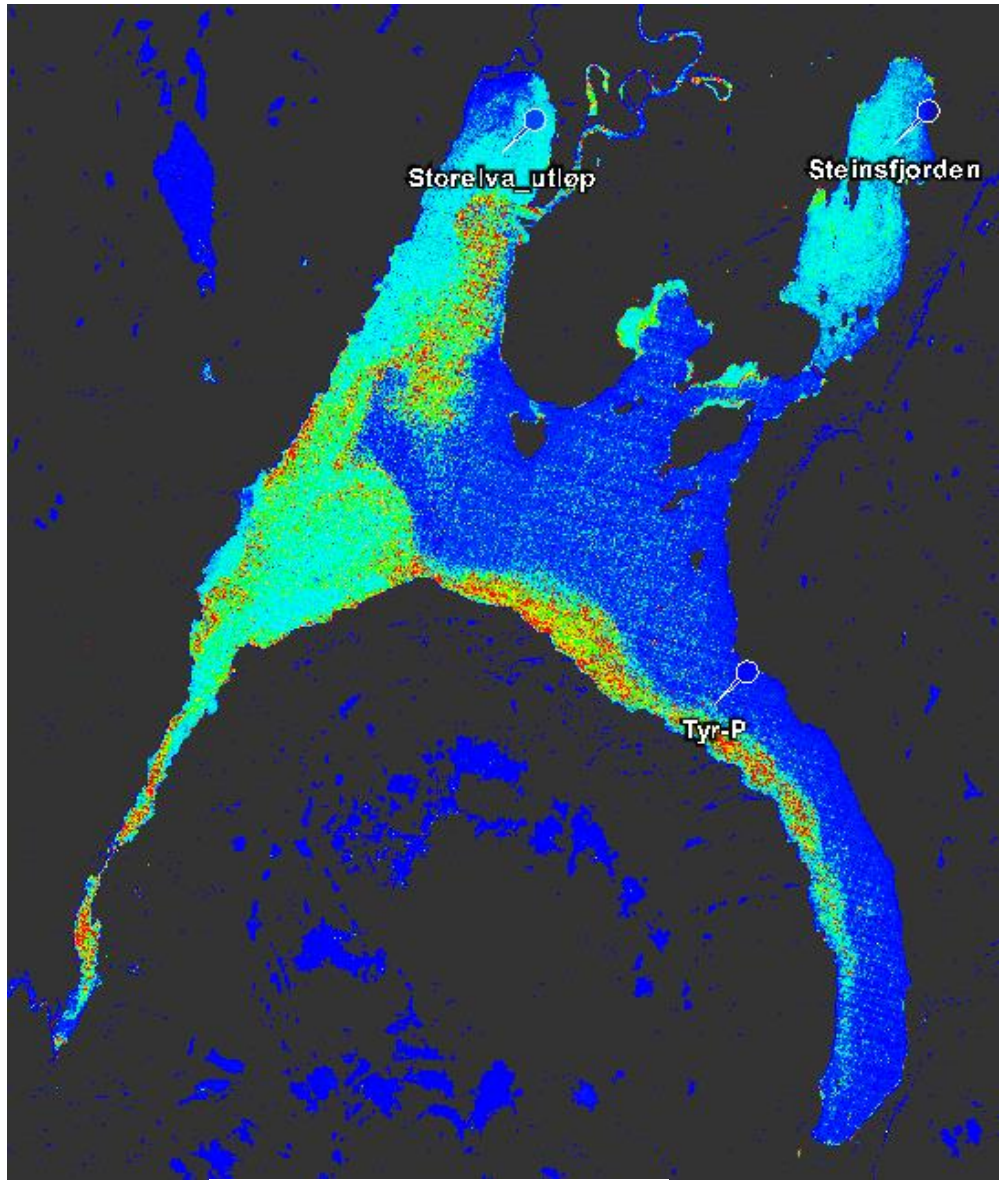


- Passering ca hver 1-2 dag med 2 satellitter i Norge
- 13 optiske spektralbånd
- Dekker en område på 290 km på 4 minutter
- Geometrisk oppløsning 10-20-60m

- Daglig passeringer
- 21 optiske spektralbånd (OLCI) og 9 termisk (SLSTR)
- Dekker en bredde på 1270 km (OLCI) /1675 km (SLSTR)
- Geometrisk oppløsning 300 m/500-1000 m

Parameters which can be achieved from from satellite data relevant for classifying ecological status in large lakes (and coastal waters)

