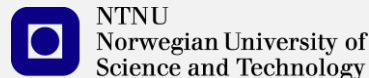


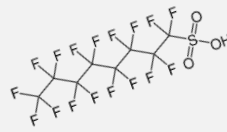


PFAS-profiler i akvatisk miljø påvirket av lokale punktkilder

Håkon Austad Langberg



Om prosjektet



- Finansiert av Norges forskningsråd
- Prosjektpartnere: the Norwegian institute for water research (**NIVA**), the Norwegian university of life sciences (**NMBU**), the Colorado School of Mines (**CSM**), the Department for Environment & Health, Vrije University Amsterdam (**E&H**), and the Norwegian University of Science and Technology (**NTNU**)



PFAS-historikk

AFFF (PFAS-brannskum)
kommer på markedet

1960

1970

1980

1990

2000

2010

PFOS-brannskum fases
ut i Norge. Erstattes av
6:2 FTS-skum (2007)

Alt PFAS-brannskum
fases ut i Norge (2012-
2013)

3M faser ut
produksjon av PFOS
(2001)

PFOS inkluderes i
Stockholmskonvensjonen
(2009)



Perfluorooctane-
sulfonic acid
(PFOS)

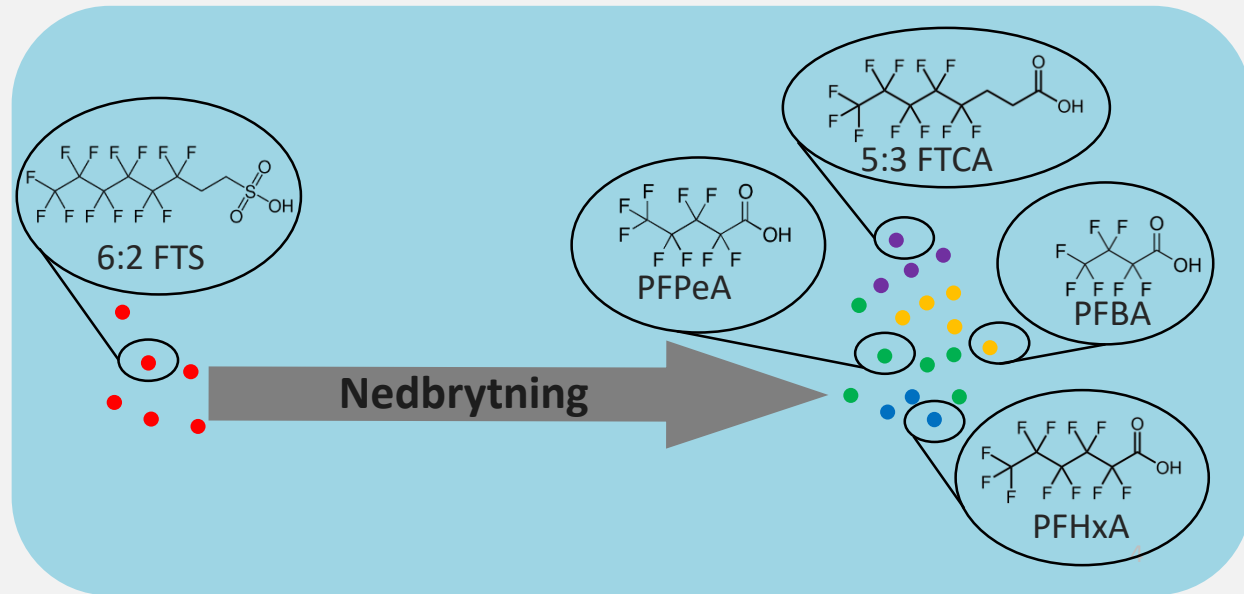


6:2 Fluorotelomer
sulfonate
(6:2 FTS)



