How to detect trends of emerging pollutants:

The Arctic sample Bank in Denmark and examples of it use in retrospective temporal

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- **Aarhus University**

The Arctic sample Bank in Denmark

- What do we store in the sample Bank?
- How do we store it?
- How much do we store?
- How many samples do we have today?
- What is the purpose of the sample bank?
- Examples of time trend analyses ?

What do we store in the sample Bank?

- **Almost any thing**
- **Fish (liver)**
- **Shell fish (blue mussel, prawns, crabs. soft parts)**
- **Marine mammals (meat, liver, kidney, blubber)**
- **Terrestrial mammals (reindeer)**
- **Plants (seaweed, lichen, other plants)**
- **Sediments (marine, lake, stream)**

How do we store it?

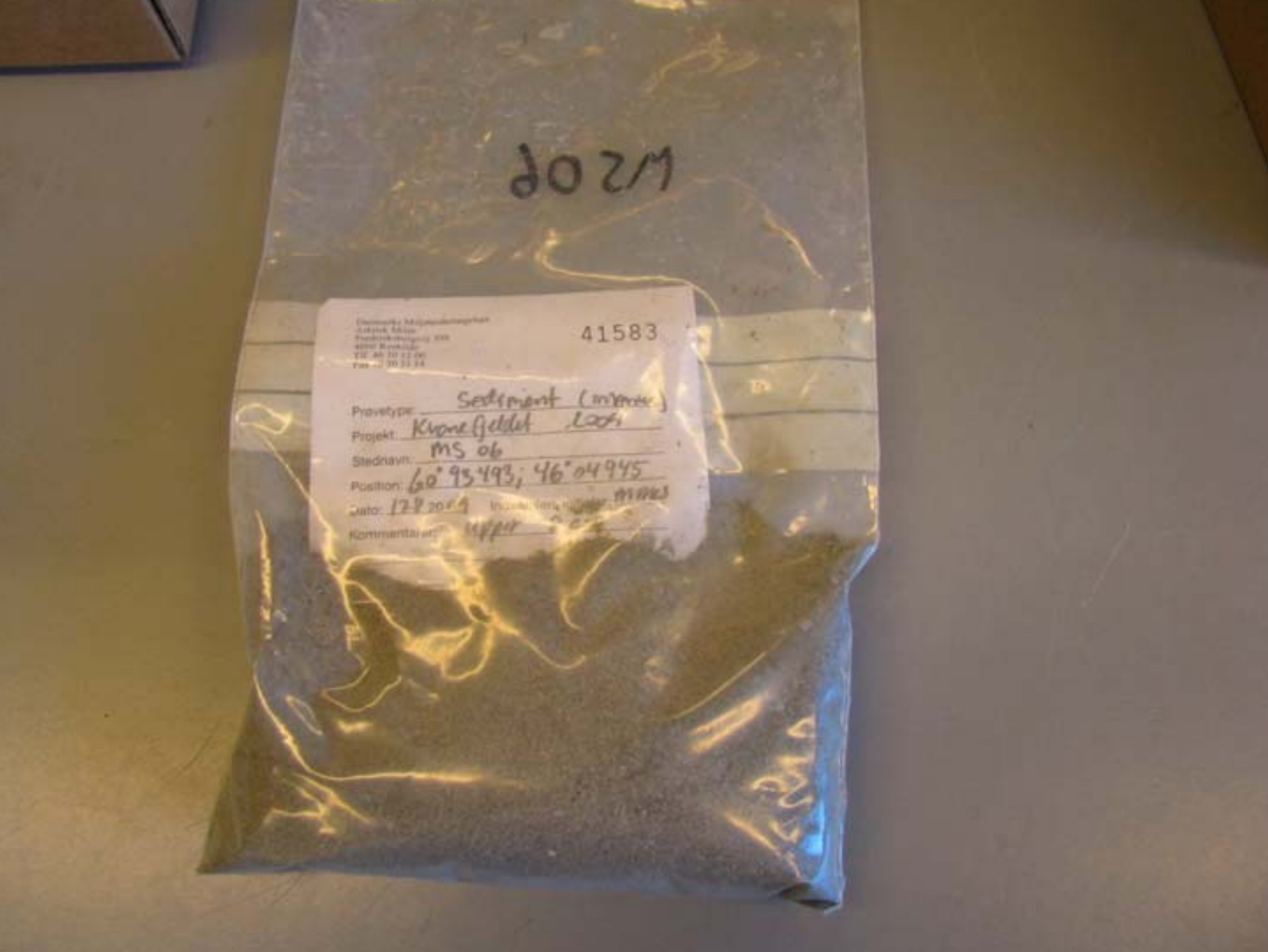
- **Frozen -20°C**
- **Dried – Freeze dried**

