



VILDTFORVALTNINGS-DAGE 11-12 NOVEMBER 2024

# ONE HEALTH: INTEGRATION AF ØKOSYSTEMER, MENNESKER OG VILDE DYR

Mennesker, dyr og økosystemer kan ikke studeres isoleret!

- KLIMAÆNDRINGER
- FORURENING
- TAB AF BIODIVERSITET
- ZONOSER



PHOTO: R. DIETZ

# ONE HEALTH



World Health Organization

- KUN PATOGENER!
- VETERINÆR-PROFESSION SIDEN 9000 B.C
- FOR ALVOR ETABLERET I 1700-TALLET
- INTERDISCIPLINARITET

# BLOT EN LILLE DEL AF PLANETARY HEALTH

## TRIPPLE/QUADRUPLE PLANETARY CRISIS



JAGT

SHIPPING

ANLÆGS-  
ARBEJDE

TURISME

OLIE

FORURENING

FISKERI  
BLUE FOOD

KLIMAÆNDRINGER

PRÆDATION &  
KONKURRENCE

SYGDOMME

FØDEVARE-  
SIKKERHED

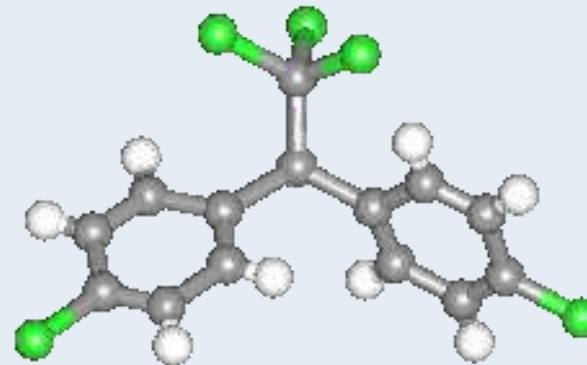
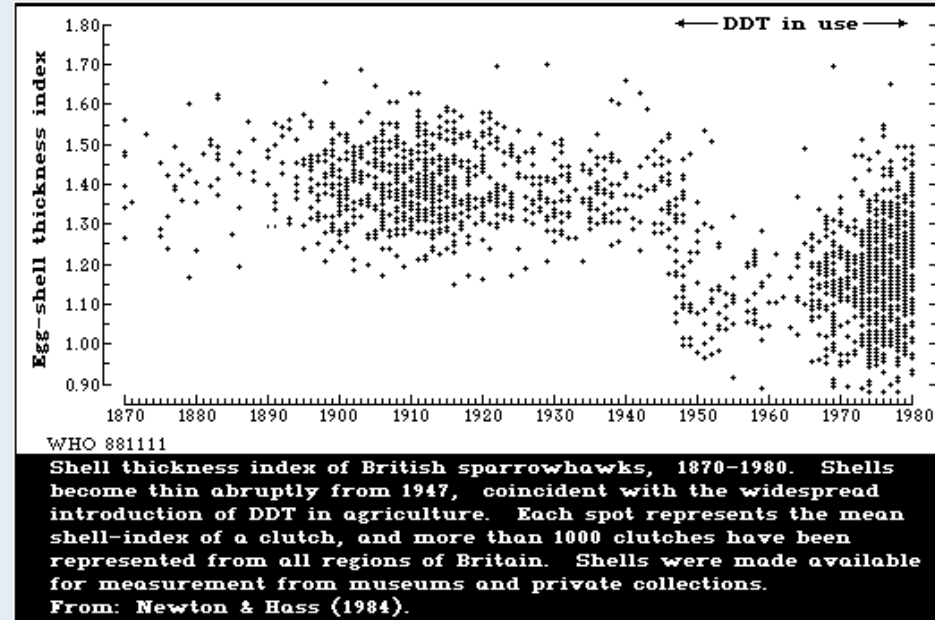
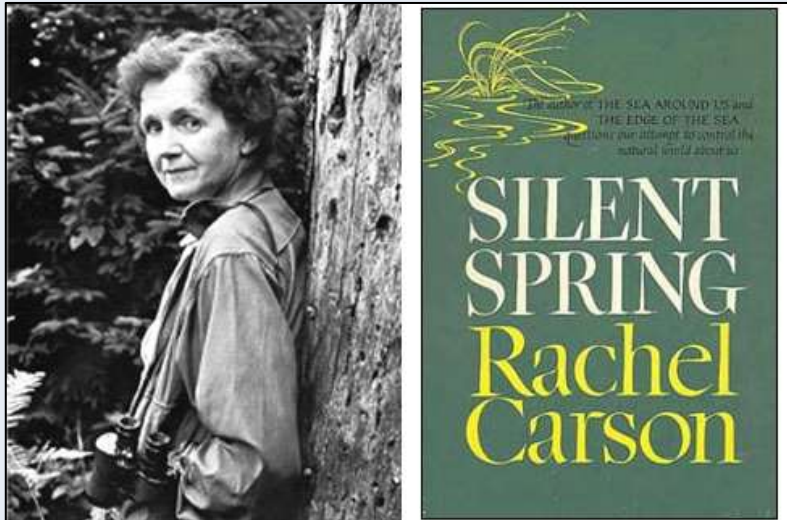




# THE SILENT SPRING: FØRSTE PLANETARY HEALTH CASE?

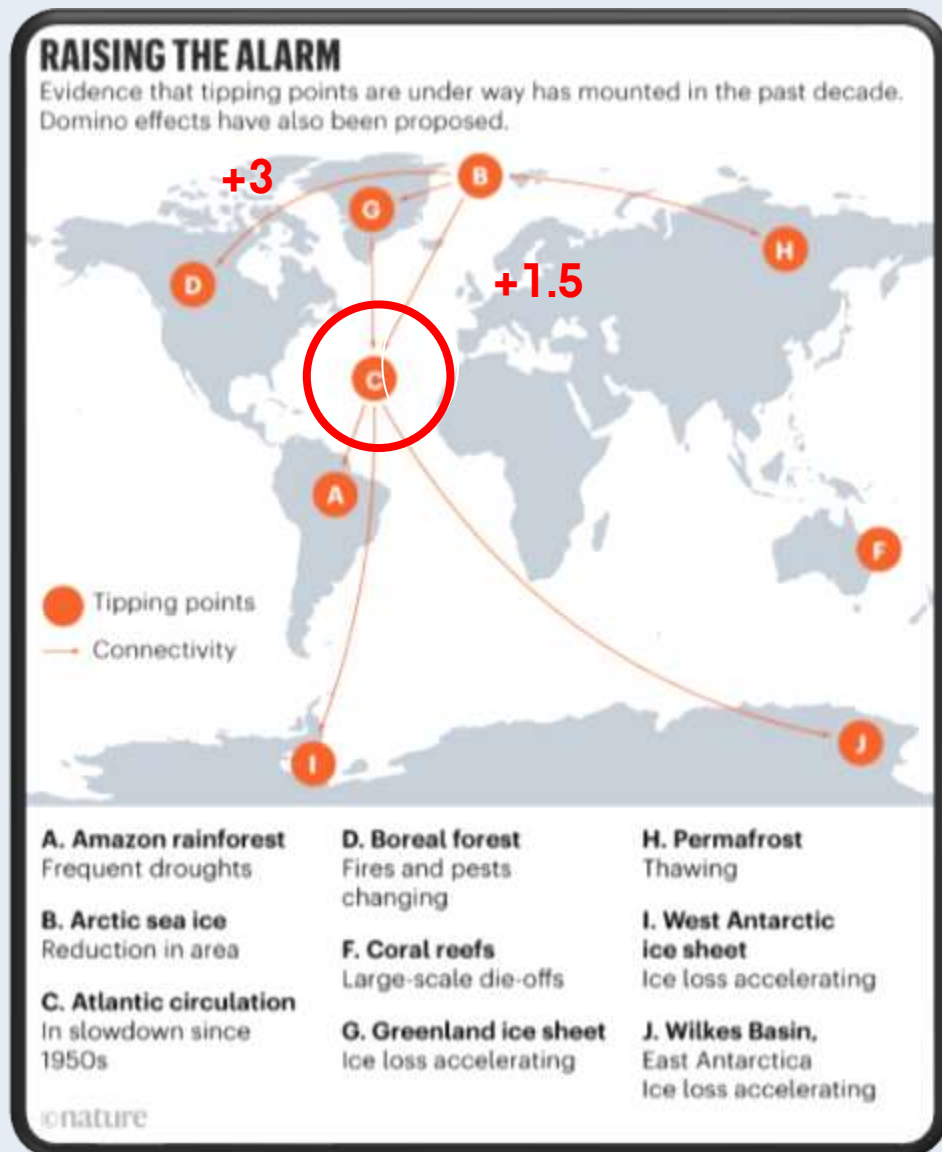
Rachel Carson

- The Sea Around Us (1952)
- Silent Spring (1962)



