

Cultural Tipping Points Associated with Global Pollutants

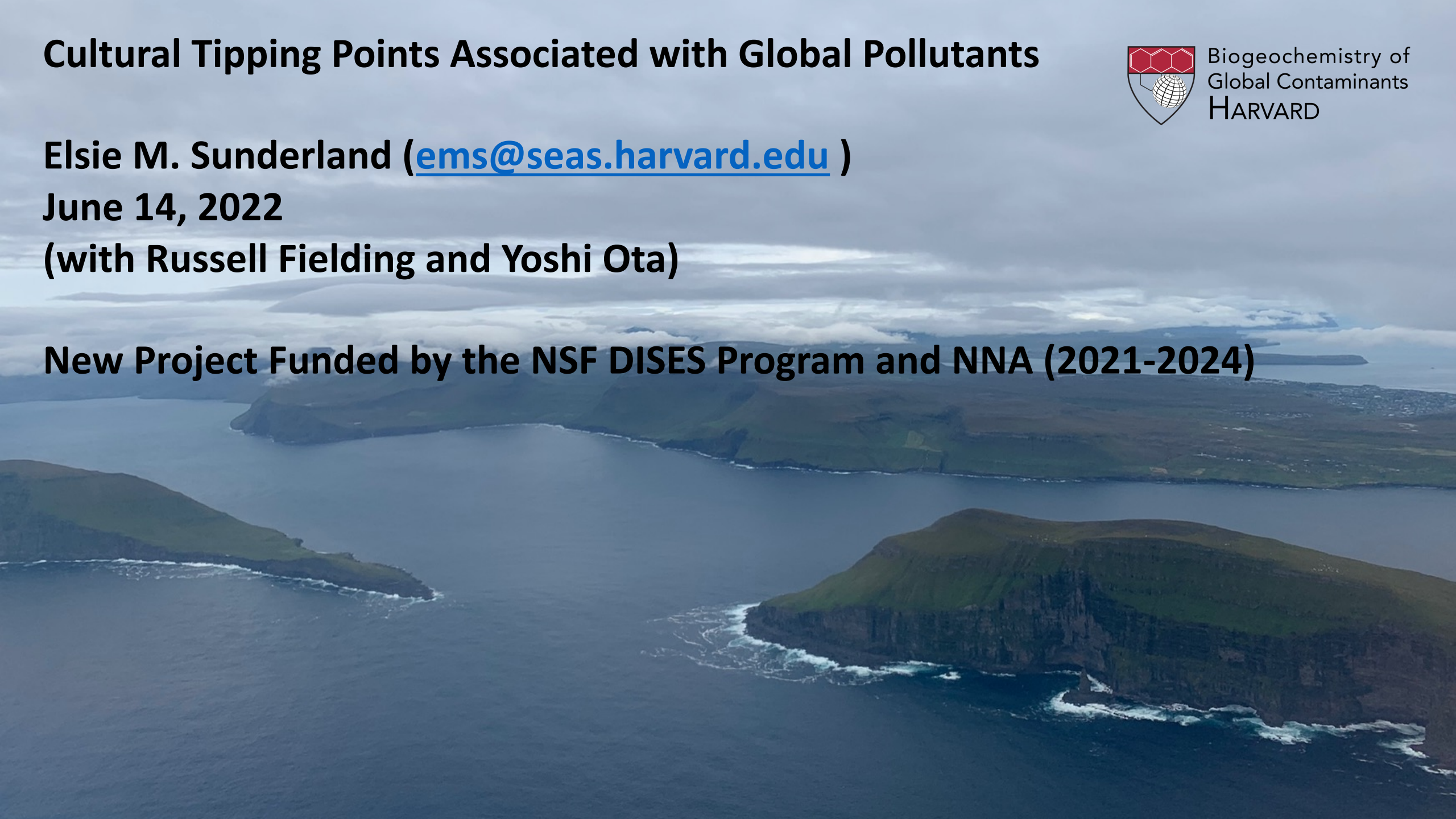


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(with Russell Fielding and Yoshi Ota)

New Project Funded by the NSF DISES Program and NNA (2021-2024)