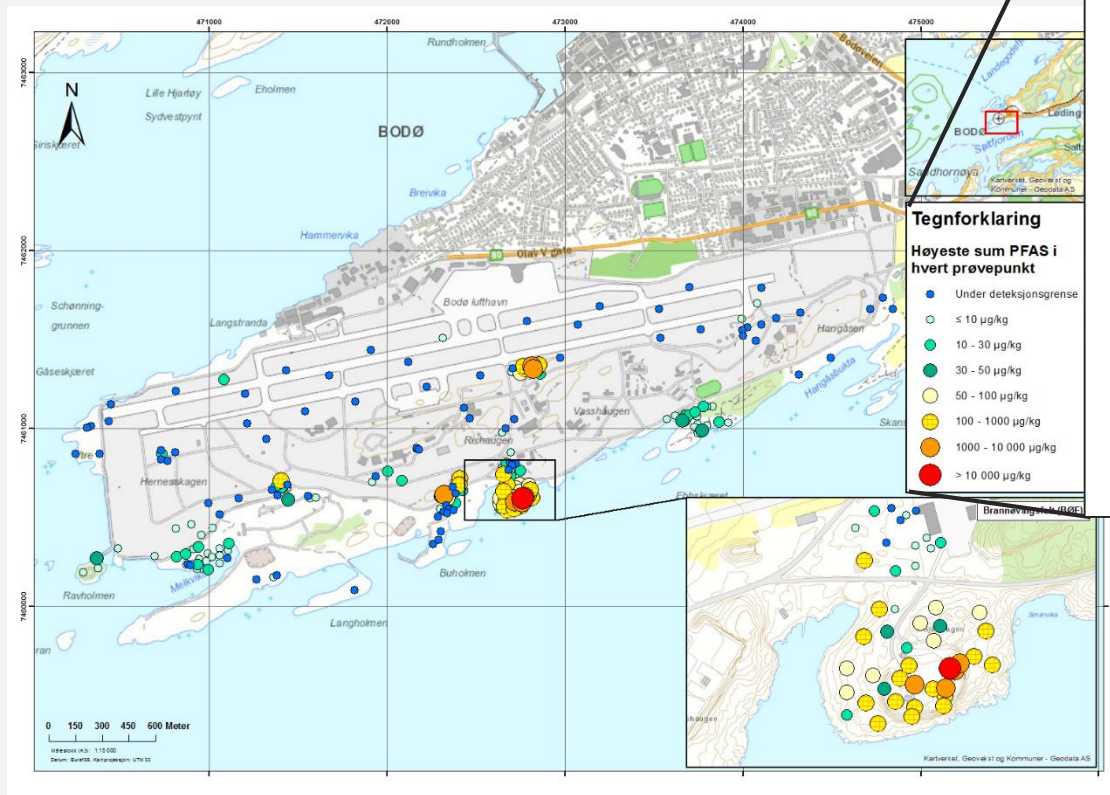
Biotransformering av 6:2 FTS

- ↗ 6:2 FTS is transformerer til kortkjedede PFAS (f.eks. PFPeA, PFBA, PFHxA)
- ↗ Lite potensial for akkumulering i fisk



Bodø airport

- Høye PFAS-konsentrasjoner i vann fra flyplassen (dominert av PFOS and 6:2 FTS)
- PFOS-skum ble faset ut i 2007
- 6:2 FTS-skum fra 2007 til 2013