The W
PRODUCE
pples
Kanselle
25cm

AMAP CORE 2006
RINGSÆL SCO
ID:34901-46
AMAP 2000
HVIDHVAL SAQAQ
ID 22579.80.78.81.67
AMAP TIME TREND
AMAP
RINGSÆL SCO 2004
ID:30904-63
AMAP 2000
HVIDHVAL SAQAQ
22566.73.61.65.72
TIME TEND 2003
SCORESBYSUND
ID.NR.27201-20
RINGSÆL
AMAP 2000
HVIDHVAL SAQQAQ
ID 22569.74.75
FØDEVAREPROJEKT

ID : 380575
Cet. Nr. T-0303
Kringlerne 21.08.08

Kranzfield 07
Kringlemo 10
38575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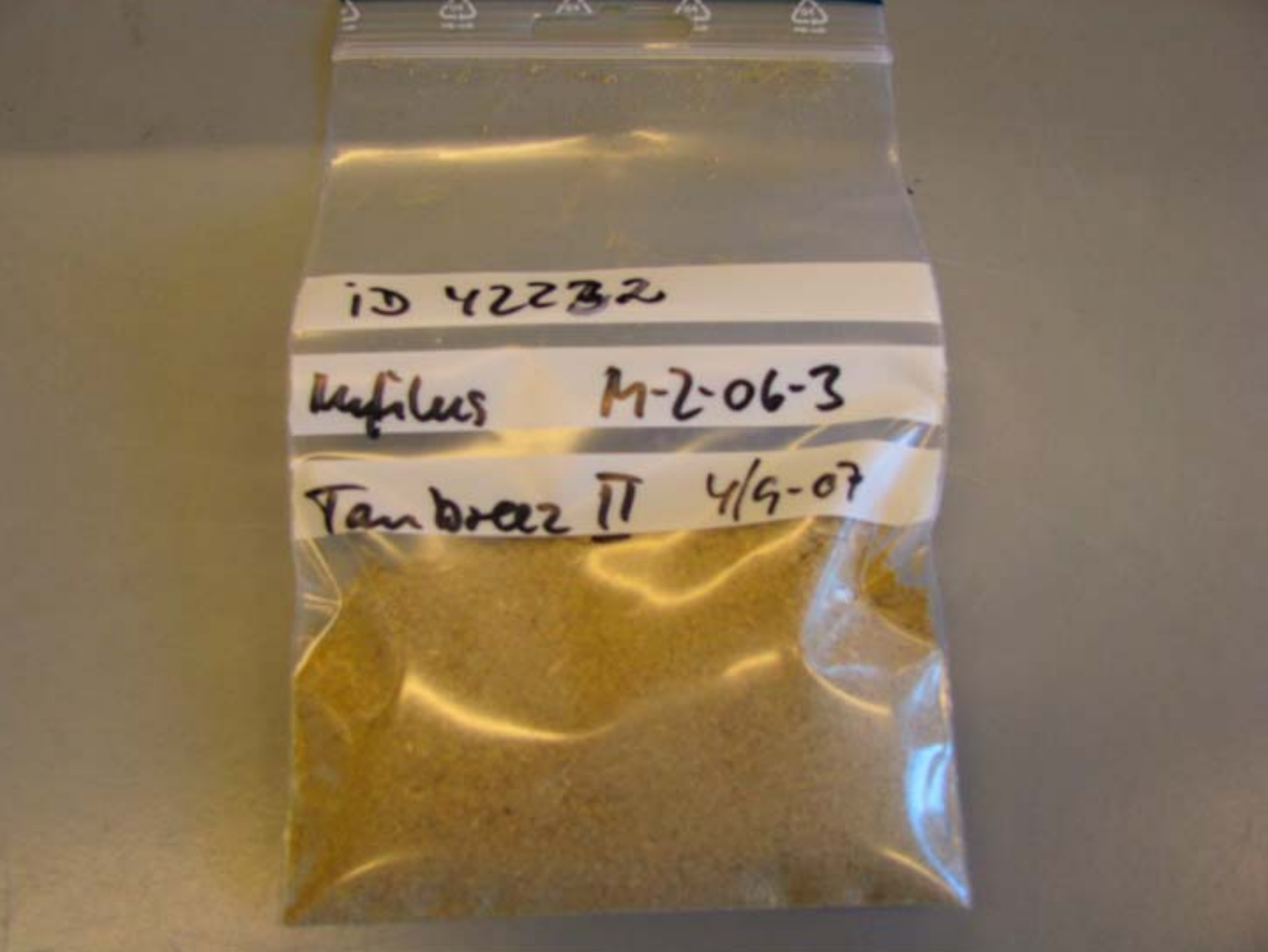
Provetype: Sediment (mynder)
Projekt: Kronefjeldet
Stednavn: MS 06
Position: 60°93493; 46°04945
Dato: 17.8.2014
Kommentarer: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Mafikes M-2-06-3
Tambraz II 4/9-07