- Phytoplankton as chlorofyl-a
- Particles as TSM, Turbiditet
- Transparency as Secchi-depth (Kd)
- Humic content/TOC as Colour/cDOM
- Specific algae-groups as f.ex. Cyanobacteria


Storelva_utløp
Steinsfjorden
Tyr-P
conc_chl [mg m^-3]
0.0
3.0
6.0
9.0
12.0
14.0
16.0

Challenges and limitations

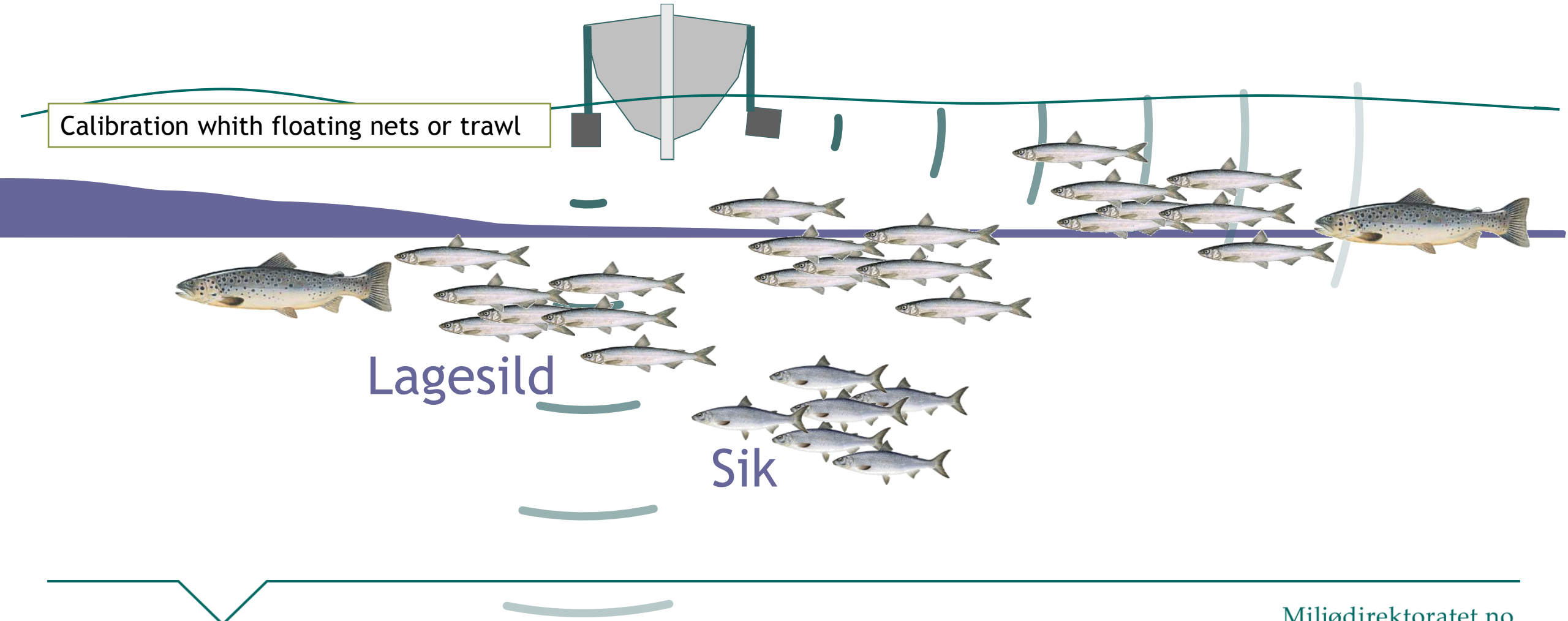
- Some data are stopped by cloudy weather (Anyway good coverage compared with monthly sampling!)
- Only upper water level covered (Ca ½ secchi-depth)
- Low sun parts of the year and shadow from high mountains
- Effects from vegetation/land around the lake
- The most frequent form is long and narrow