Human activities are transforming the global environment

Environmental Releases



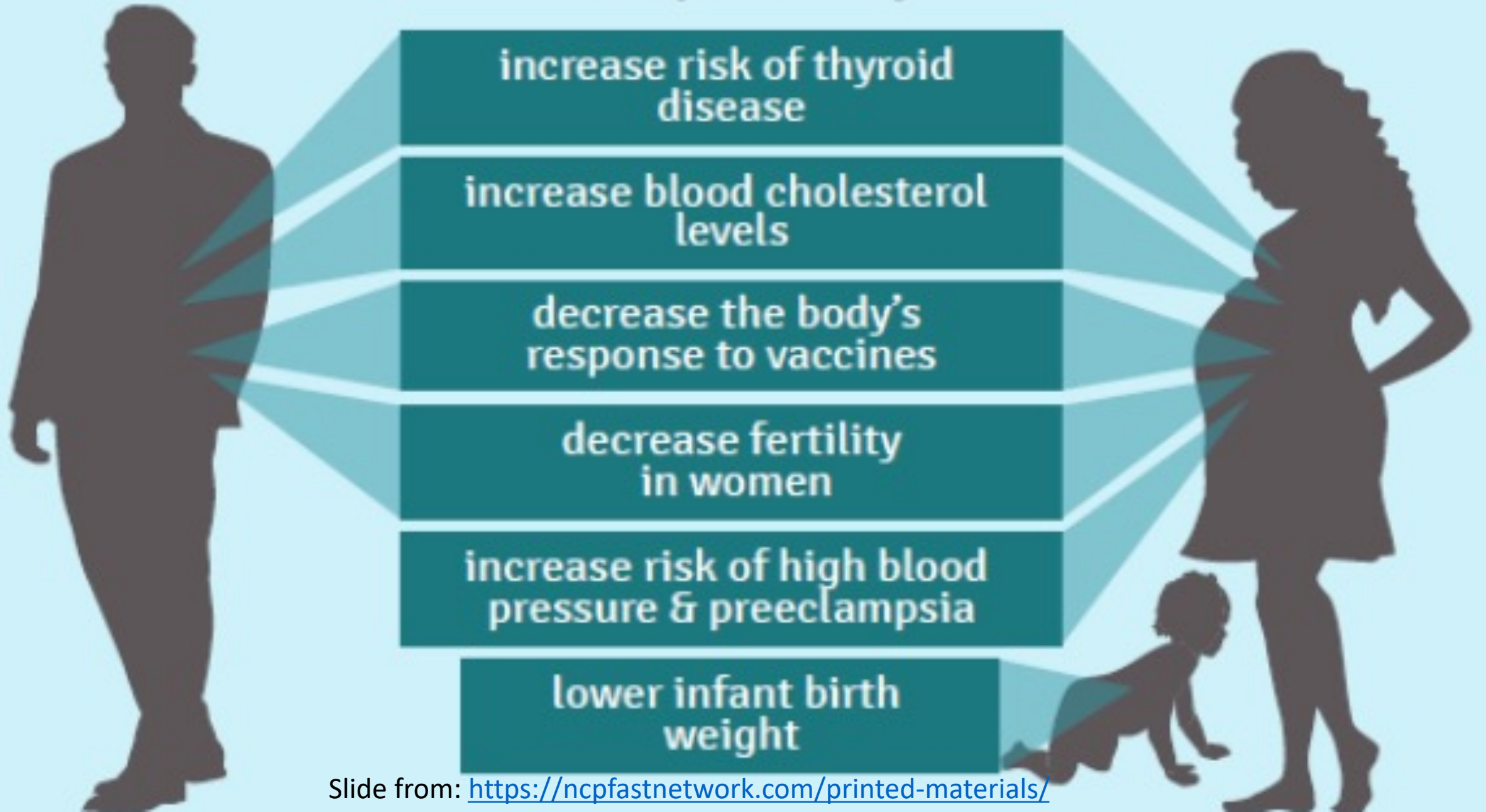
More than carbon

Fossil fuel feedstocks provide a cheap source of the parent chemicals to most synthetic organic substances