Bjorne-Video
AAR-Chap 7
CSH

BAGVED: MAA 1989.90
BAGVED: MAA 1992.93
BAGVED: MAA 1994.95
MAARM 1991
SEDIMENT
MAARM 2000
MAARMORILIK 1997
TANG, MUSING, LAV, AMMERSAT
MAARM 1999
LAV MUSING
MAARM 1998
MAARMORILIK 1996
MUSING, REJER
MAARMORILIK 1996
TANG, LAV
MAARM 2007
TANG
MAARM 2007
MUSING
MAARM 2006
LAV + AMMERSAT
REJER + LAV + SEDIMENT
MAARM 2008
MYTILUS
MAARM 2008
TANG
MAARMORILIK 2007
Rejer
LAV
AMAP 1999, 2000
MYTILUS
AMAP 1994
MOS. Dosinaorbicularis
AMAP 1994
MOS. Recurvirostrum
AMAP 1994, 99,
LAV.

How much do we store?

- **Typically**
- **Dried plant or lichen 10g**
- **Dried mussel, dried seaweed 25g**
- **sediment 250g**
- **Fish whole liver and 150 g muscle**
- **Marine mammals: Too much! but minimum 200 g**

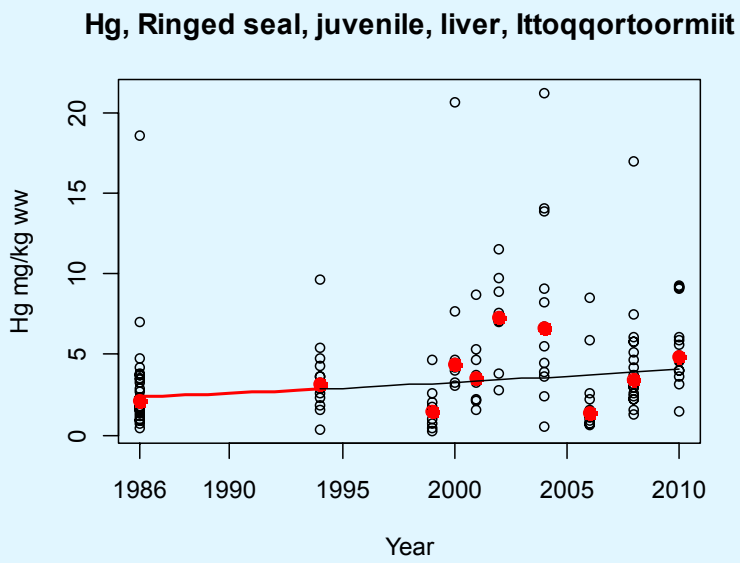
- shorthorn sculpin (2886), blue mussel,(2800),
- bladder wrack (1867), ringed seal(1570),
- Polar bear (1456), crinkled snow lichen (1258),
- harbour seal (1225), sediment (1164),
- Arctic char (1112). Greenland cod (683),
- gerfalcon, (656), walrus (637), Greenland halibut (627),
- deep sea prawn (598), harbour porpoise (556), common rockweed (372),
- hooded seal (362), black guillemot (343), atlantic cod, (326), capelin (313),
- fourhorn sculpin (303), polar cod (299),
- peregrine falcon (298), spotted wolfish (279), snow crab (254), reindeer (245), harp seal (222), minke whale (203), glaucous gull (194), soil (186), narwhal (182), ptarmigan (176), black guillemot egg (172), white-tailed eagle (168), brown seaweed (155), redfish (151), Arctic cod (115).