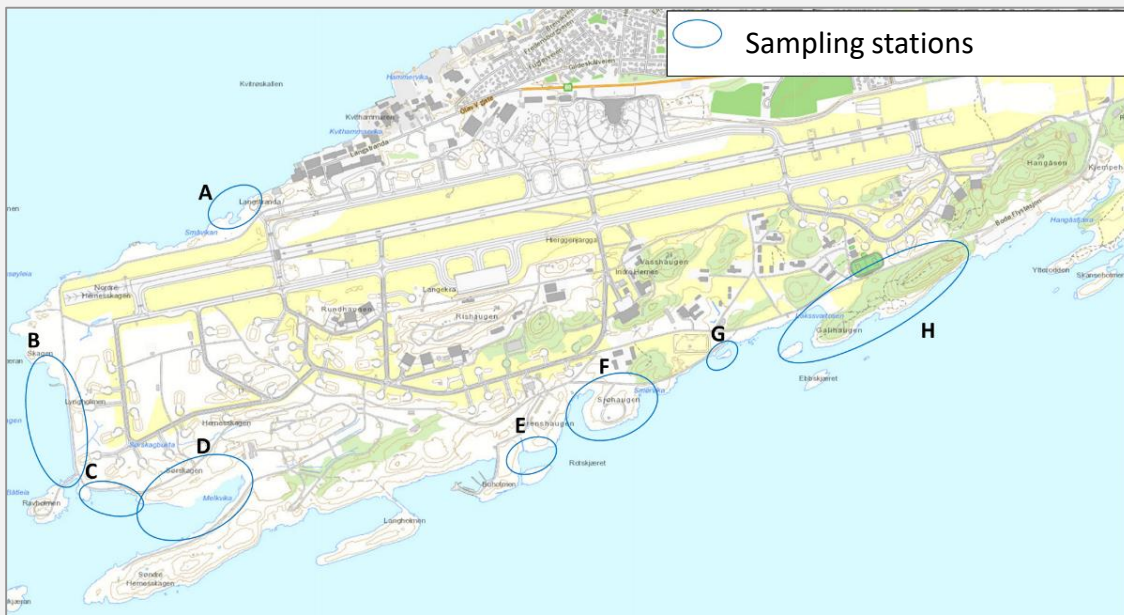


Highest conc. of tot. PFAS in each sampling point (soil)

- Blue dot: Below detection limit
- Light green circle: ≤ 10 µg/kg
- Green circle: 10 - 30 µg/kg
- Dark green circle: 30 - 50 µg/kg
- Yellow circle: 50 - 100 µg/kg
- Orange circle: 100 - 1000 µg/kg
- Dark orange circle: 1000 - 10 000 µg/kg
- Red circle: > 10 000 µg/kg