<https://www.youtube.com/watch?v=lpbc-6lvMQI>

# DE GLOBALE KLIMA VENDEPUNKTER

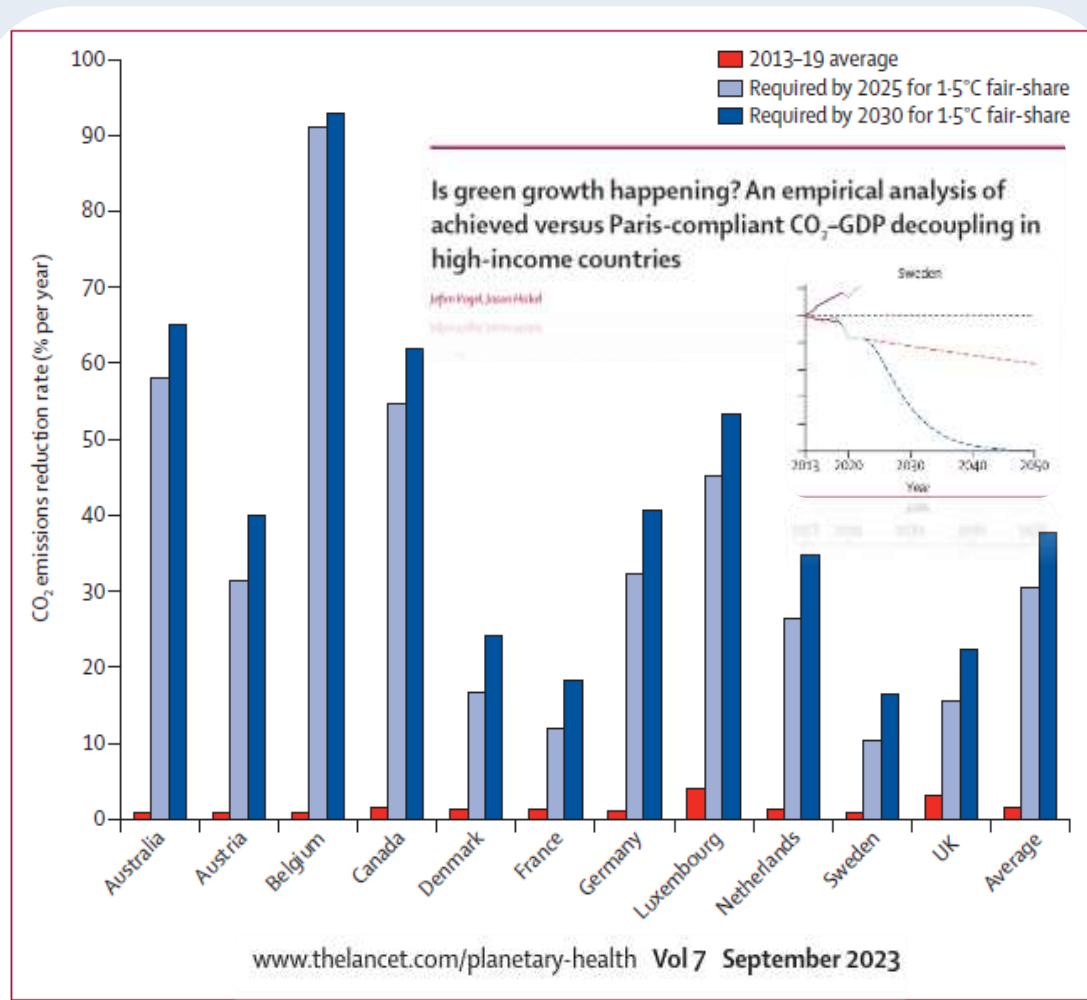


- 9 KLIMA-VENDEPUNKTER
- 6 VED POLERNE
- FORURENING
- TAB AF BIODIVERSITET OG HABITATER
- ZONOSER
- ATLANTISKE CIRKULATION
- THERMOHALINE CIRKULATION
- BLUE FOOD – KØD FRA HAVET

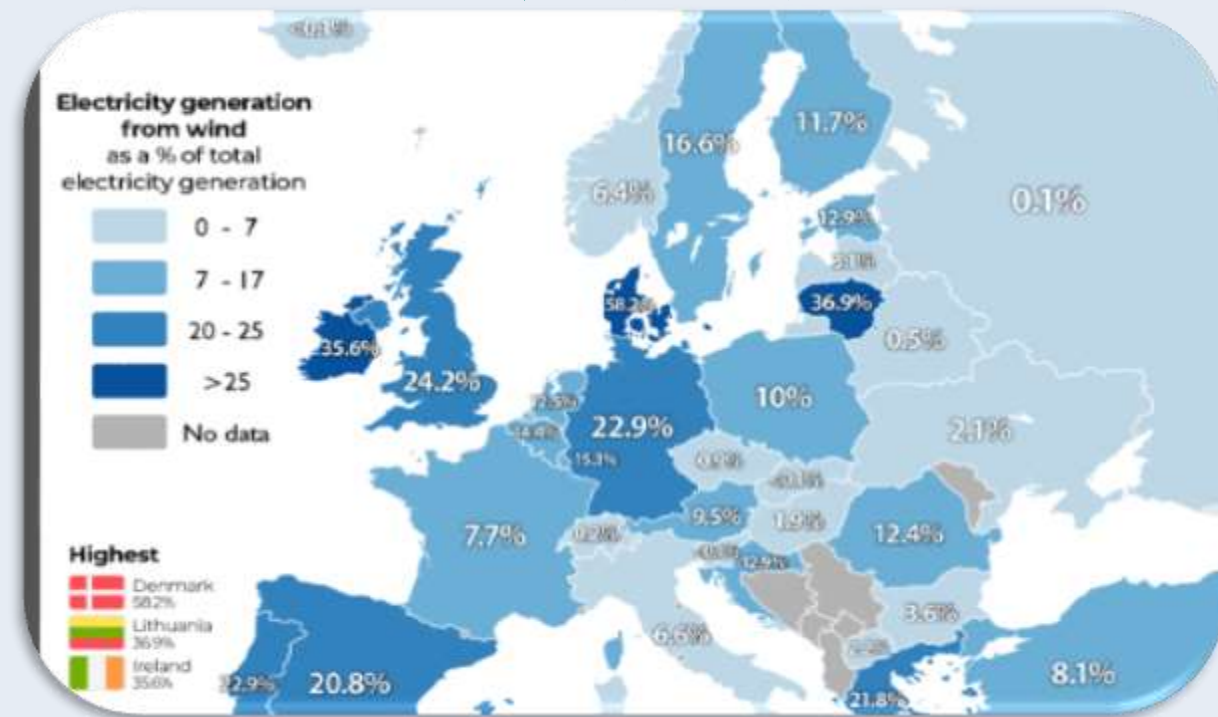
Lenton et al. Nature 575:592-595 (2019):  
*Climate tipping points — too risky to bet against*

# EUROPA NÅR MÅSKE PARIS-AFTALEN I 2175

## EU VINDENERGI



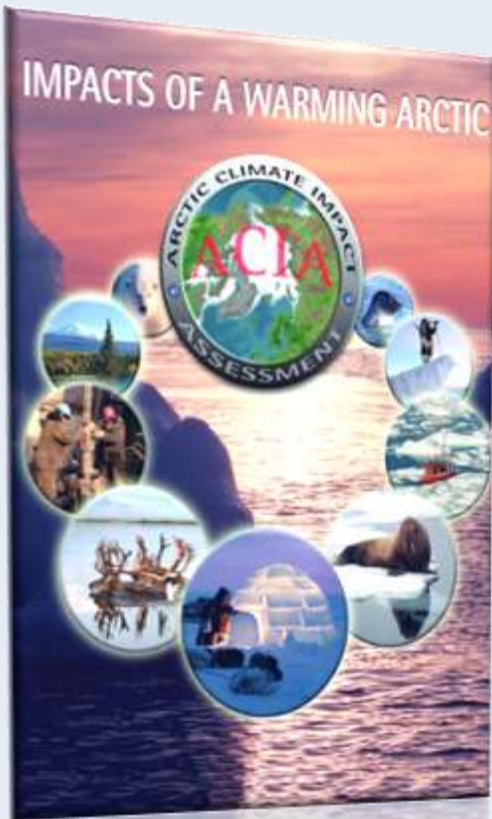
**Figure 3:** The emission reduction rates required for high-income countries to respect their 1.5°C fair-shares (blue) are several times faster than the emission reduction rates they have achieved through recent absolute decoupling (red)