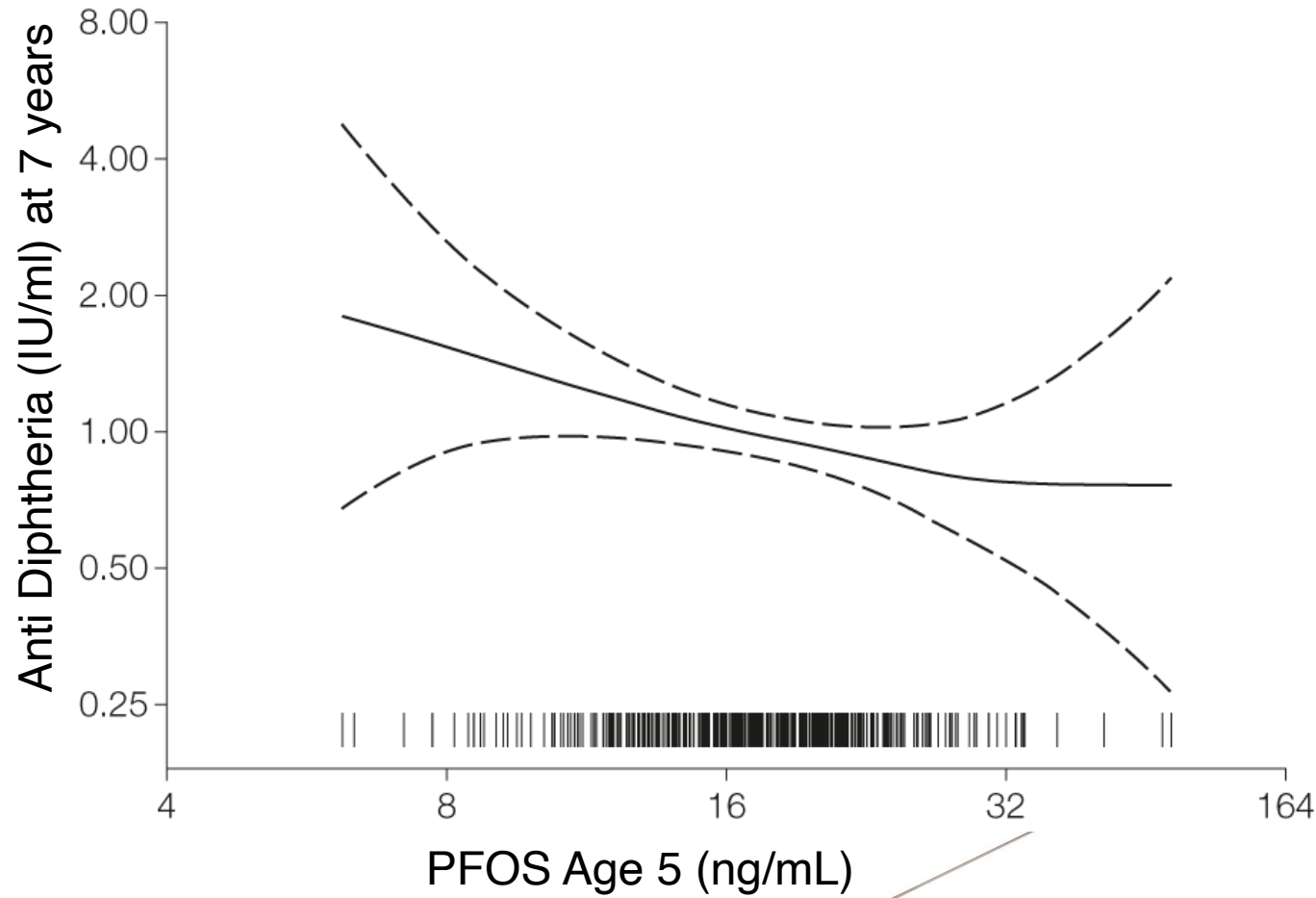
- 1-in-6 children suffer from a neurodevelopmental abnormality, mostly of unknown causes.
- Epidemiological studies note alarming rises in allergy, atopy, asthma, diabetes, obesity, autism spectrum disorders, etc. that are not linked to lifestyle changes.

<http://brainrain.dk>

Human studies suggest PFAS exposure may...



Children from the Faroe Islands



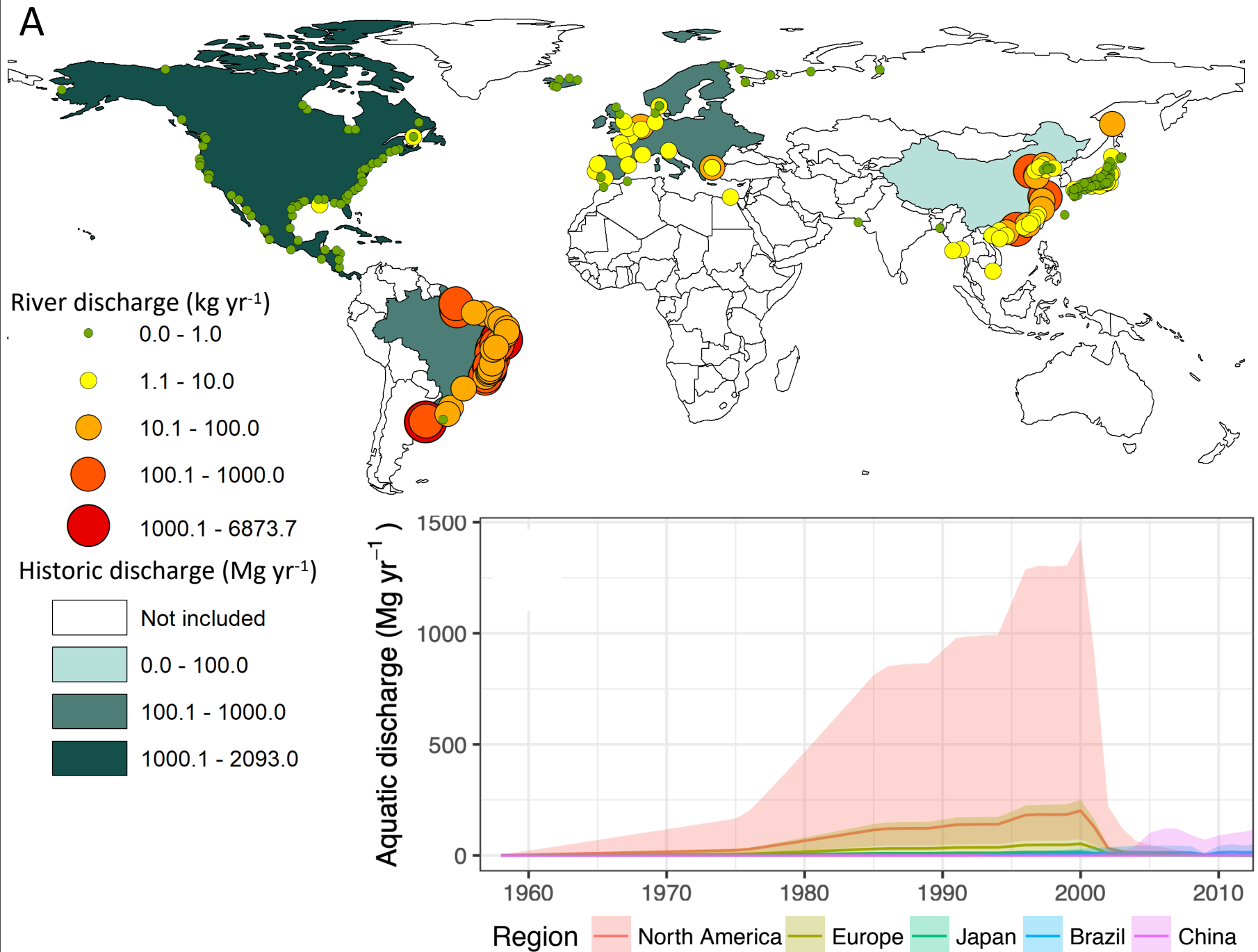
50% Reduction in antibody concentrations for each doubling of PFASs