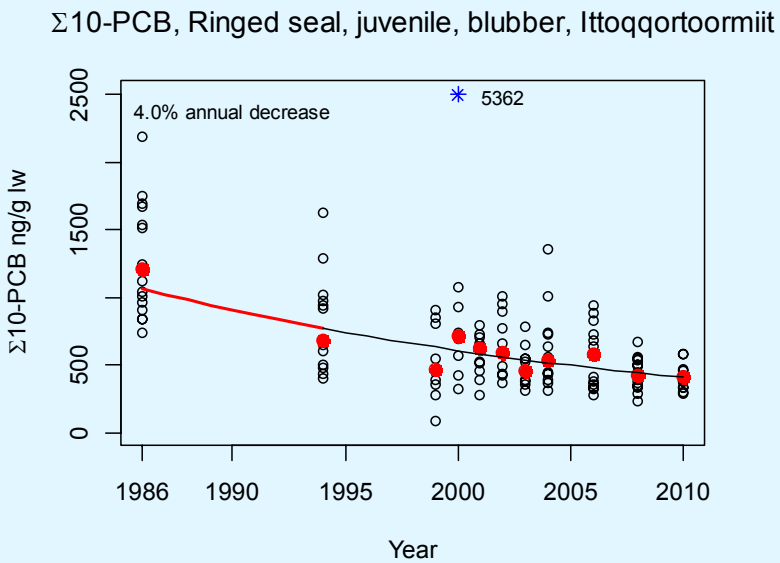
What is the purpose of the sample bank?

- **Background for industrial activities (mining)**
- **Monitoring of industrial activities**
- **Interesting rare samples (rare fish, eagles falcons, polarbear etc.)**
- **Amap projects including temporal trend monitoring**
- retrospective temporal trend

examples of it use in retrospective temporal trend

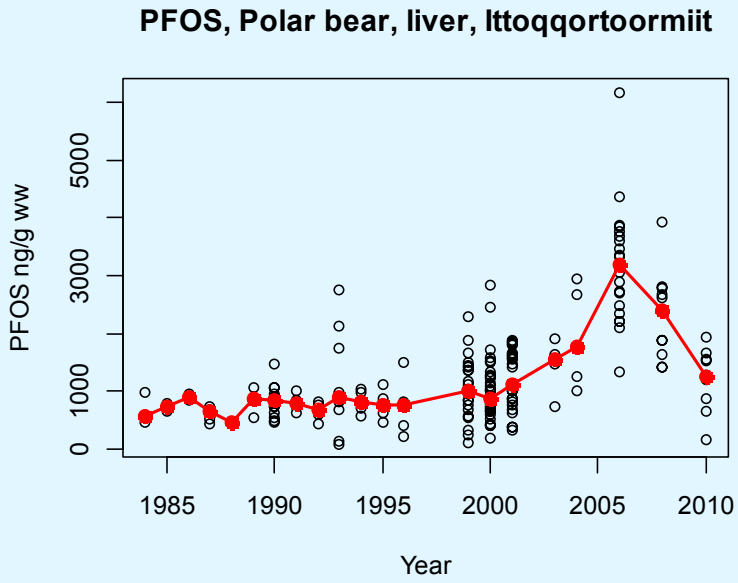
Backward prolonging of existing time-series