- National territorial princippet
- High-income lande er ikke grønne
- Vi skal øge Upcycling & Recycling
- Reduce use-of-goods strategies
- Vi når Paris-aftalen I 2175 I Europa



# OVERVÅGNING AF PLANETARY HEALTH I ARKTIS



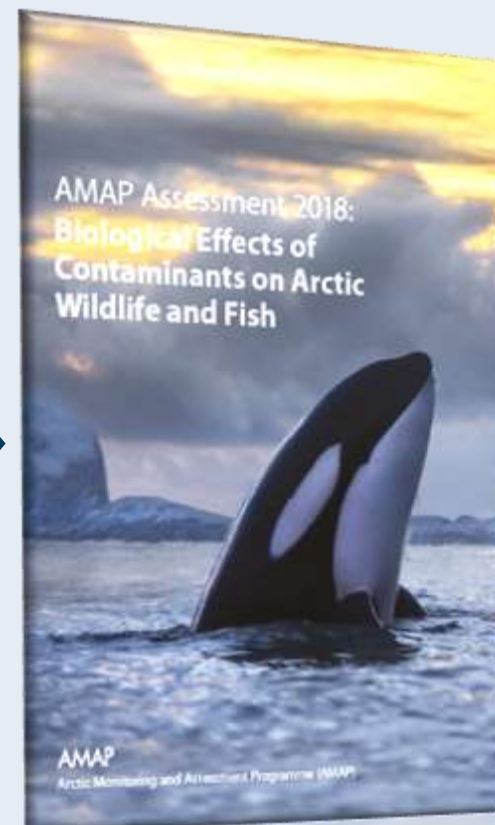
2004

KLIMAÆNDRINGER



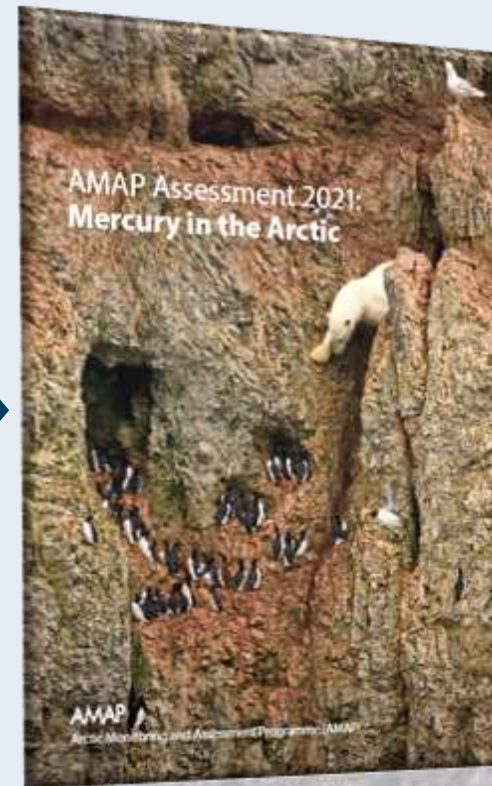
2013

BIODIVERSITET



2018

MILJØGIFTE



2021

TUNGMETALLER

# I ARKTIS GØR VI SINDSSYG MEGET! - I DANMARK FORSVINDENDE LIDT!

Bioinformation  
- integration af Miljø  
ændringer (One Health)

**Forurening**

Klimacændringer  
Fødekæde-ændringer

Biodiversitet  
Zoonoser

Human eksponering  
Translational medicine

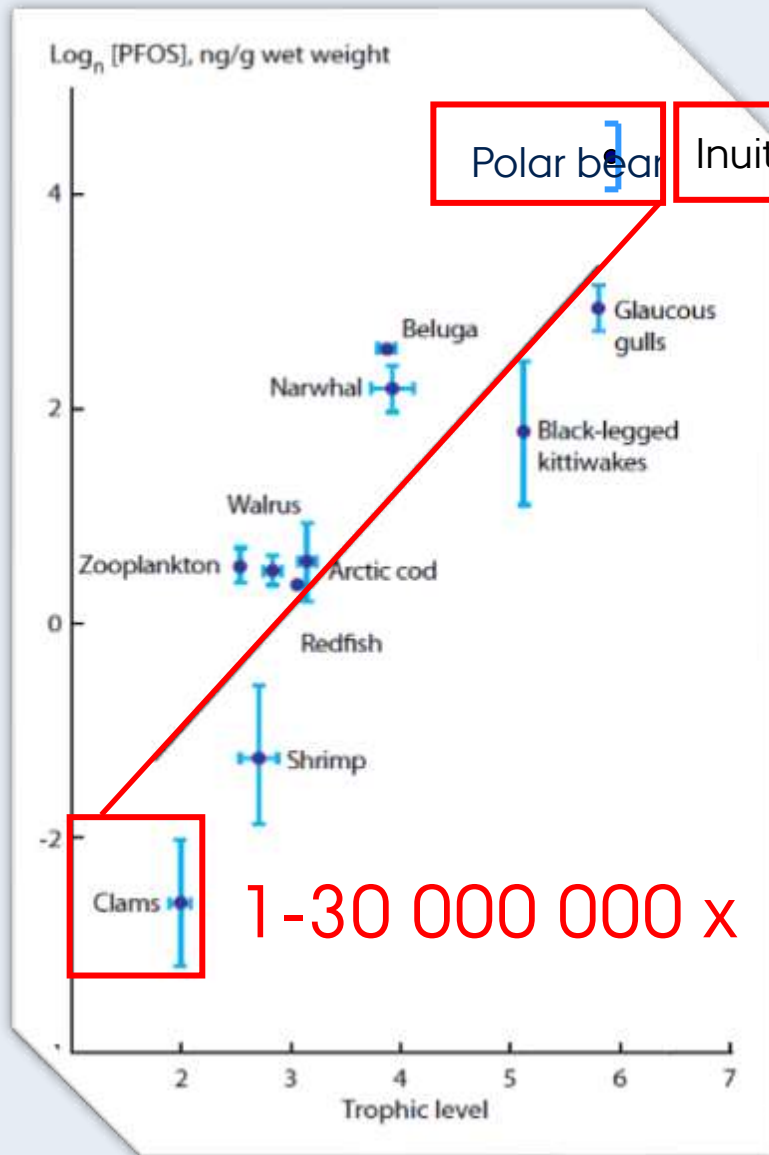
... lokal viden, kultur og sundhed

>1.5 mill Google  
hits  
"polar bear"  
"pollution"