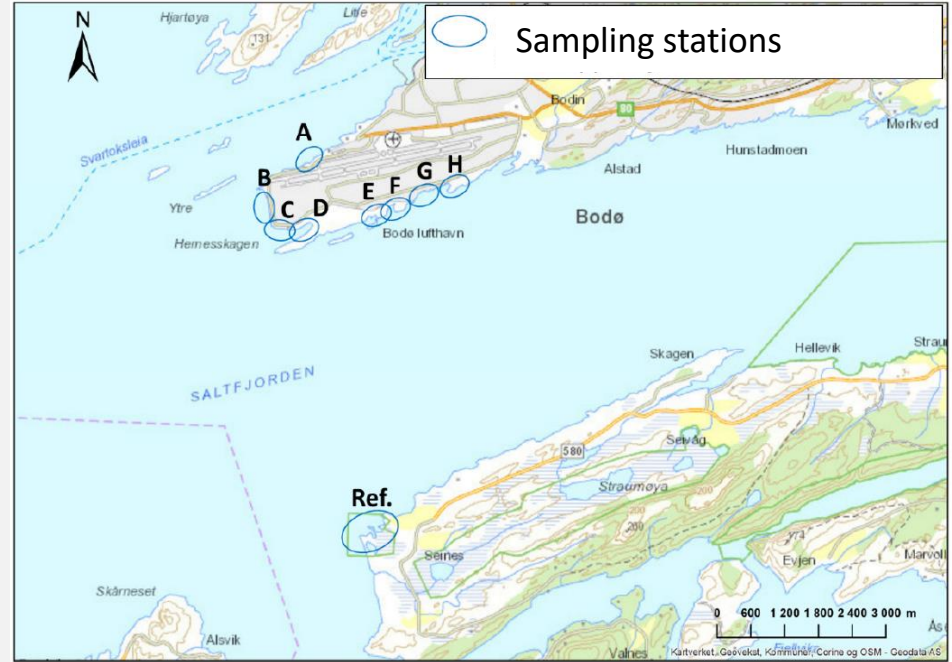
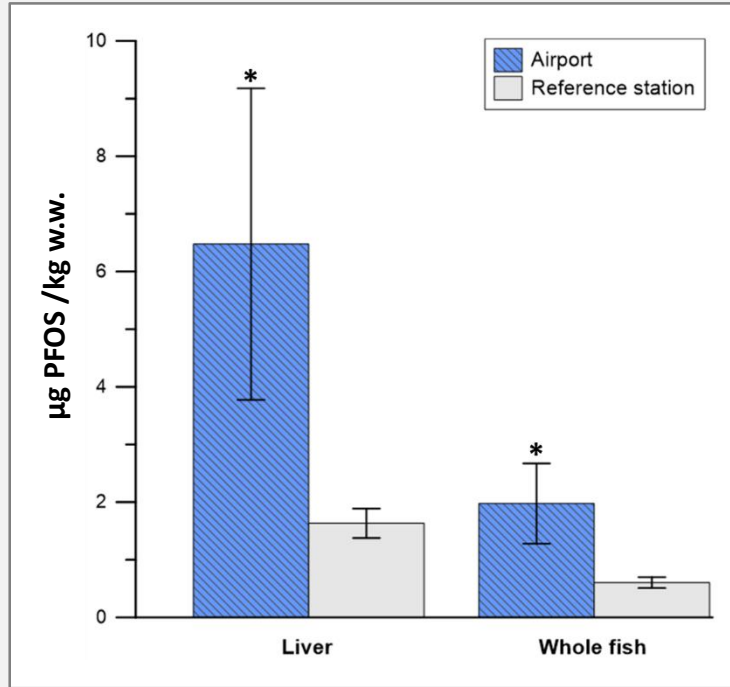
Bodø airport

- ↗ Lave konsentrasjoner i sjøvann (Passive prøvetakere: 0,5 – 3,1 ng/l)
- ↗ Lave konsentrasjoner i sedimenter