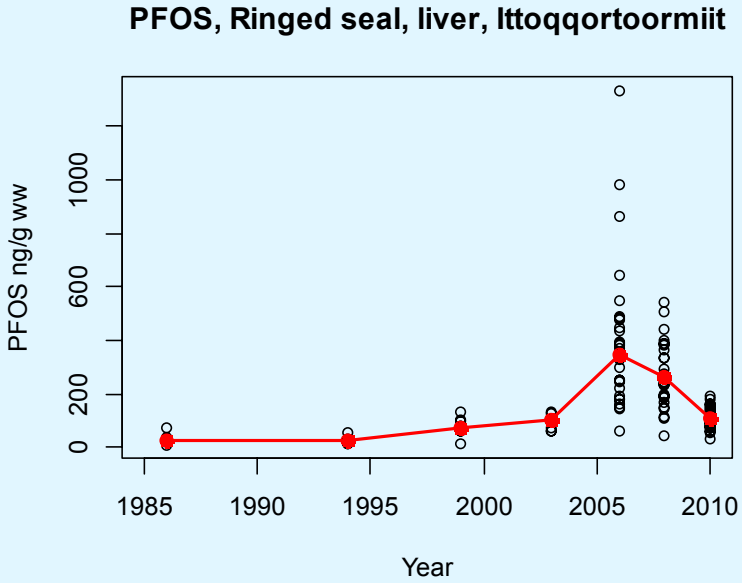




*included in Rigét et al. Sci. Total Environ. 2010, **408**: 2874-2884 and Riget et. al. Sci Total Environ, 2011, **409**: 3520-3526*

Retrospective studies of “new” contaminants

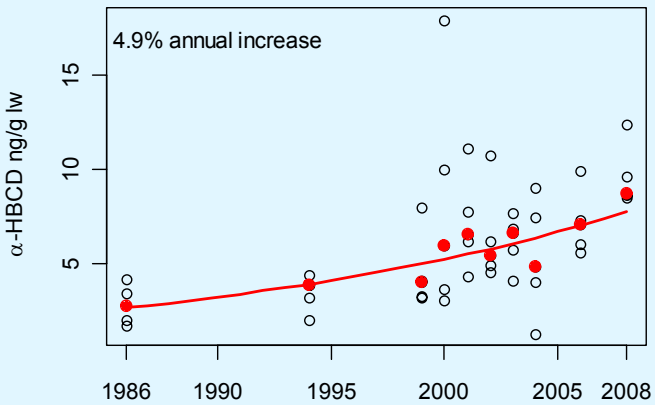




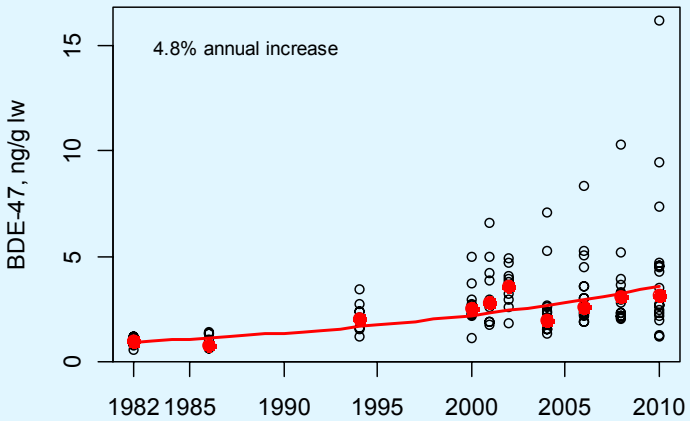
updated from Dietz et al. Environ. Sci. Technol.2008, ***42:*** *2701-2707*
updated from Bossi, Riget, Dietz Environ. Sci. Technol,2005, **39**, 7416-7422

Retrospective studies of “new” contaminants

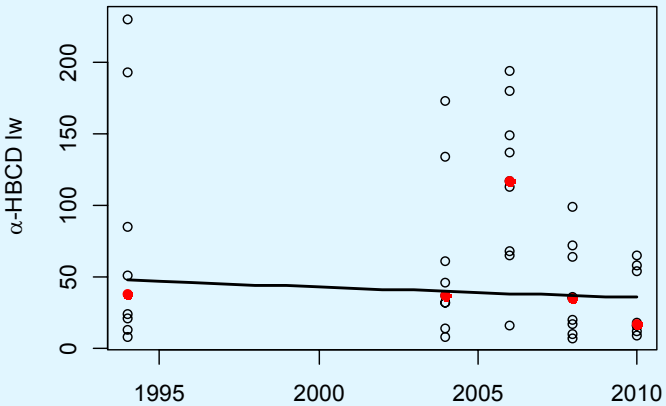
α-HBCD, Ringed seal, juvenile, blubber, Ittoqqortoormiit