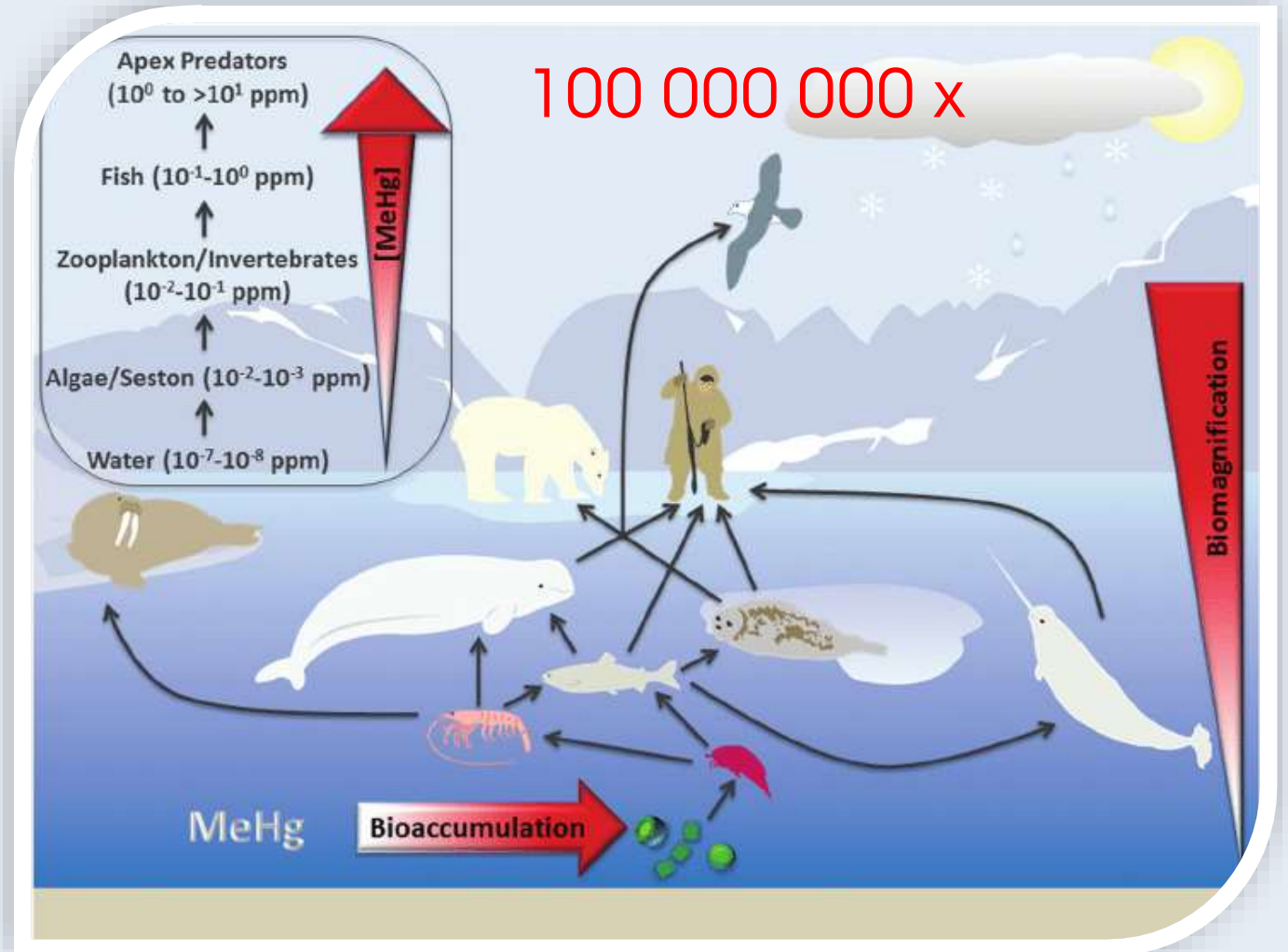


# BIOMAGNIFICERING I ARKTISK AF KVIKSØLV OG PFAS



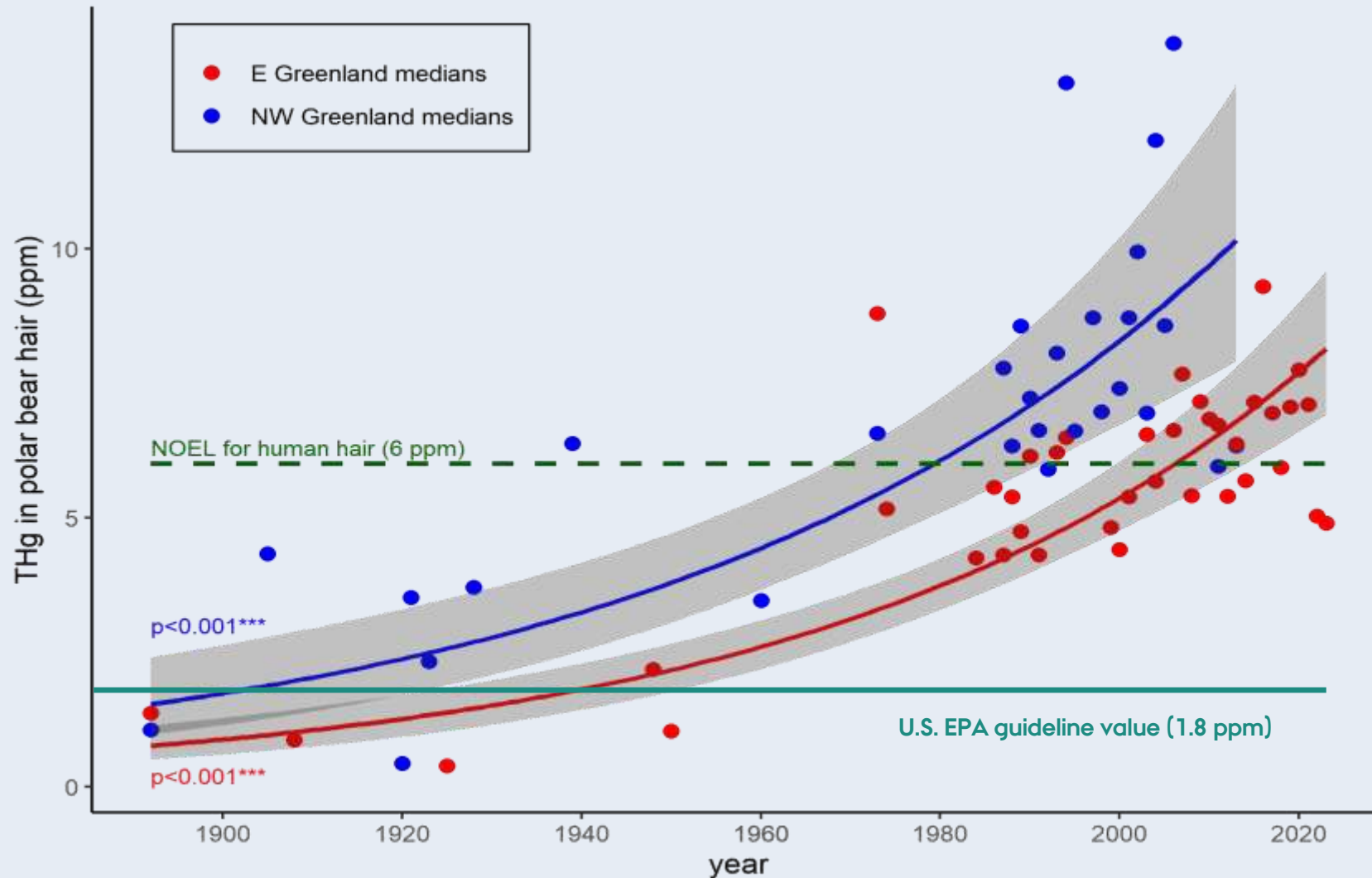
SOURCE: AMAP

Lange, langsomme, fedt- og protein-holdige fødekæder

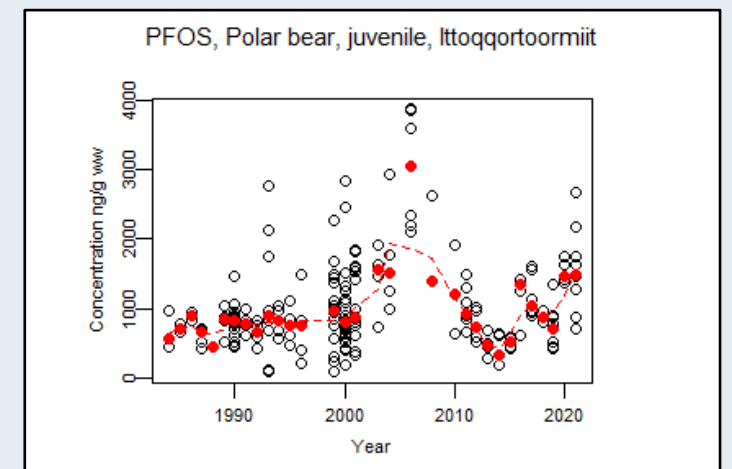
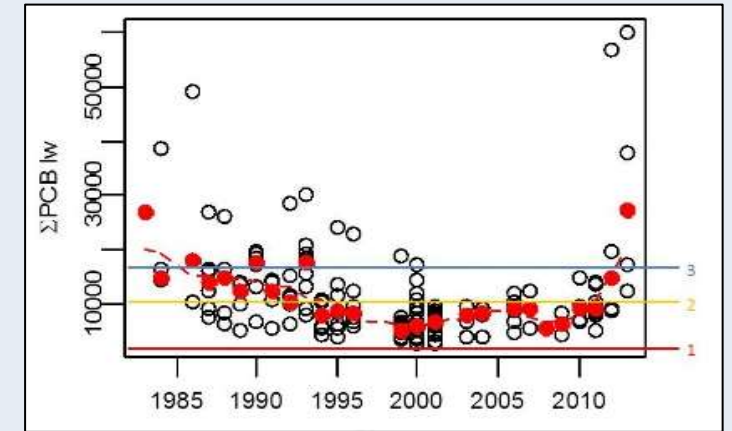
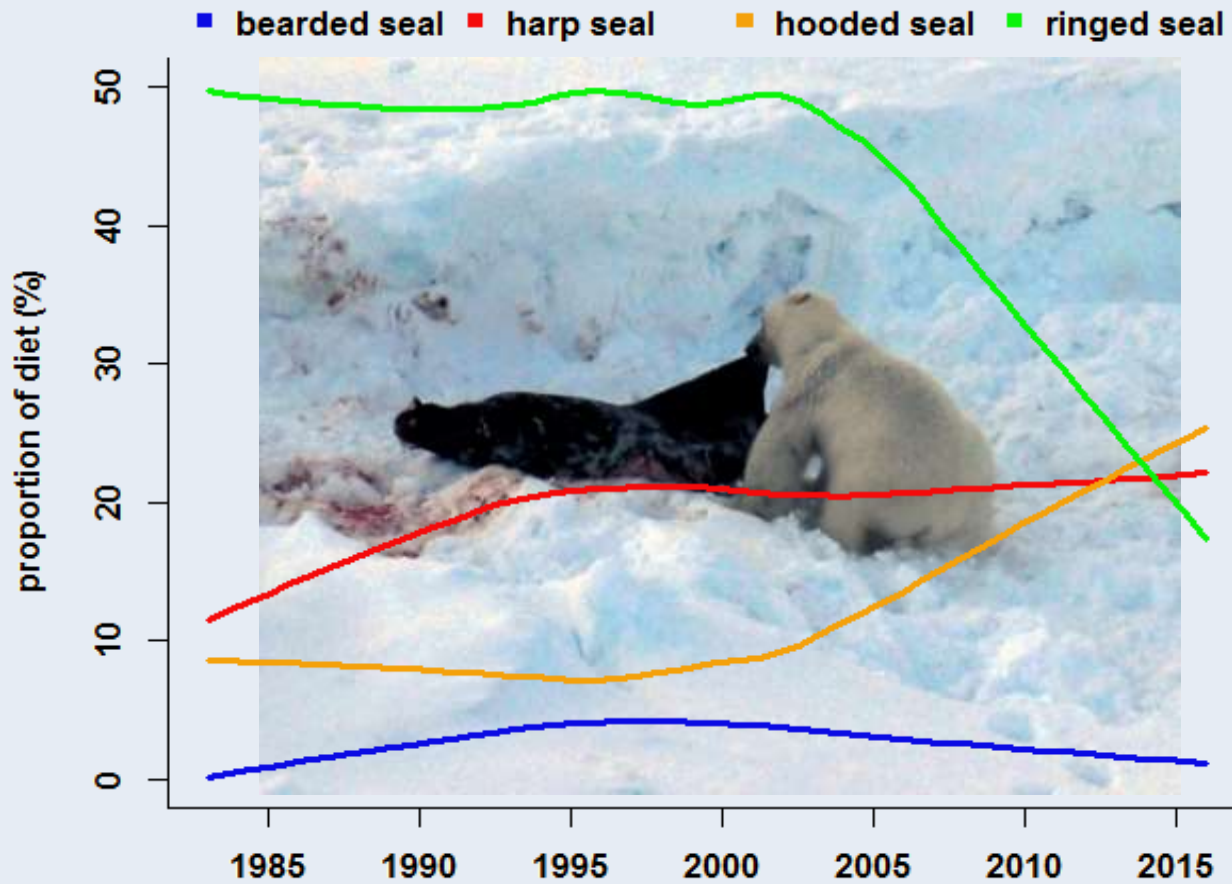


# LANG TIDSSERIER ER SINDSYGT VIGTIGE!

Dette studium er brugt af FNs miljøprogram Minemata



# LANGE TIDS-SERIER: KLIMAÆNDRINGER PÅVIRKER ISBJØRNES FØDEGRUNDLAG





# NYE ARTER KOMMER TIL ARKTIS – OG DANMARK! LANGE TIDSSERIER AF FANGST OG EFFEKTER



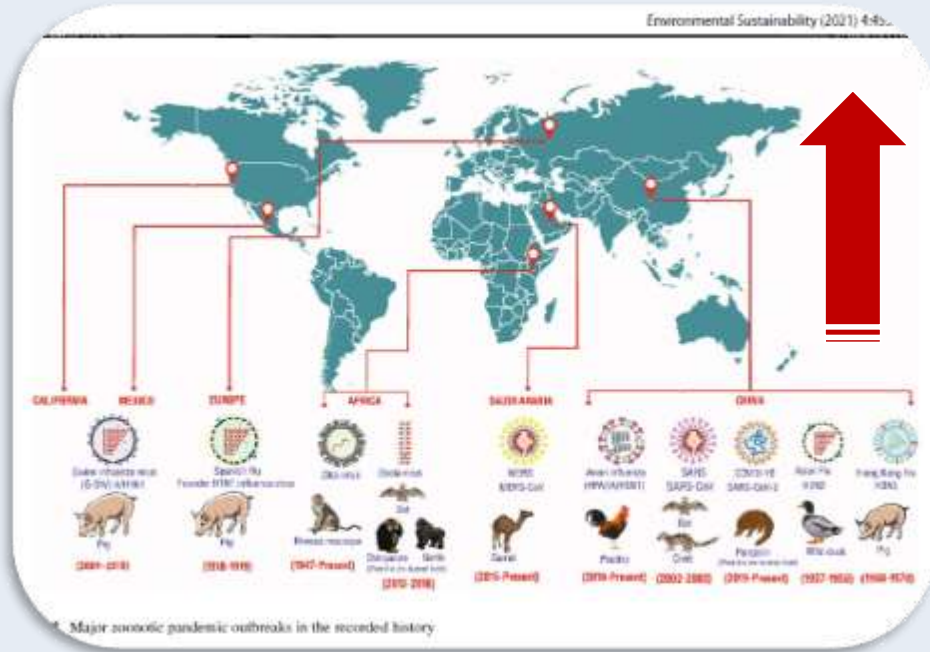




# MED GLOBAL OPVARMING RYKKER ARTER OG SYGDOMME MOD NORD: ØGER RISIKOEN FOR PANDEMIER

~75% AF SYGDOMME I STIGNING ER ZONOSER

STARTER DEN NÆSTE PANDEMI I ARKTIS?



- INVASIVE ARTER
- NYE VEKTORER
- KØD-KONTROL
- KØD-MARKEDER
- PERSONLIG BESKYTTELSE
- NAIIVE ARTER
- INFLUENZA DEN NÆSTE?



A personal take on science and society

## World view

...in forces to counter  
...ctic pandemic threat



By Christian Sonne

Emerging disease risk is the fourth component of a quadruple crisis brewing in the Arctic.

The Arctic is under stress, that much is known. Between 1979 and 2021, the region warmed four times faster than the global average, with effects – as yet poorly understood – on its ecology and ability to store carbon, on global sea levels and on wider ocean-circulation and weather patterns. Add in the effects of biodiversity loss and pollution, and people often refer to a triple planetary crisis. I think we should actually be talking about a quadruple crisis. Since starting research in the Arctic in 1997, I have spent nearly all of my summers there, monitoring changes in pollution levels, habitats and food webs using a 'One Health' approach that integrates effects on wildlife, humans and ecosystems. And it's becoming clear that, as the Arctic warms, its environment degrades and human activities increase, new health threats are emerging. In particular, the Arctic is likely to become a hotbed for zoonotic diseases that spill over into humans from other animals. That threat was brought home to all of us by the COVID-19 pandemic. We need to take seriously the possibility that the next pandemic could come from the north.