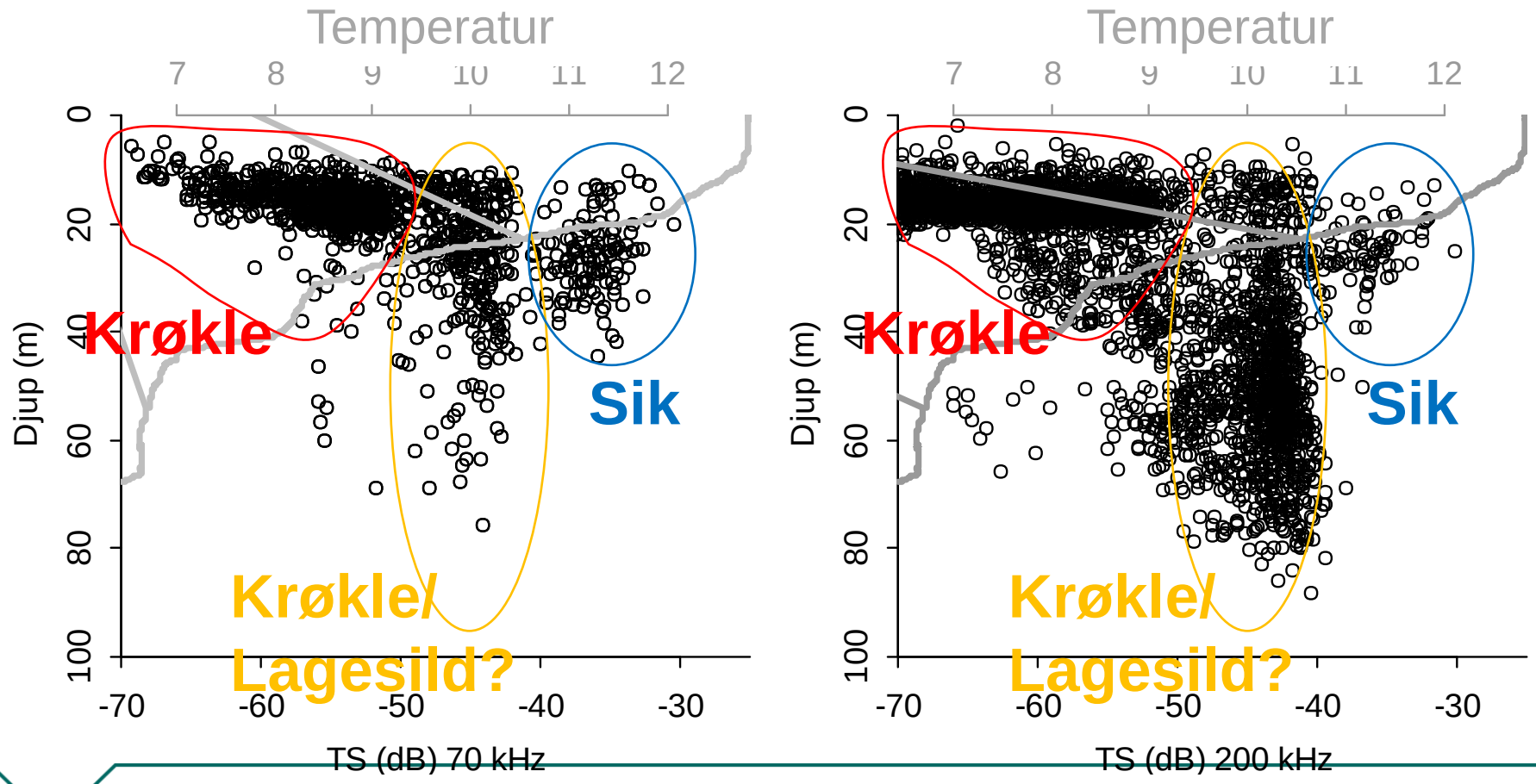
Fish in large lakes

Monitoring of large (deep) lakes started in 2015:

- Pelagic (fish) communities are more important in large lakes
- Traditional net-fishing, according to standards, is laborious in large lakes
- We needed more effective monitoring methods for fish