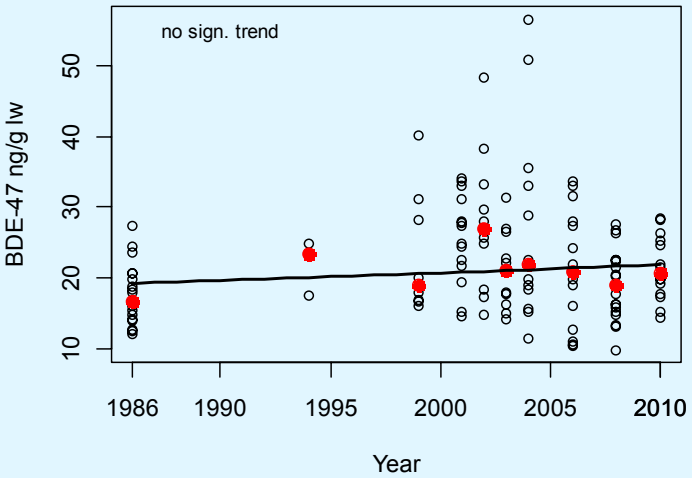
BDE-47, Ringed seal, juvenile, blubber, West Greenland



Glaucous gull, Adult male, Ittoqqortoormiit



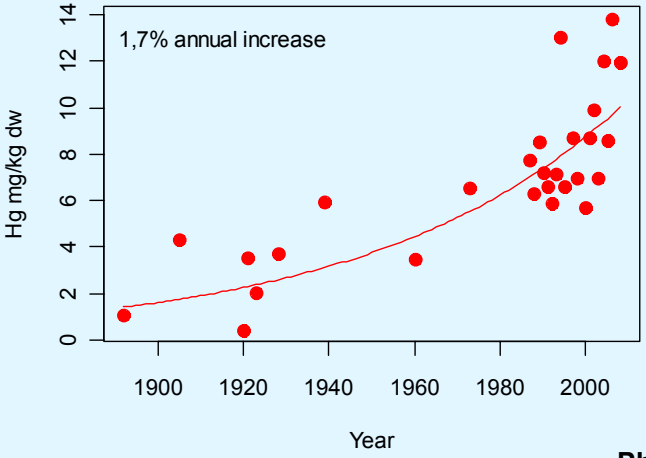
BDE-47, Ringed seal, juvenile, blubber, East Greenland



Vorkamp, Rigét, Bossi, Dietz Environ. Sci. Technol, **45**:1243-1249
*Updated from Vorkamp et al. Environmental International 2008, **34**: 499-508*
Unpubl data

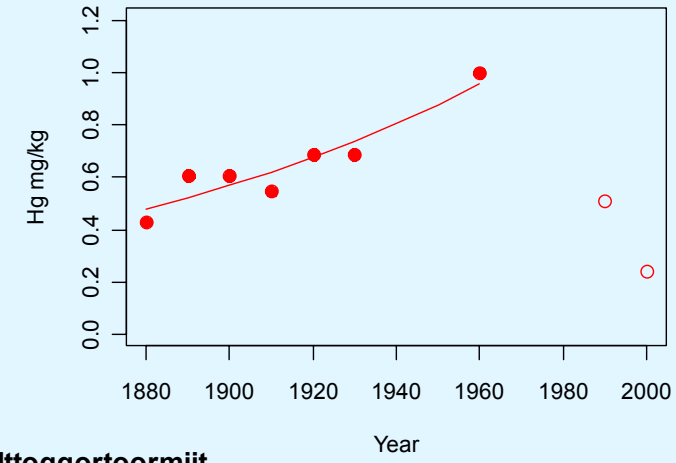
Hard tissue as media

Hg (annual median), Polar bear, Hair, West Greenland



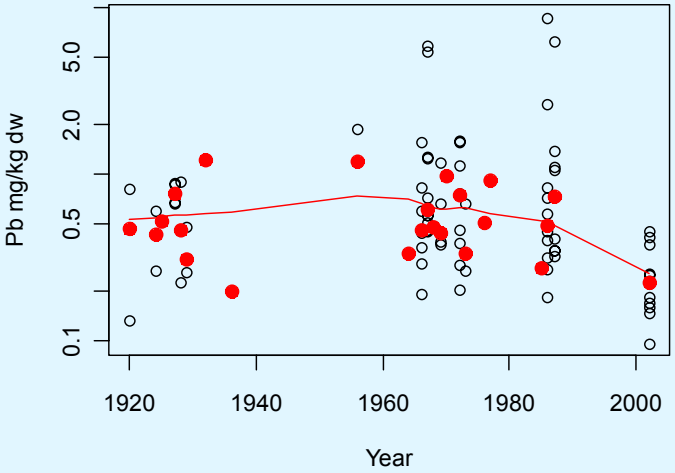
*updated from Dietz et al. Environ. Sci. Technol, 2006,**40**(4): 1120-1125*