Some 60% of emerging infectious diseases are zoonotic. Their emergence and spillover is in general highly inter-linked with habitat degradation, biodiversity loss and food-web changes – all of which are present in the Arctic. But a warming Arctic harbours other risks. As sea ice thaws, 'forever chemicals' are increasingly being transported into Arctic environments. These include mercury, per- and poly-fluoroalkyl substances and polychlorinated biphenyls, all known to modulate human and animal immune systems and increase vulnerability to respiratory infections. Invasive fish and whale species are also bringing in industrial chemicals and their own diseases.

The pathogens enter an environment in which some native species, such as polar bears (*Ursus maritimus*), have not been exposed to them, and so are at increased risk. The release of ancient microorganisms long frozen in ice and sediments as the landscape thaws adds to this danger: humans and other wildlife are likely to lack any immune defences against them.

These risk factors are set to increase. The first ice-free Arctic summers could come as early as the 2030s. The Arctic Ocean has huge potential for energy, fishery and tourism sectors, and is not subject to any global treaty regulating its exploitation. Further wildlife disturbance, pollution, overfishing and jurisdictional conflicts are the likely result. The current perception is that the Arctic possesses relatively low microbial activity. Compared with temperate and tropical latitudes, many fewer resources are devoted

to studying zoonoses in the Arctic, with sparse surveillance for emerging threats in most areas. This needs to change – taking account of human, animal and wider environmental perspectives.

