



BUNDESAMT FÜR
SEESCHIFFFAHRT
UND
HYDROGRAPHIE

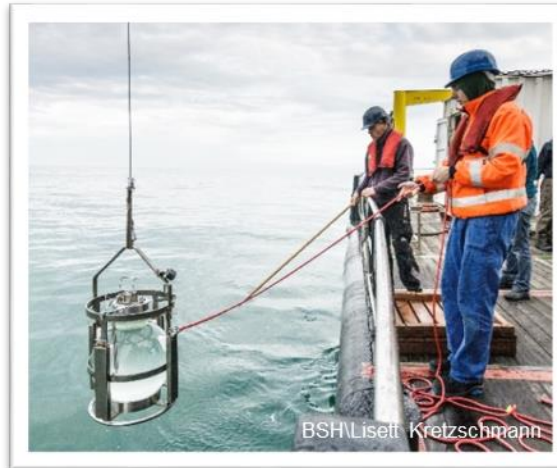
Long-Term Monitoring of Chemical Sediment Composition in the German Bight: Insights into Past and Future Trends and Changes

Anna Plass, Wiebke Pape, Ingo Weinberg,
Matthias Hasenbein, Torben Kirchgeorg



BSH/Lisett Kretzschmann

BSH Monitoring

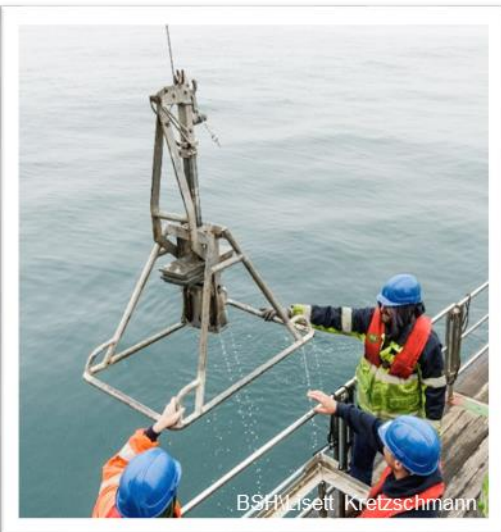


- Federal Maritime and Hydrographic Agency (BSH): maritime pollution monitoring, hydrographic survey, approvals of offshore installations, shipping

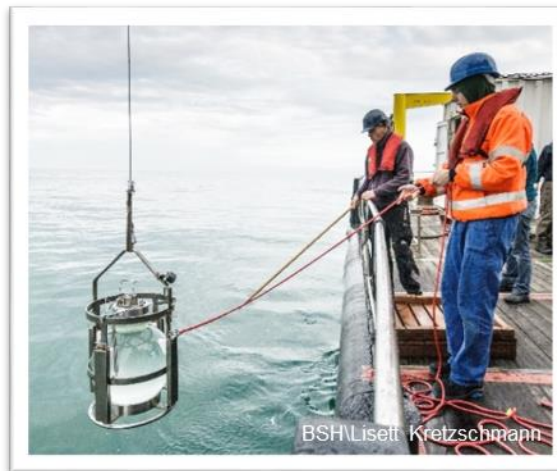
- Annual sampling campaigns in North & Baltic Sea