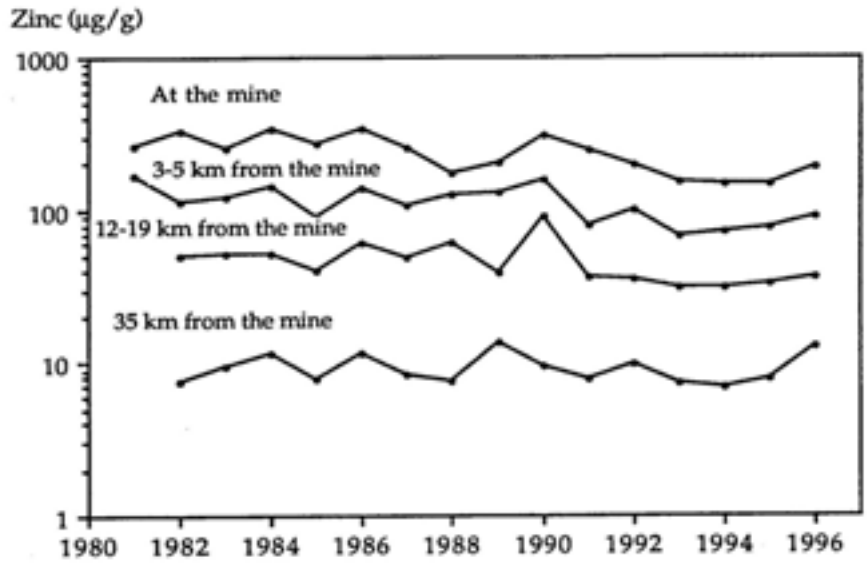
Hg (median 10-year period), Gyrfalcon, feather no. 5, juvenile