When it comes to logistics, low-tech is high-tech in the Arctic. On the human side, Canadian researchers have already started taking samples from sewage and other sources that can easily be analysed for the presence of viral pathogens. This kind of approach should be combined with better access to community health care, clinical inspections and consultations with local doctors. A particular flash point is the handling and consumption of raw or dried animal meat in subsistence-hunting communities. Hygiene courses, meat inspection and better disease surveillance developed in partnership with those communities can help to both sustain food security and prevent spillover events.

On the wildlife side, long-term finance is needed for yearly and seasonal surveillance programmes. These schemes should collaborate with local communities using existing techniques that don't rely on technologies such as cryogenics and so are easy to use *in situ*. Such activities could be embedded into the ongoing Arctic Council monitoring and assessment programmes on pollution, biodiversity and climate change, as laid out in the council's 'One Arctic, One Health' project.

On the broader environmental front, efforts to reduce pollution, safeguard biodiversity and reduce greenhouse-gas emissions through international agreements play their part. Efforts spearheaded by various Arctic Council working groups, and other initiatives such as the ongoing negotiations for a United Nations-backed treaty on plastic pollution, show how intergovernmental and interdisciplinary collaboration across public health, biodiversity conservation, pollution and food security can help with achieving sustainability.

To make a true difference, there is need for a broader Arctic monitoring and assessment plan, underpinned by treaty, that combines surveillance of pollution and of disease. This is currently difficult to achieve through the Arctic Council, given the absence of Russia and Russian data since the country's invasion of Ukraine in 2022. A better opportunity to establish a holistic understanding and action plan might be afforded by the proposed pandemic-preparedness treaty, currently under negotiation at the World Health Organization. This could build on the efforts of almost 200 globally recognized One Health Networks, including those in the Arctic.

Action must be taken now. If it isn't, it will become more difficult to mitigate wildlife interactions and diagnose, treat and isolate people with an infection – and the risk of a future pandemic with an Arctic ground zero will only increase.

Christian Sonne is a professor in the department of Ecoscience at Aarhus University in Roskilde, Denmark. e-mail: cs@ecos.au.dk



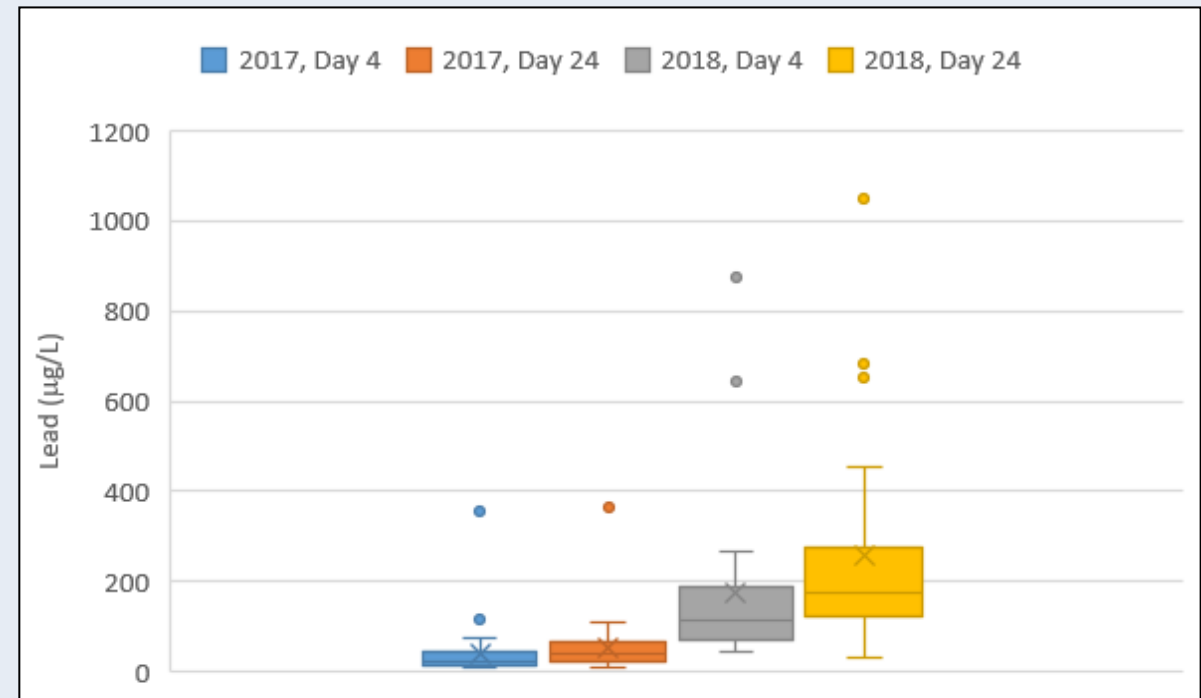
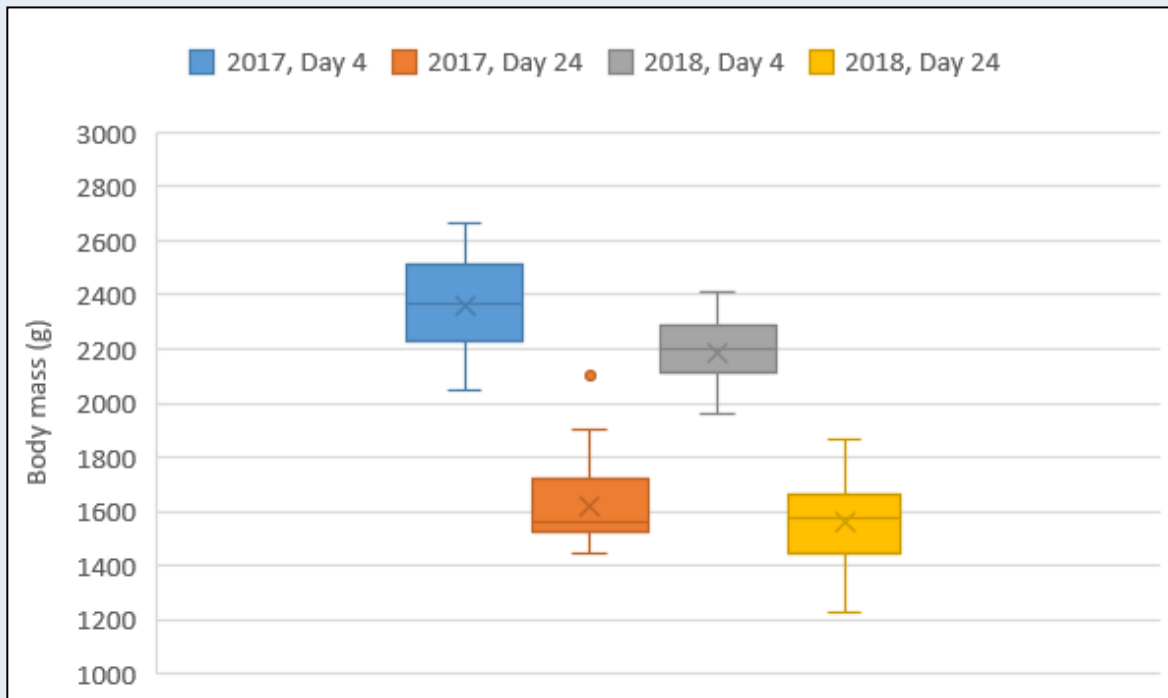
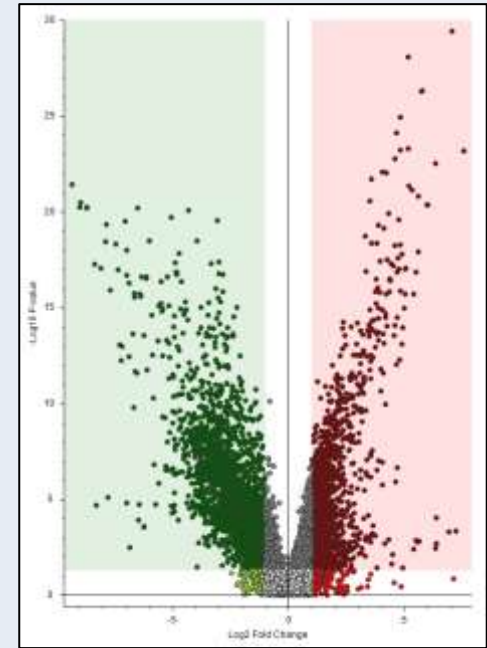
# DANMARK MANGLER SOLIDE GENNEM-TÆNKTE OVERVÅGNINGS-PROGRAMMER A LA ARKTIS

- NOVANA (MILJØFREMMEDE STOFFER). LONGITUDINAL CROSS-SECTIONAL
- OVERVÅGNING AF FUGLEINFLUENZA (FUGLE, SÆLER) --- RELATION TIL FASANER?
- OVERVÅGNING AF BLY I GÆS. SOLIDT OPFØLGENDE CROSS-SECTIONAL/LONGITUDINALT COHORT DESIGN
- VIRUS-INFEKTIONER I TRÆKFUGLE PÅ CHRØ
- VINGE-UNDERSØGELSER (JAGTUDBYTTE)
- FALDVILDT. CROSS-SECTIONAL - TILFÆLDIGT OG ELENDIGT. PENGE LIGE UD AD VINDUET
- PFAS I DANSKE HAVPATTEDYR I TID OG RUM (2 SOLITÆRE STUDIER). LONGITUDINAL CROSS-SECTIONAL
- PFAS I DANSKE FUGLE OG KLOVBÆRENDE VILDT IN PROG (2 SOLITÆRE STUDIER). CROSS-SECTIONAL
- .....?