Calibration whith floating nets or trawl




Temperatur
7
8
9
10
11
12
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20
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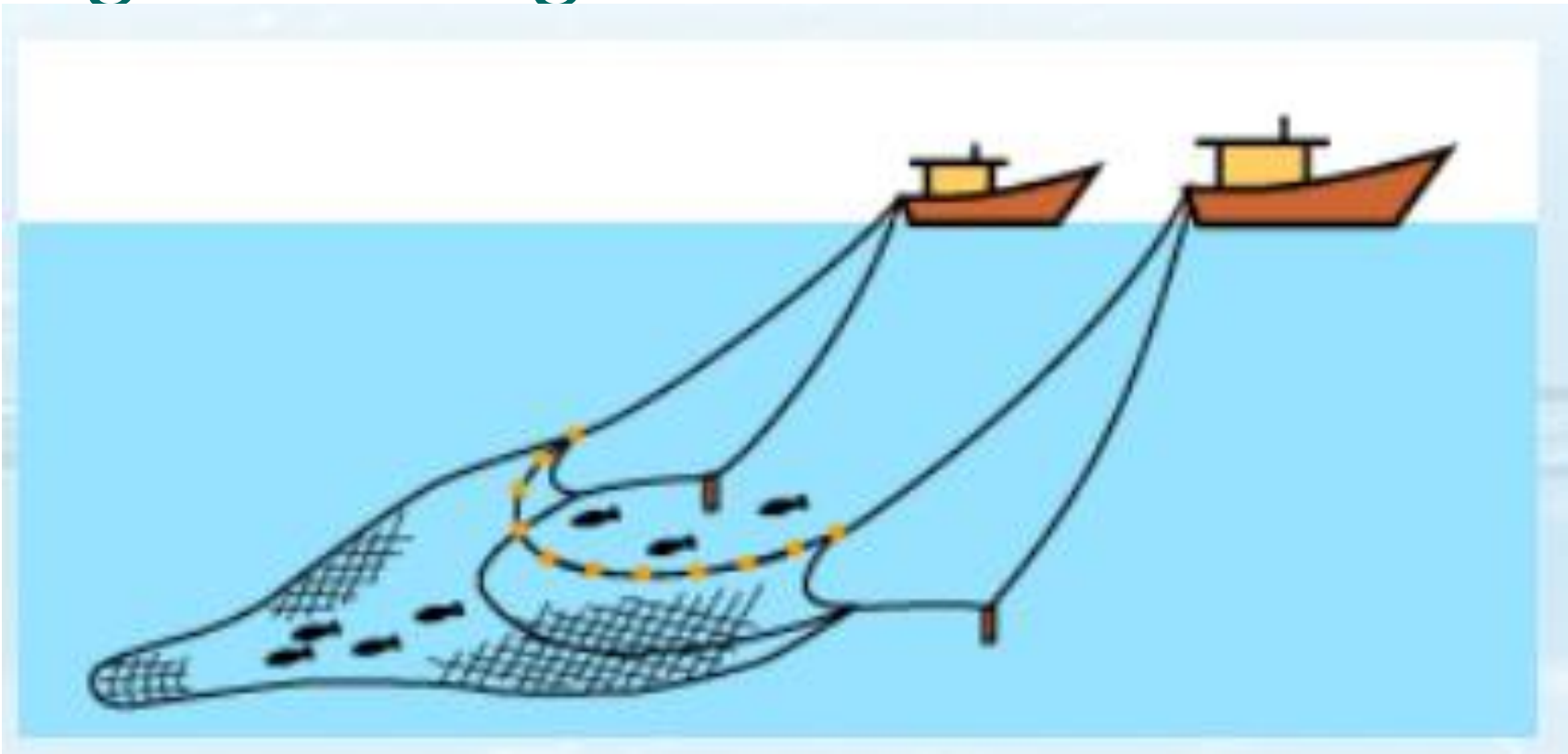