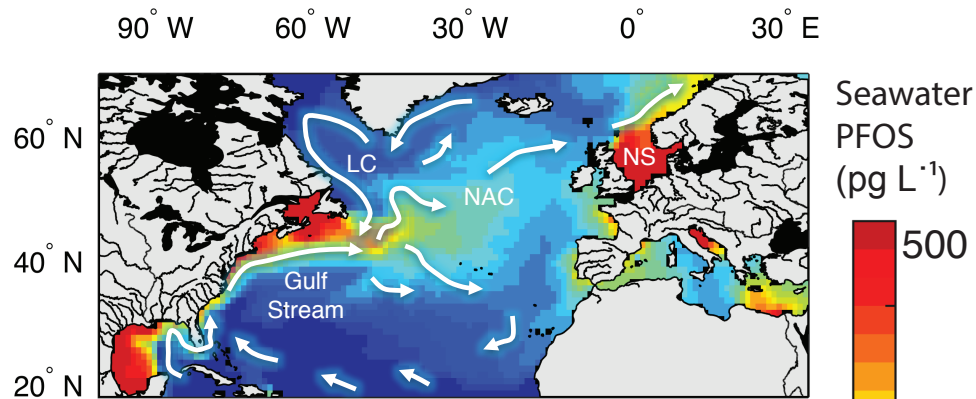
Grandjean et al., 2012



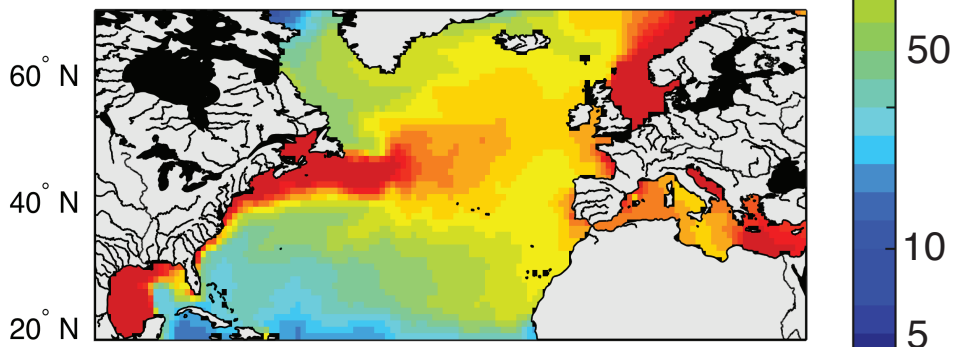
Modeled
global
PFOS
discharges
from rivers
to the
oceans ca.
2010



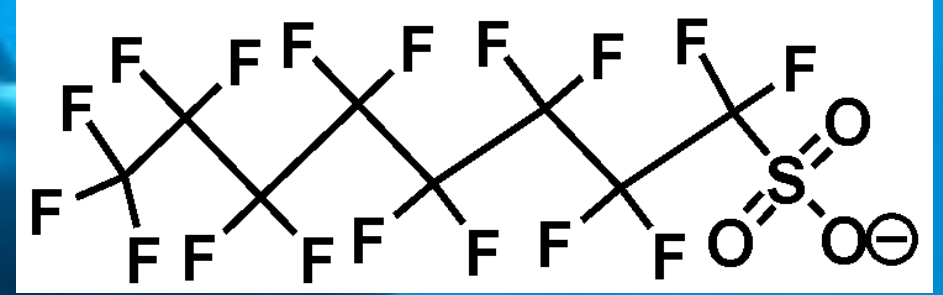
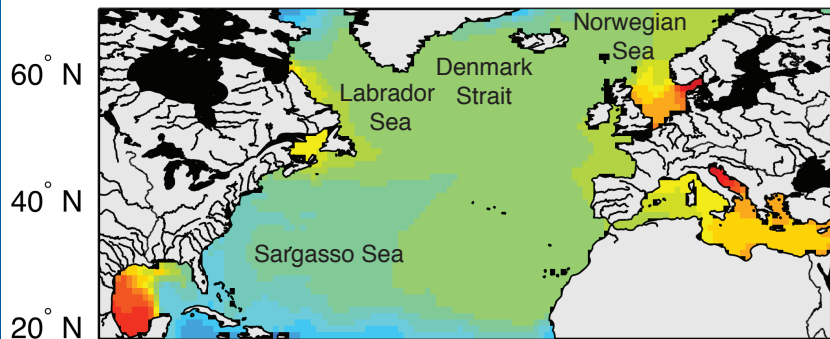
(A) 1980