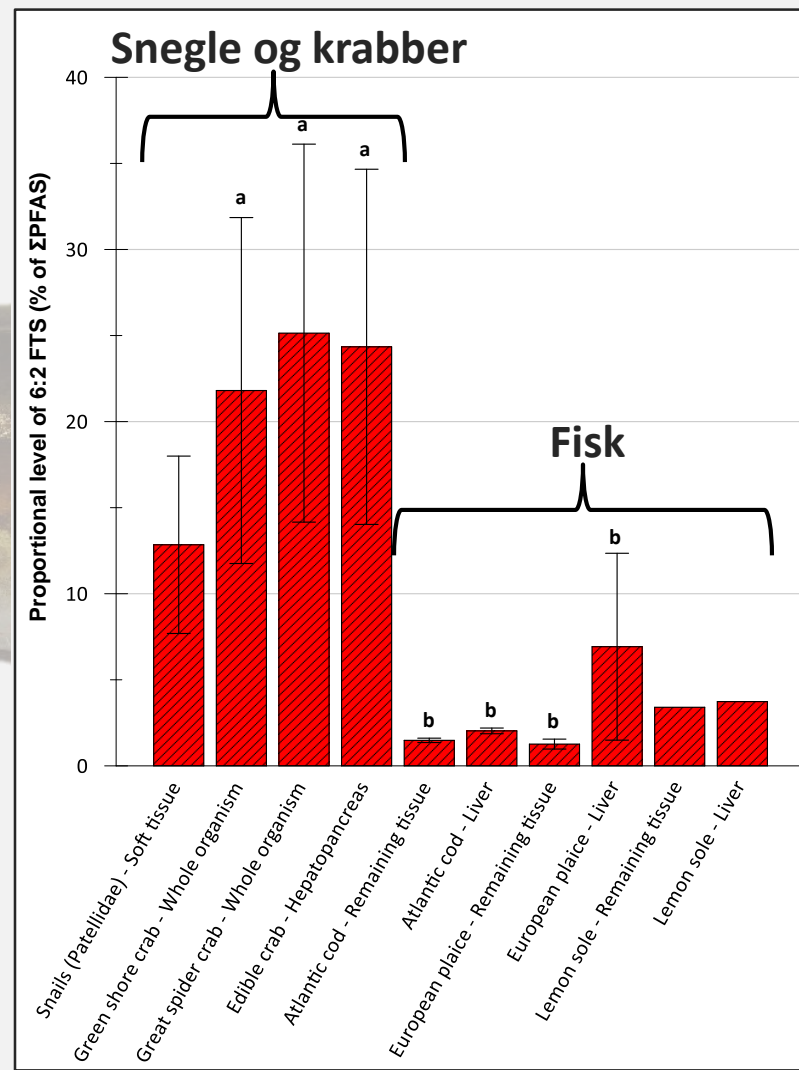
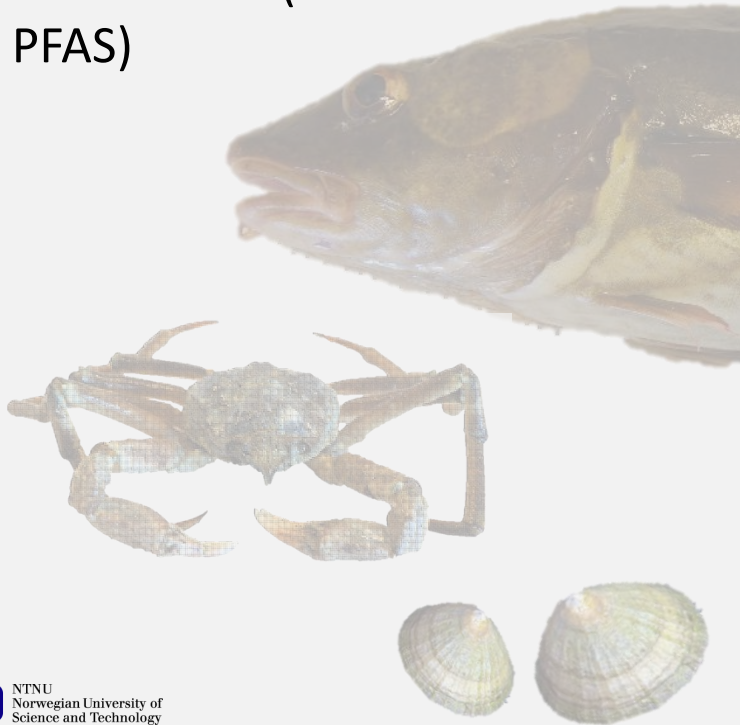
Increasing trophic level