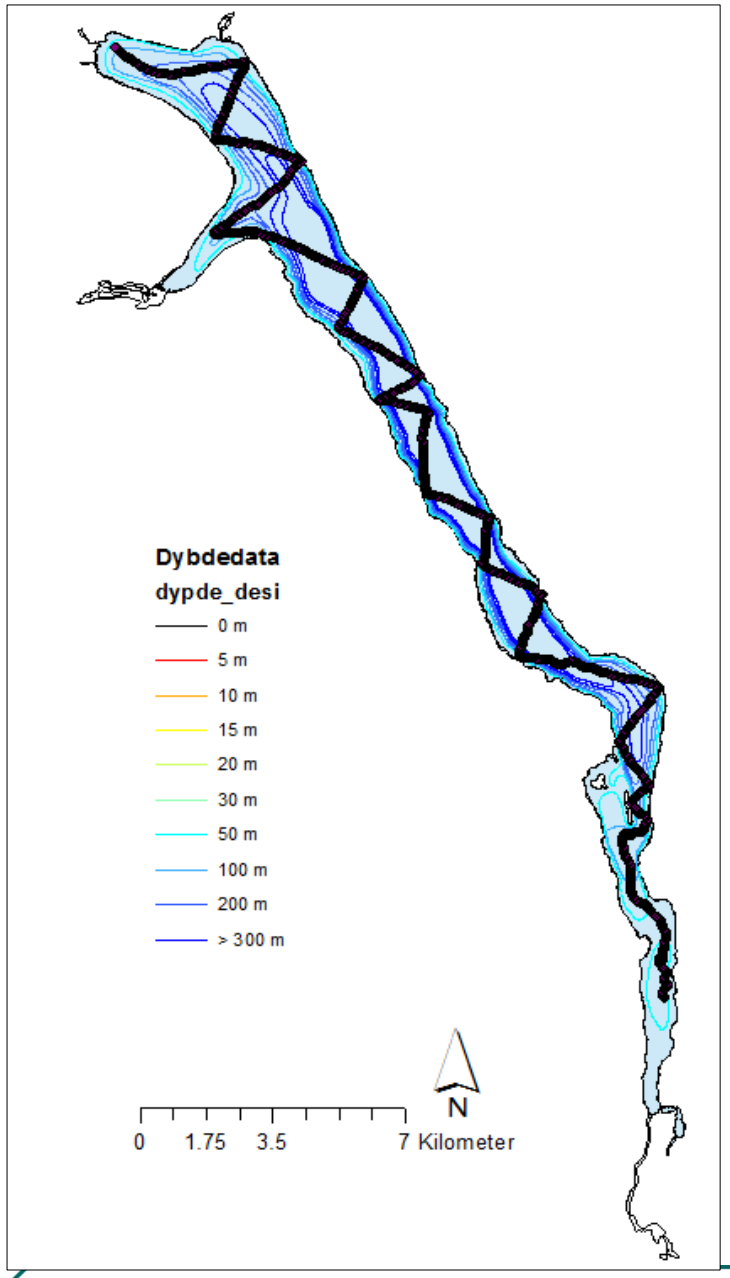
Djup (m)
Krøkle
Sik
Krøkle/
Lagesild?
-70
-60
-50
-40
-30
TS (dB) 70 kHz
Temperatur
7
8
9
10
11
12
0
20
40
60
80
100
Djup (m)
Krøkle
Sik
Krøkle/
Lagesild?
-70
-60
-50
-40
-30
TS (dB) 200 kHz