(B) 2000



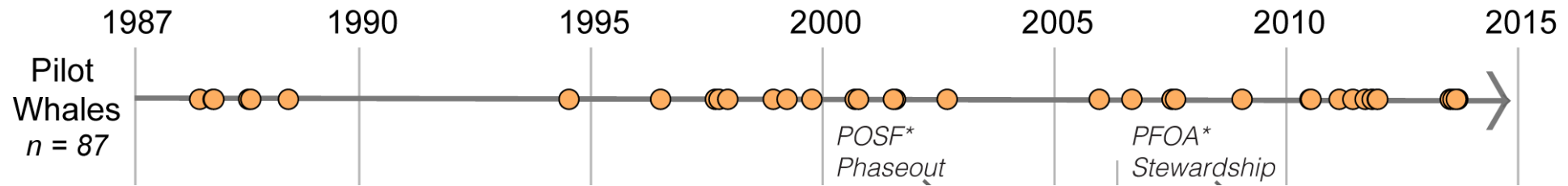
(C) 2020



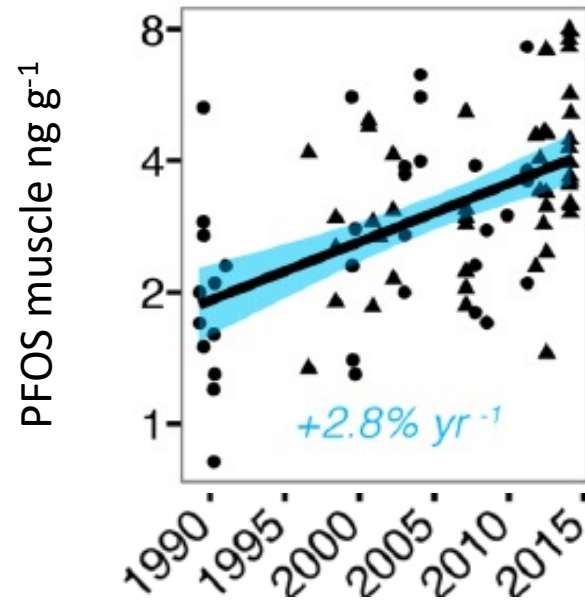
Modeled PFOS in North Atlantic seawater (10 m)

X. Zhang et al., 2017

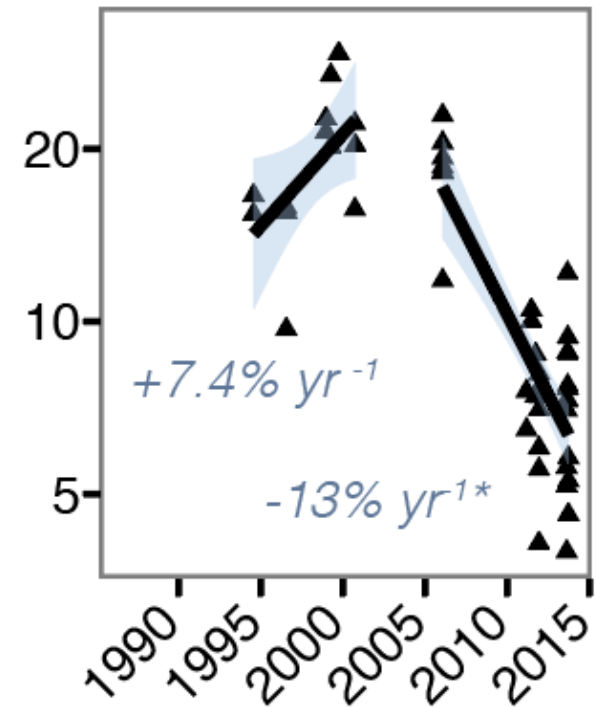
Changing Concentrations of PFAS in Pilot Whales over Time