PFOS-konsentrasjoner i torsk

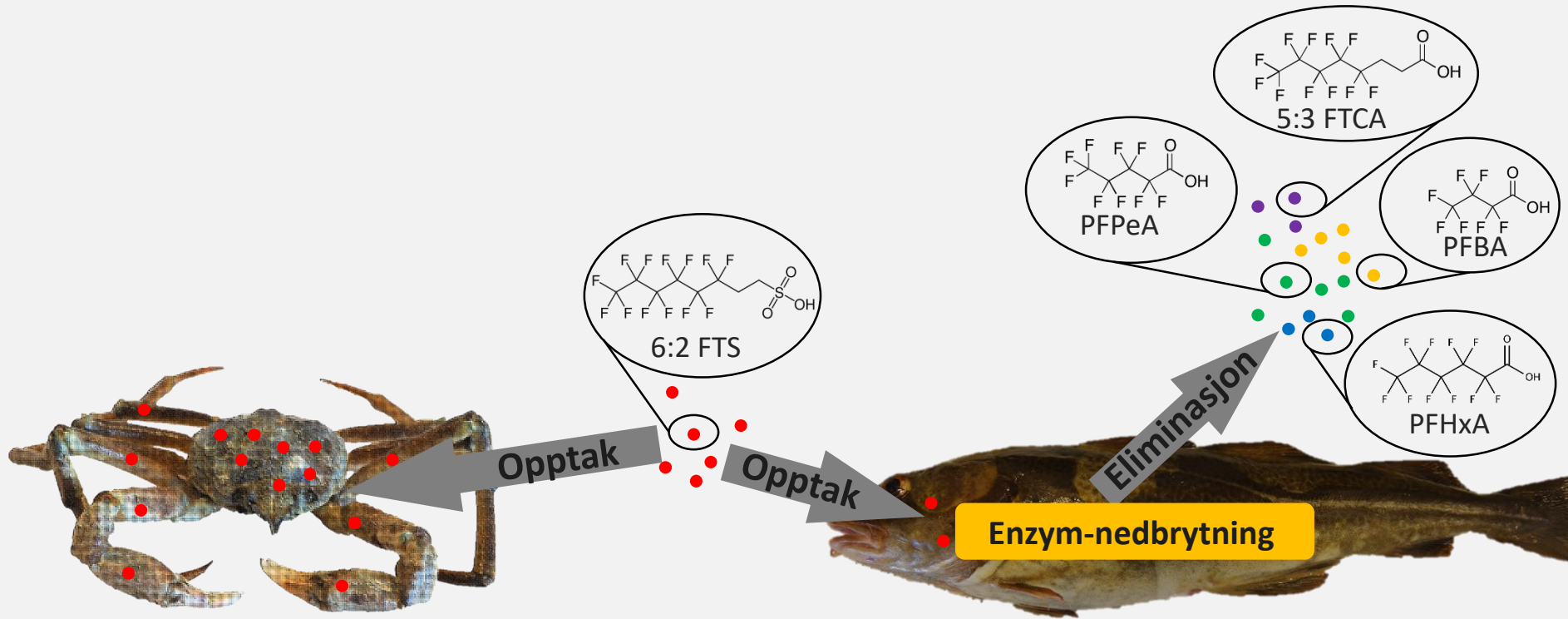


Bodø Airport

Nivåer av 6:2 FTS (% av total PFAS)

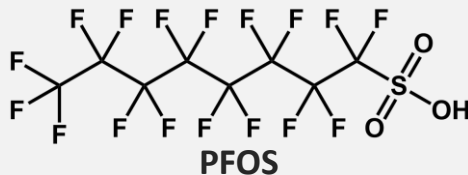
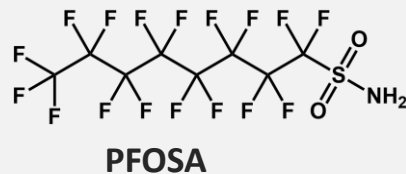
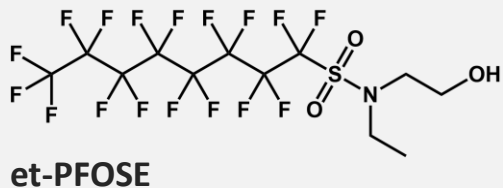
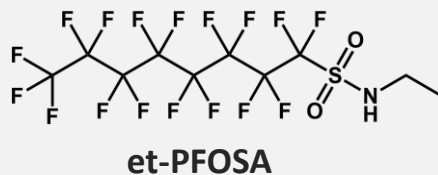
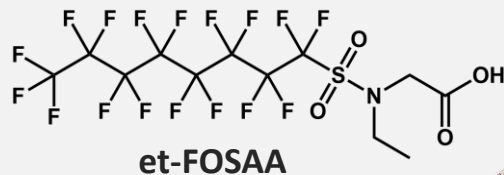