# STUDY DESIGN ER ALT!

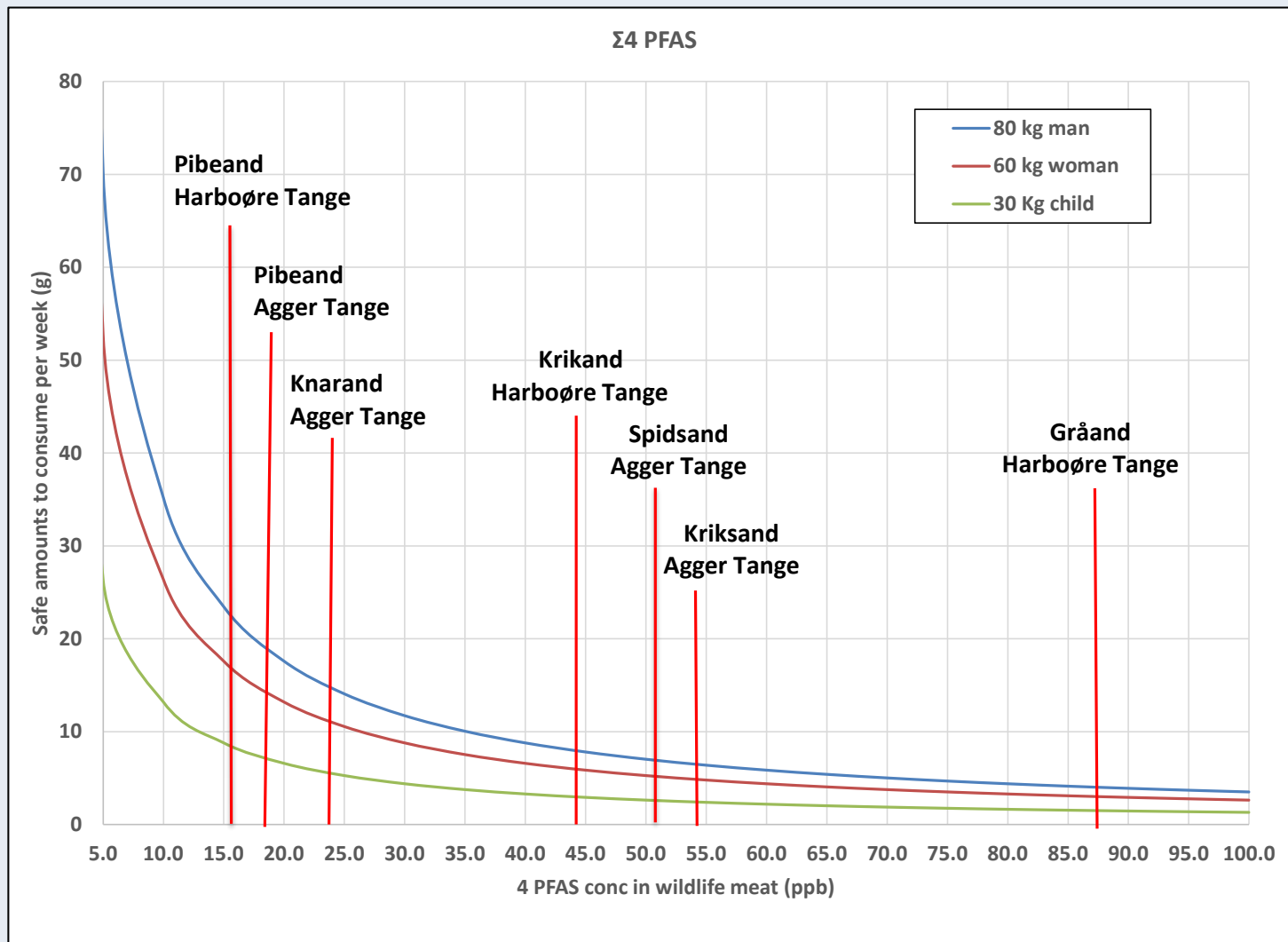
- DET ROBUSTE STUDY DESIGN: GENTAGNE MÅLINGER PÅ SAMME INDIVID OVER GENERATIONER (COHORTE). KRÆVER GEN-FANGST
- ALTERNATIVER: CASE-CONTROL, MANIPULATIVE OG TVÆRSNIT-STUDIER (FALDVILDT). KRÆVER IKKE GEN-FANGST