Dassuncao et al., 2017, ES&T

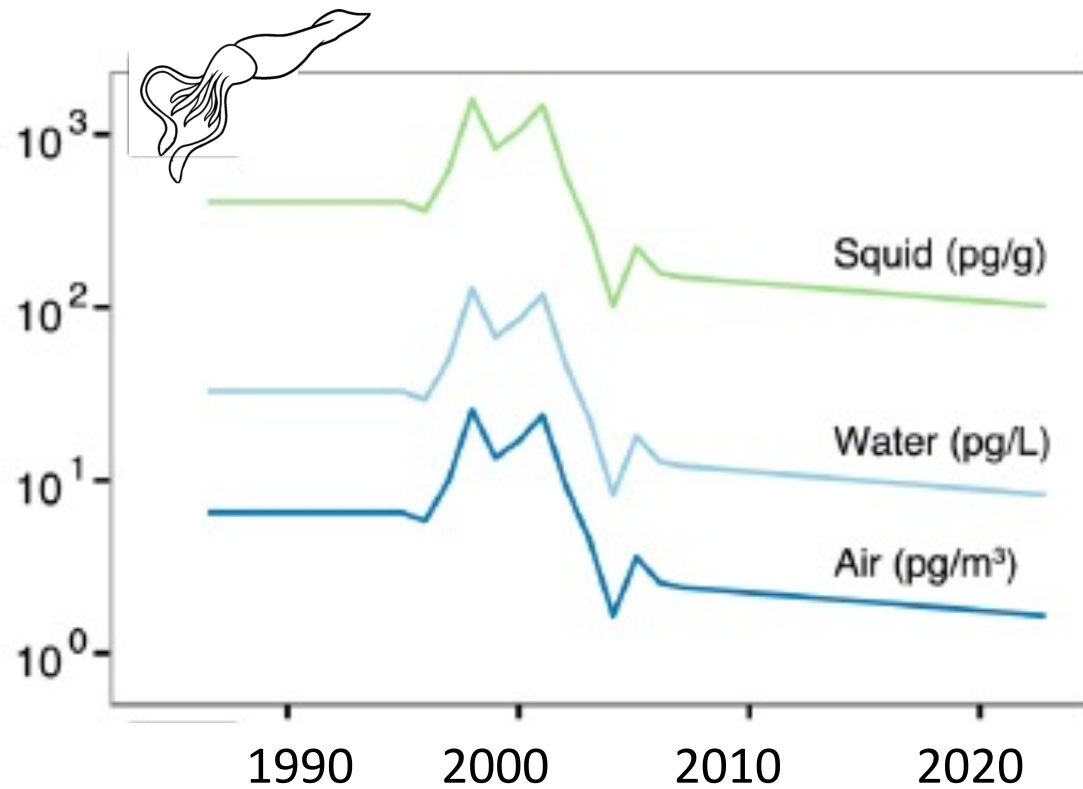


Juvenile males 9-12 years

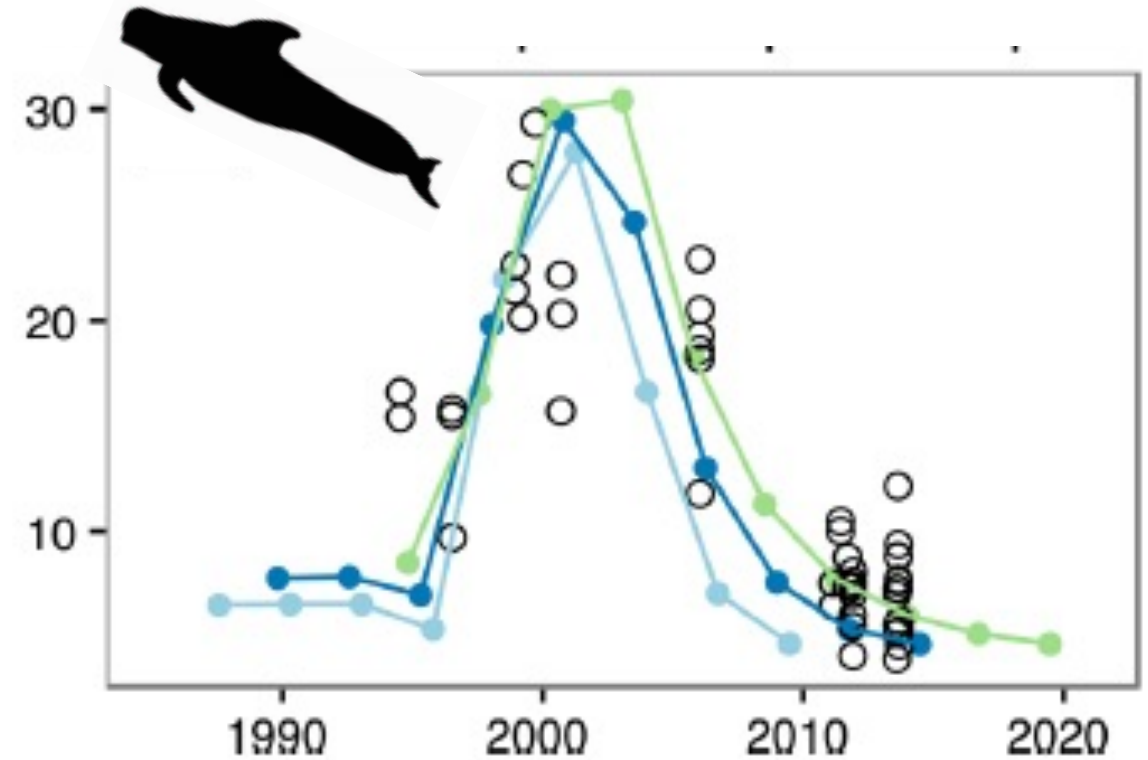


Declining atmospheric FOSA successfully predicts observed changes in pilot whale FOSA concentrations