Pelagic trawling

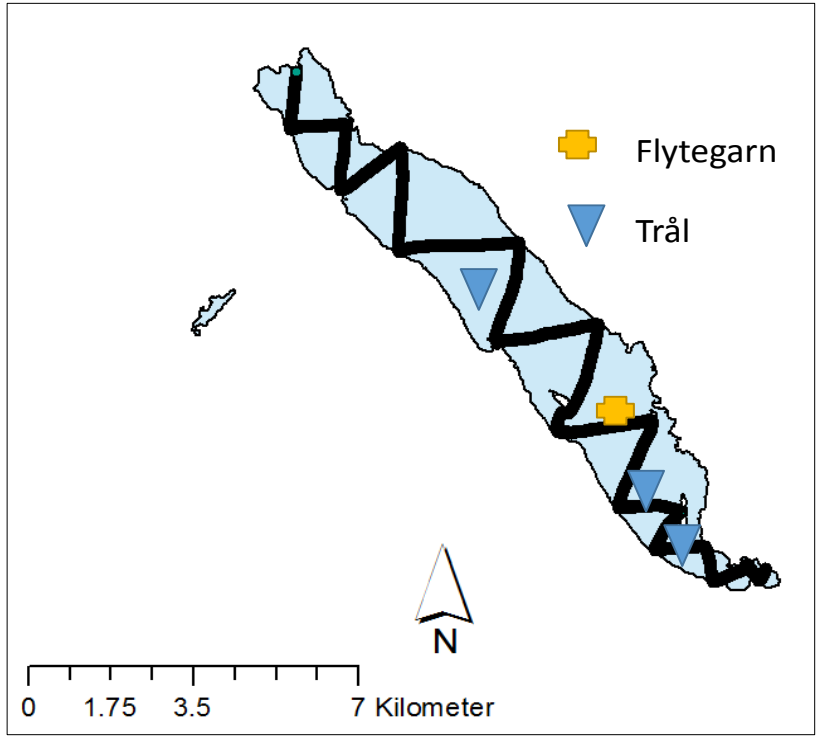


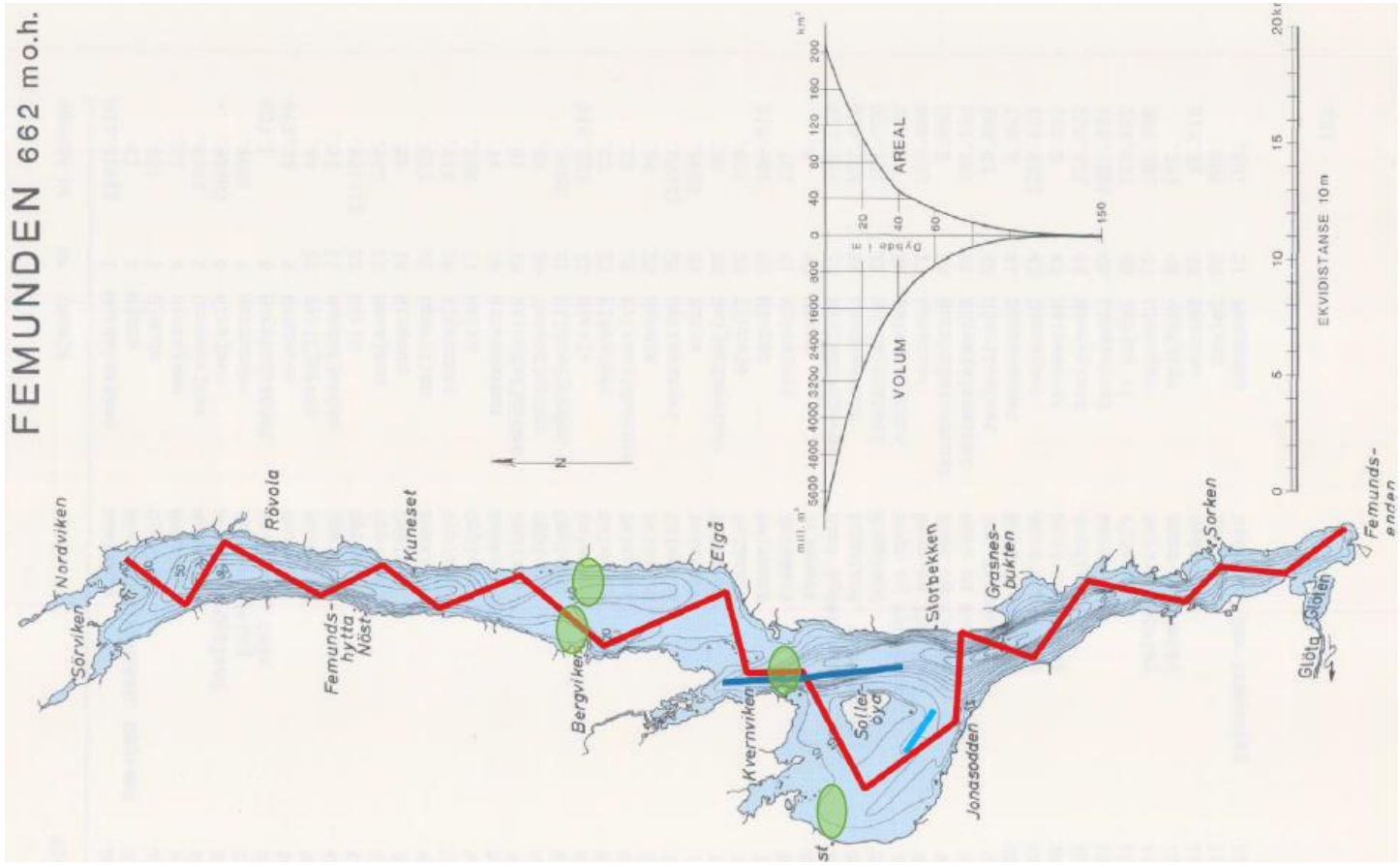
Tinnsjøen (Tinnsjå)

Eksempler - ekkoloddkurser



Eikeren





Tabell Fe3. *Estimert biomasse av pelagisk sik og røye i Femunden. WS-FBI og normalisert EQR indikerer at innsjøen skal klassifiseres med tilstand som* ***god****.*

Innsjø-areal (km²)	Transekt-lengde (km)	Deknings-grad	Biomasse (kg/ha)		Total bio-masse (t)	WS-FBI	Norm, EQR	Tilstand
			Sik	Røye				
203	72,4	5,1	19,6	0,9	416	1,78	0,75	God

Potential Nordic cooperation

- DNA –
  - reference library (ongoing)
  - Development of new DNA-based classification methods on invertebrates and phytobenthos
- Satellite – develop classification methods for relevant parameters in lakes based on stallite-data
- Hydroacoustics – Standardised methods for fish-monitoring in large lakes

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Takk!