Bioakkumulering av 6:2 FTS



Forløper-forbindelser

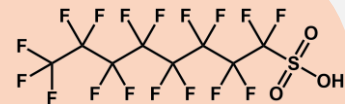
- Forløperforbindelser til stabile PFAS
- PFOS-forløpere er brukt i forbruksartikler
- Langtransport



Nedbrytning av forløper-forbindelser

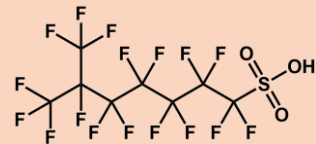
- PFAS-produksjon:
 - Electrochemical fluorination (ECF)
 - Telomerization
- ECF: miks av lineære (L) og forgrenede (br) isomerer
- Telomerization: lineære isomerer
- Forgrenede PFOS-forløpere (br-preFOS) mer effektivt transformert enn lineære (L-preFOS)

L-forløpere



L-PFOS

br-forløpere

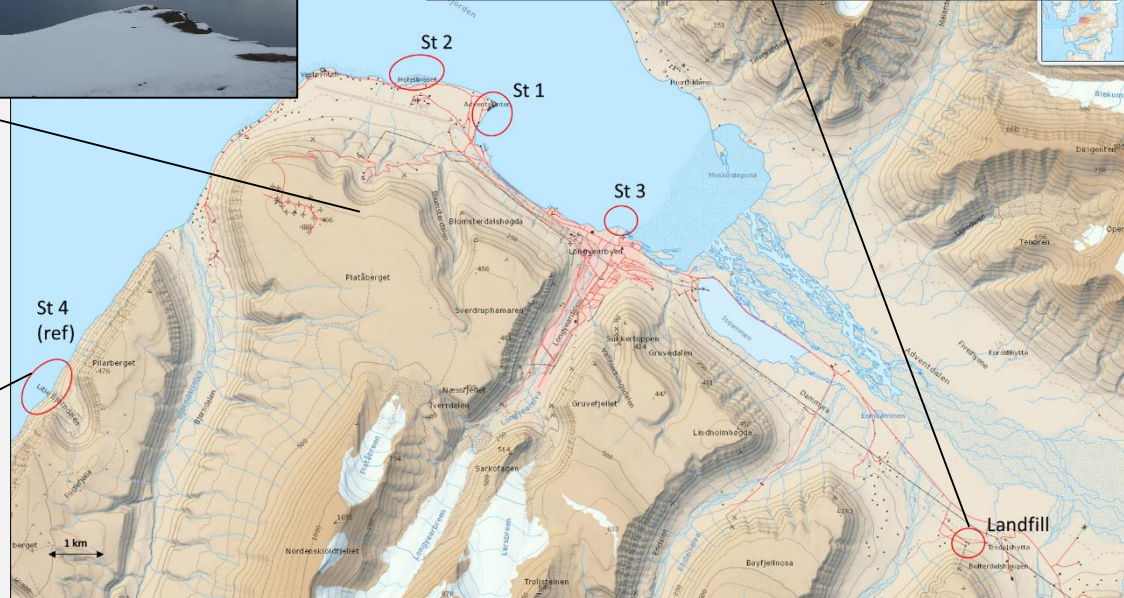


br-PFOS

Site location and information

Hovedkilder:

- Flyplass
- Deponi
- Langtransport

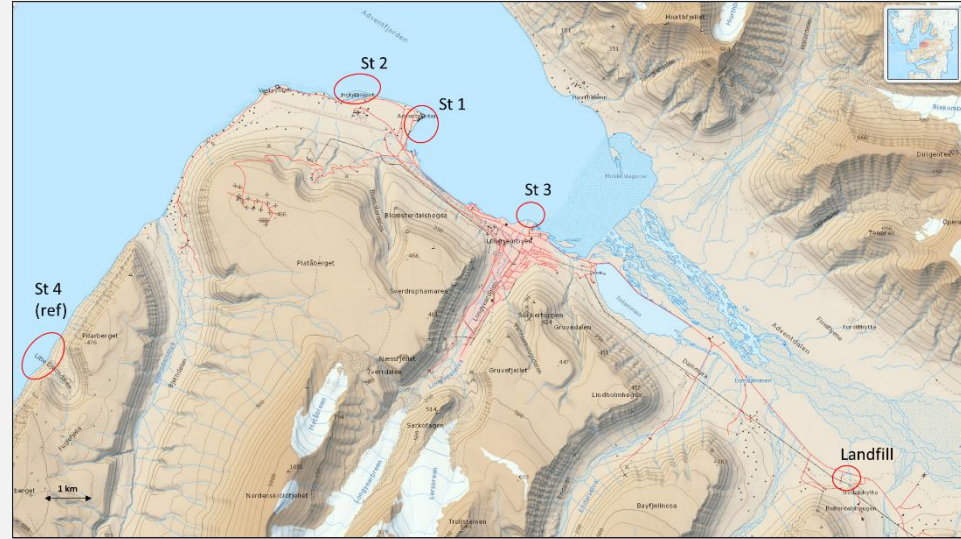
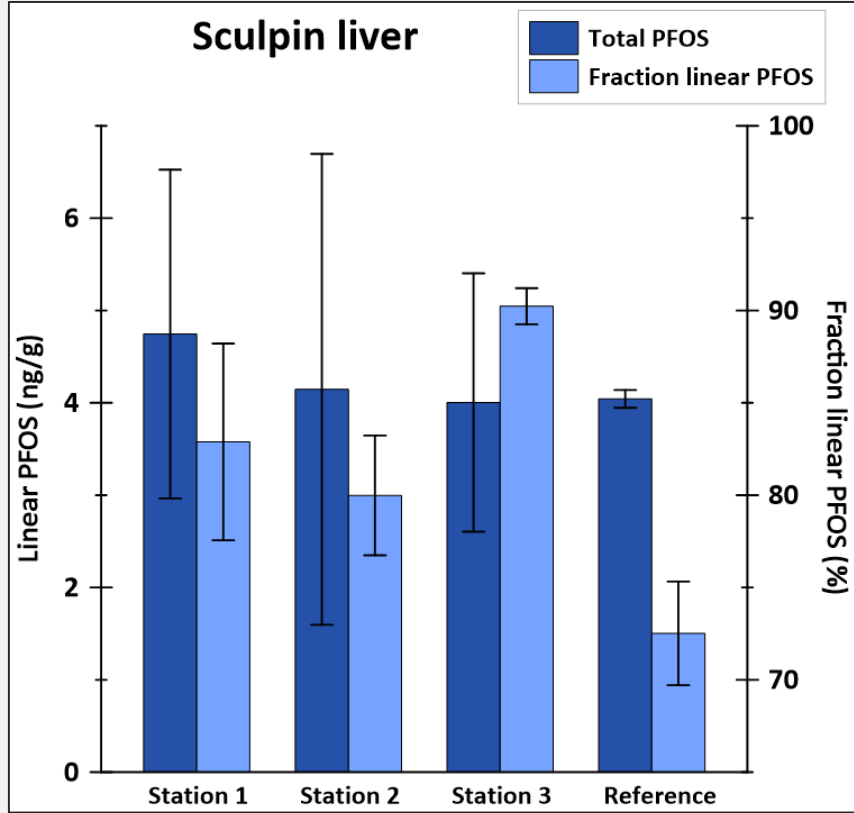


Svalbard - Longyearbyen

Hovedkilder:

- Flyplass
- Deponi
- Langtransport







Spørsmål?

hal@ngi.no