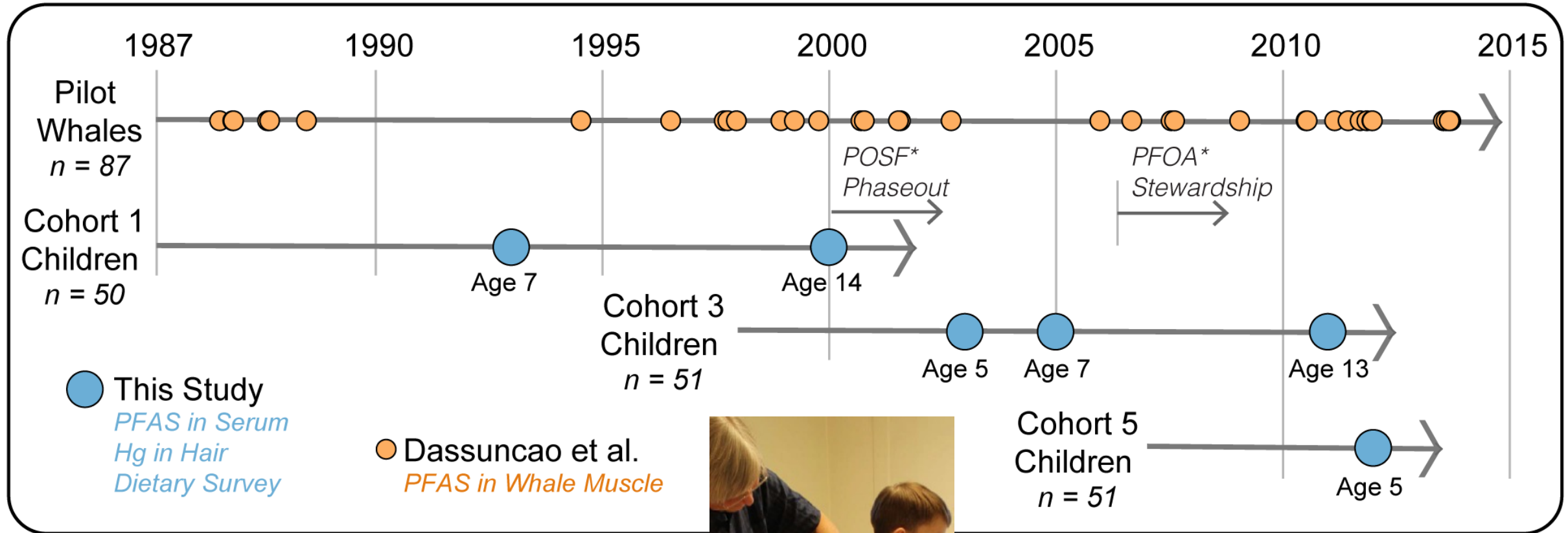
Environmental Concentration



Pilot whale FOSA concentration (ng⁻¹ g⁻¹)