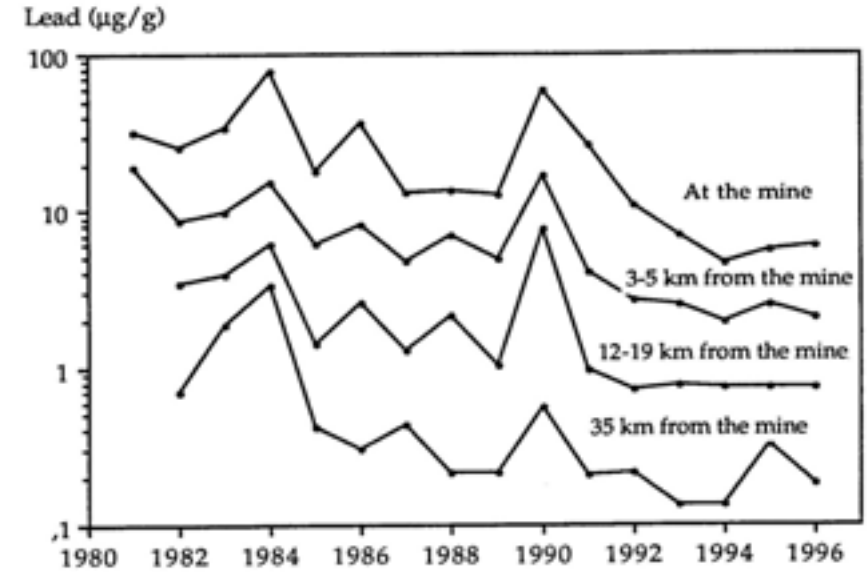


*Dietz et al. Environ. Sci. Technol, 2006,**40**(19): 5911-5916.*

Pb, Polar bear, teeth, Ittoqqortoormiit

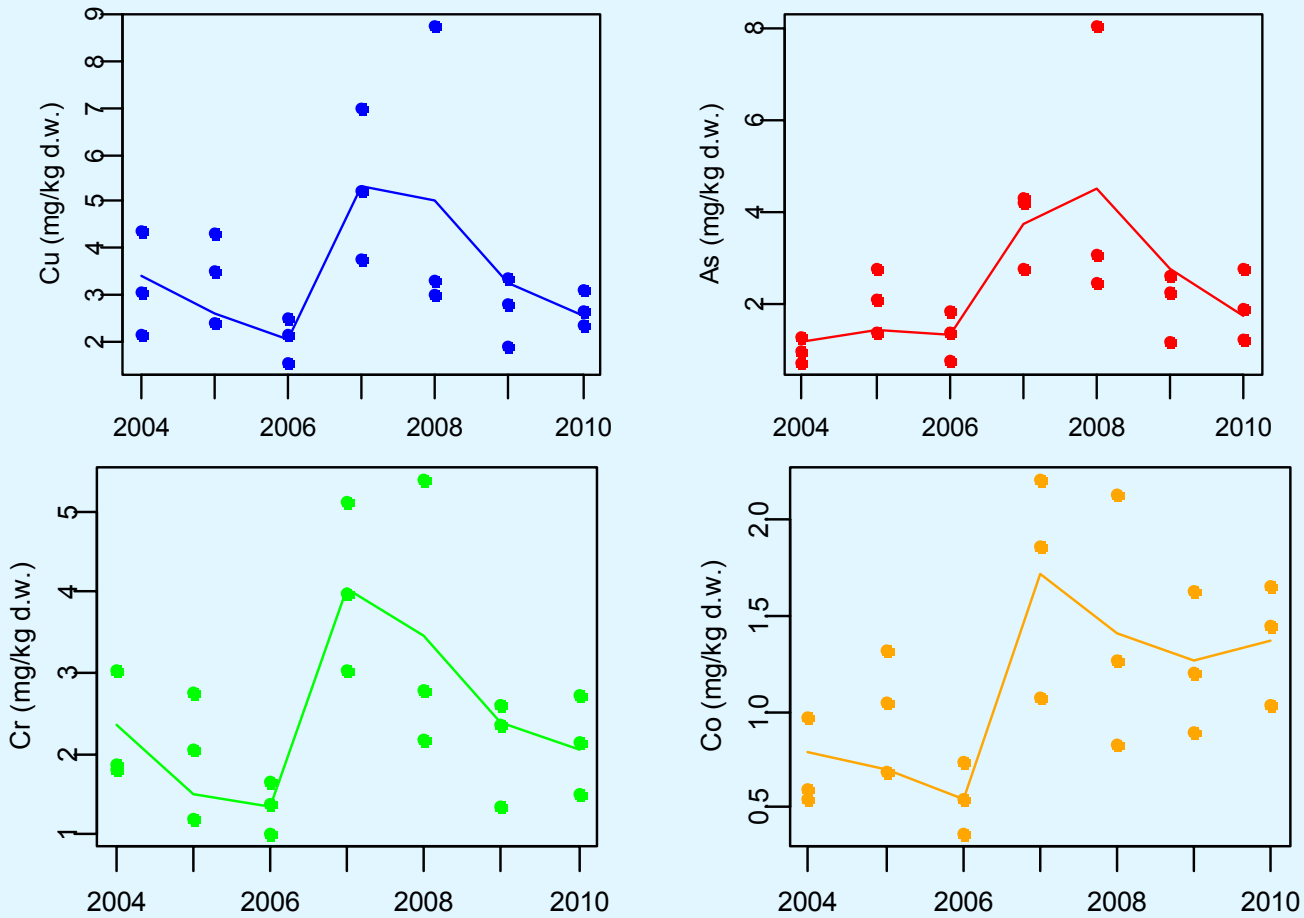






› **Zinc and lead concentrations (µg/g dry weight) in brown seaweed at Maarmorilik zinc and lead mine from 1981 to 1996**

Temporal trends in concentrations of Cu, Cr, As and Co in lichens from area 1 at the gold mine during 2004-2010



Conclusion

- **Our simple sample bank is very useful for the environmental researchers especially when they make retrospective time trend analyses.**
- **Most of our studies could not have been made without the sample bank.**
- **The sampling and storage of samples will continue, but it becomes harder and harder to find space for all the new samples.**
- **Samples stored for one purpose are often used for other purposes.**