# ET PRESSET DANSK HAVMILJØ



PFAS ANALYSER GENNEMFØRT  
AF MST, NIRAS OG AU

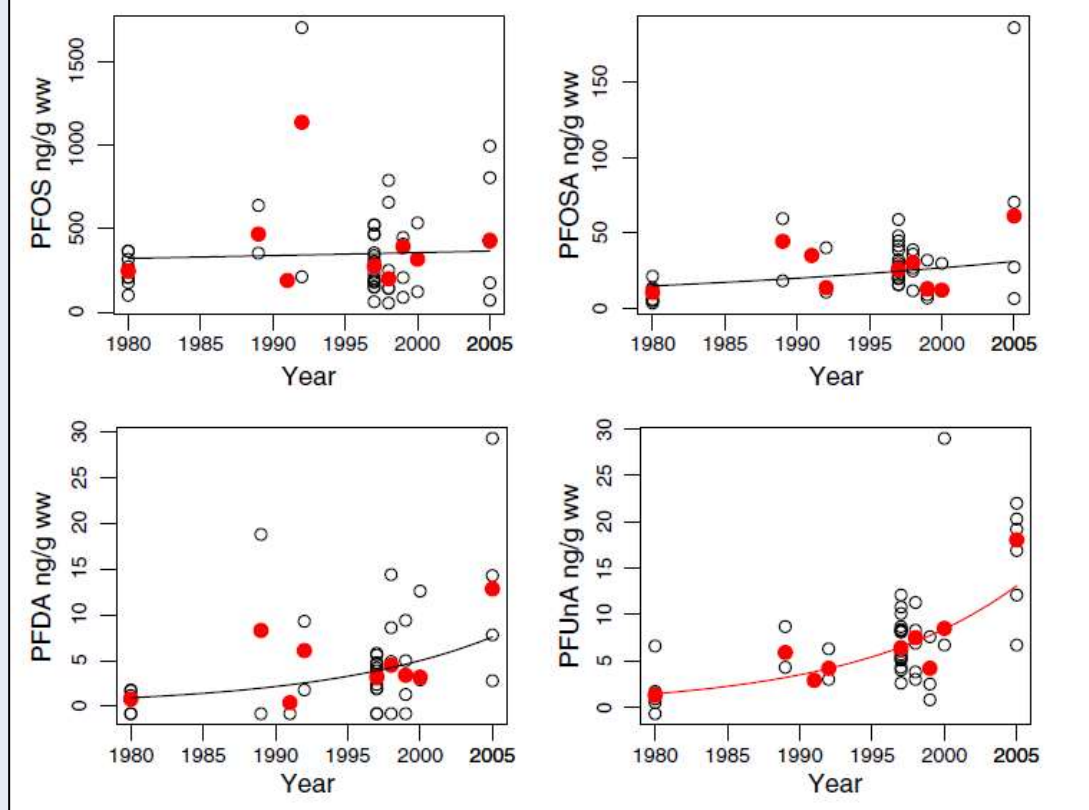
NYE STUDIER PÅ VEJ AF FUGLE  
OG KLOVBÆREDNE VILDT

# TO STUDIER AF PFAS I DANSKE HAVPATTEDYR



## Temporal and life history related trends of perfluorochemicals in harbor porpoises from the Danish North Sea

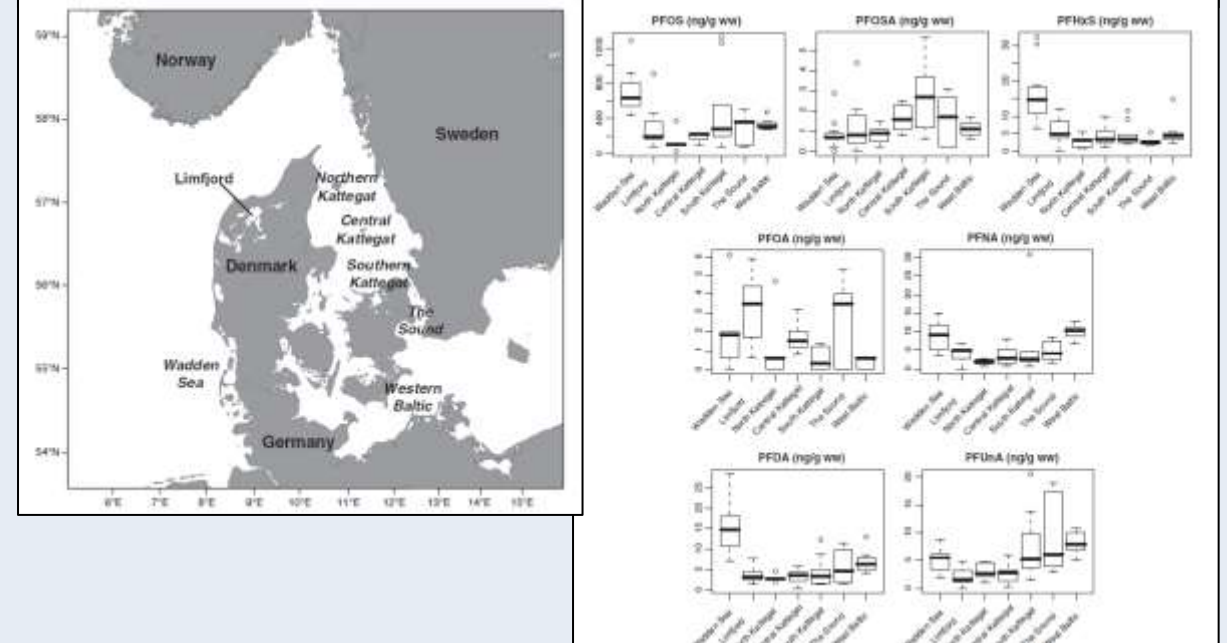
Anders Galatius<sup>a</sup>, Rune Dietz<sup>a,\*</sup>, Frank F. Rigét<sup>a</sup>, Christian Sonne<sup>a</sup>, Carl Christian Kinze<sup>b</sup>, Christina Lockyer<sup>c</sup>, Rossana Bossi<sup>d</sup>



Short Communication

## Spatial trends of perfluorochemicals in harbor seals (*Phoca vitulina*) from Danish waters

Rune Dietz<sup>a,\*</sup>, Frank F. Rigét<sup>a</sup>, Anders Galatius<sup>a</sup>, Christian Sonne<sup>a</sup>, Jonas Teilmann<sup>a</sup>, Rossana Bossi<sup>b</sup>



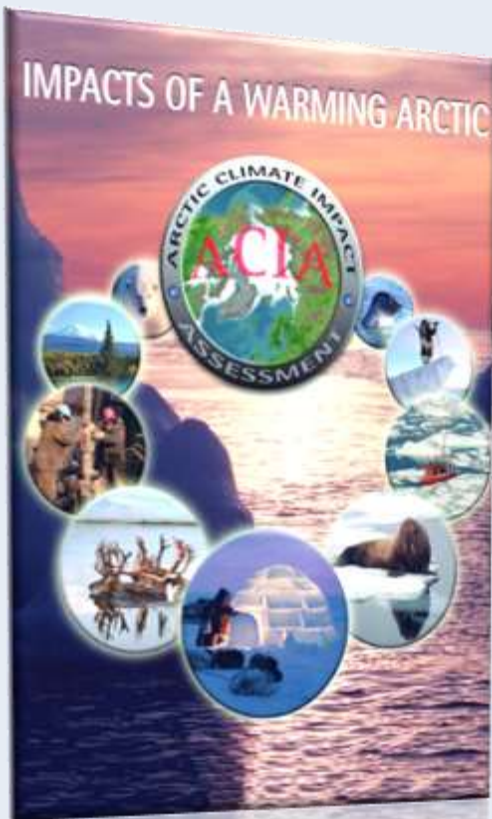
# KONKLUSIONER OG FORSLAG

- ALT FOR FÅ LANGE FOKUSEREDE MONITERINGSPROGRAMMER I DK
- TIL STUDIER AF QUADROUPLE PLANETARY CRISIS
- JAGTEN OG JÆGERNES OG LYSTFISKERNES EKSPONERING
- RENE FØDEVARE FRA NATUREN (PLUS DRIKKEVAND)
- REKREATION OG GRØNT INDEX
- UDVÆLGE SENTINEL KEY SPECIES - RÅDYR, KRONDYR, HAVFUGLE, GÆS, SÆLER, MARSVIN, ULV, ODDER, FISK (INKL. FERSK) ..... ANDRE?
- OVERVEJ COHORTER - EDERFUGL OG KLOVBÆRENDE?
- MANIPULEREDE STUDIER - CASE-CONTROL OG COHORTER
- SPIL IND TIL KONVENTIONER (BIODIVERSITET, FREDNINGER, FORURENING, SYGDOMME.....)





# HVIS I VIL VIDE MERE OM PLANETARY HEALTH & ARKTIS:



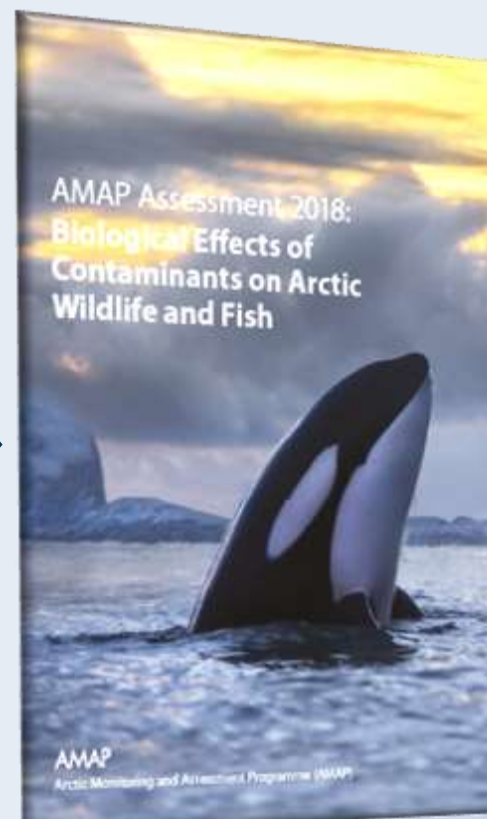
2004

KLIMAÆNDRINGER



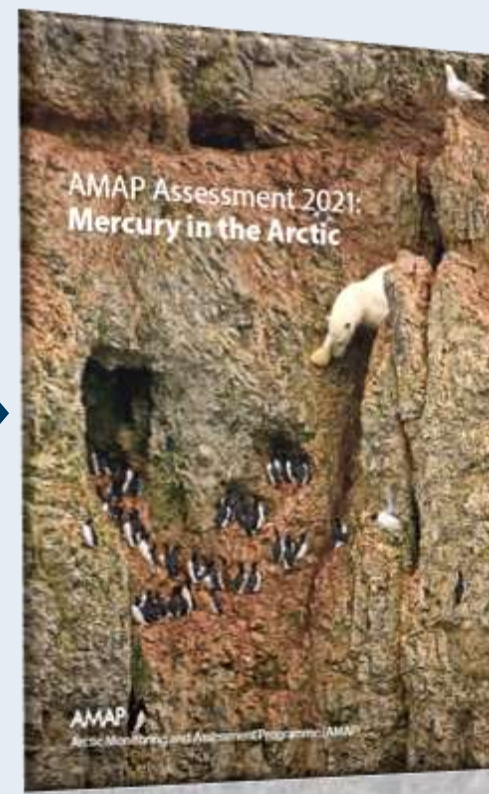
2013

BIODIVERSITET



2018

MILJØGIFTE



2021

TUNGMETALLER