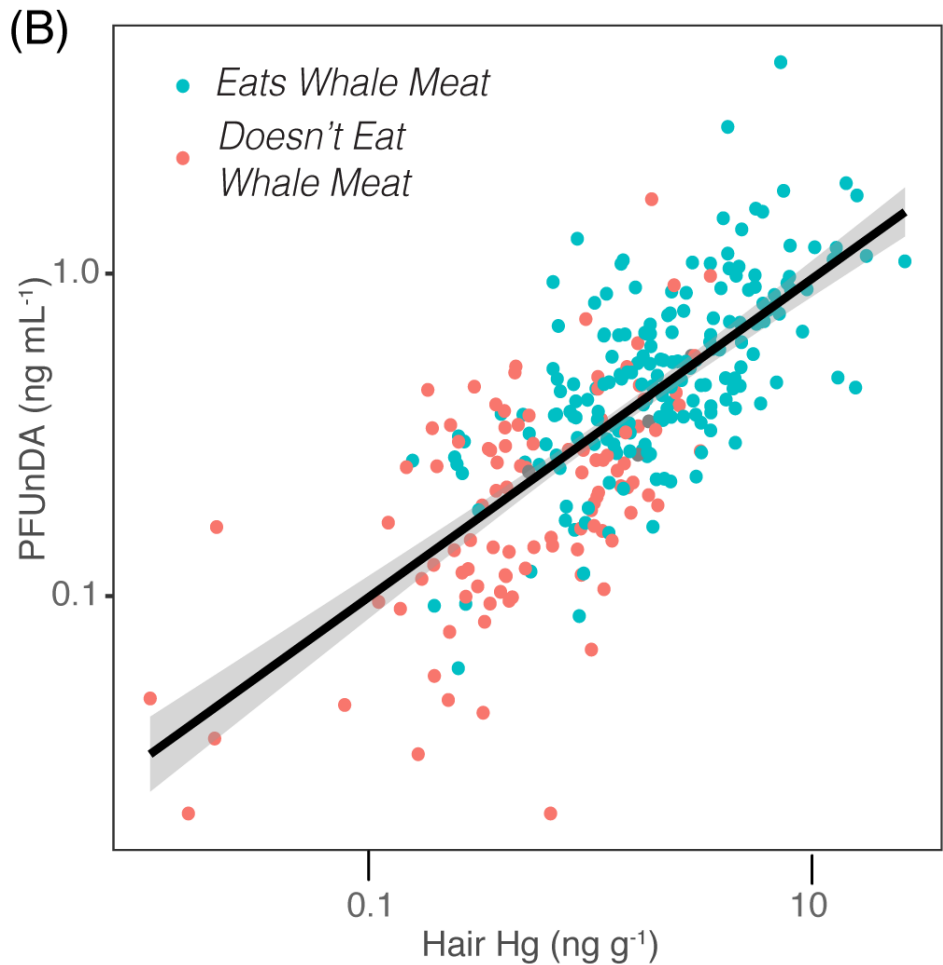
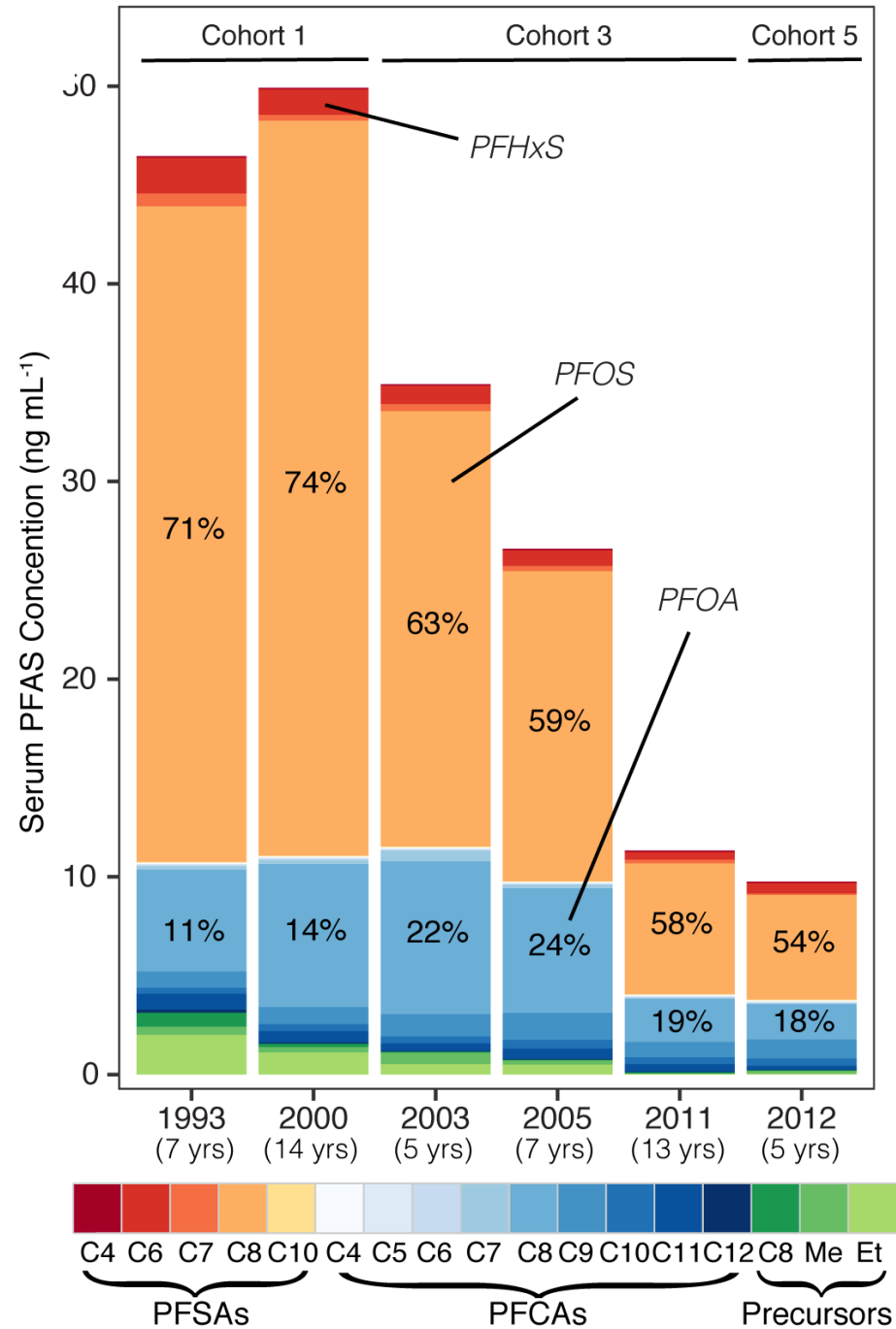


Identify the contribution to exposure from seafood using longitudinal data from children in the Faroe Islands



Declining serum PFAS in Faroese children driven by PFOS and FOA

Dassuncao et al., 2018



Policy & Governance

Global
Pollution
Agreements



International
Governance



Health,
Well-Being,
Culture

Human Component



Cultural Keystone
Species



Release of Hg, PCBs, PFAS

Integrated Socio-Environmental System

Indicator Fishing Communities
e.g., Faroe Islands, North Atlantic



Atmospheric
Transport

Natural Component



Deposition
to the Ocean



Seawater Warming/Ecosystem Changes



Apex
Predators

Bioaccumulation in
Marine Food-Webs