- Pollutants, nutrients, oceanographic parameters, radioactivity

- Data of German Bight since 1980s



BSH Monitoring



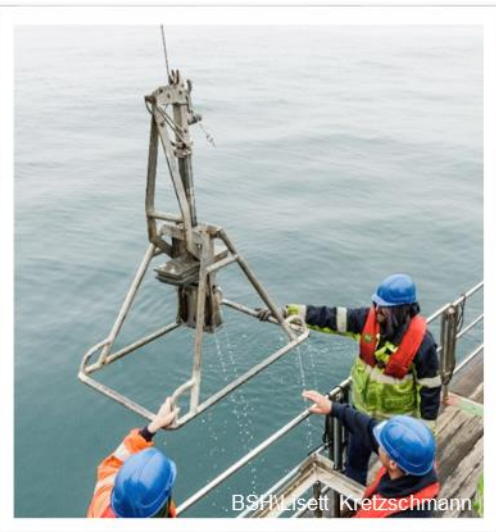
BLMP
Bund-Länder-Messprogramm

WFD
Water Framework Directive

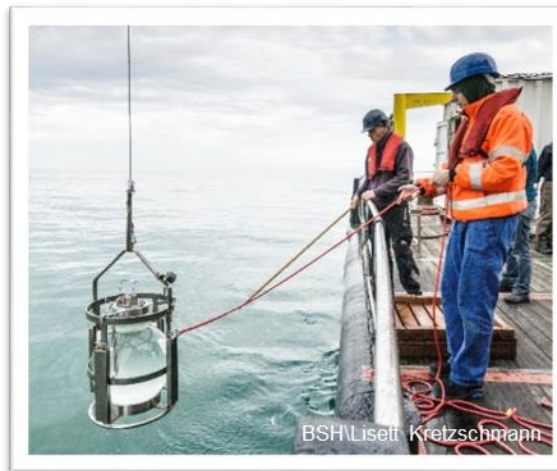
MSFD
Marine Strategy Framework Directive

CEMP (OSPAR)
Co-ordinated Environmental Monitoring Program

COMBINE (HELCOM)
Cooperative Monitoring in the
Baltic Marine Environment



BSH Monitoring



BLMP
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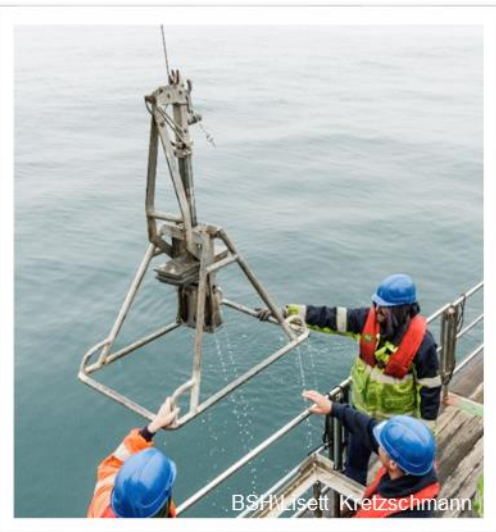
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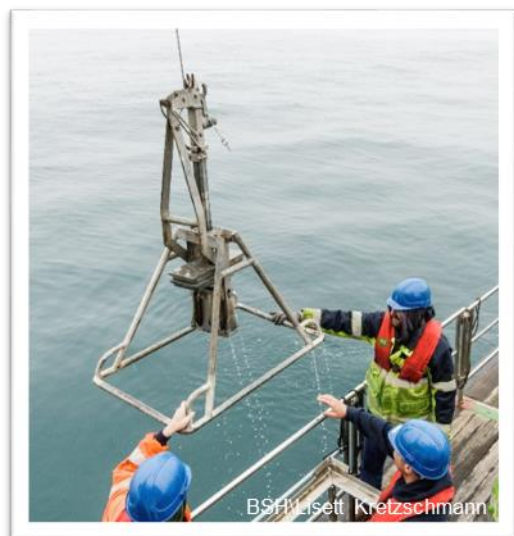
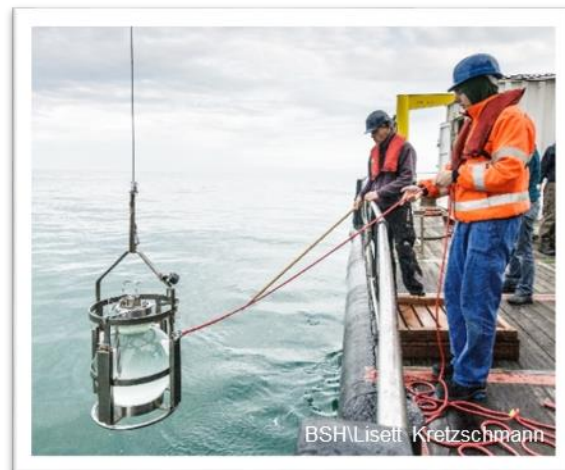
CEMP (OSPAR)
Co-ordinated Environmental Monitoring Program

COMBINE (HELCOM)
Cooperative Monitoring in the
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→ Goal of the MSFD is the good environmental status



BSH Monitoring



Metals

Al

As

Cd

Co

Cr

Cu

Fe

Hg

Mn

Ni

Pb

Zn

Organic pollutants

Hexabromocyclododecane (HBCDD) (e.g. Hexabromcyclododecan)

Mineral oil hydrocarbons (MOH) (e.g. chlorinated paraffin)

Organochlorine pesticides (CP) (e.g. DDT)

Organotin compounds (OTC) (e.g. TBT)

Per- and polyfluoroalkyl substances (PFAS) (e.g. PFOS)

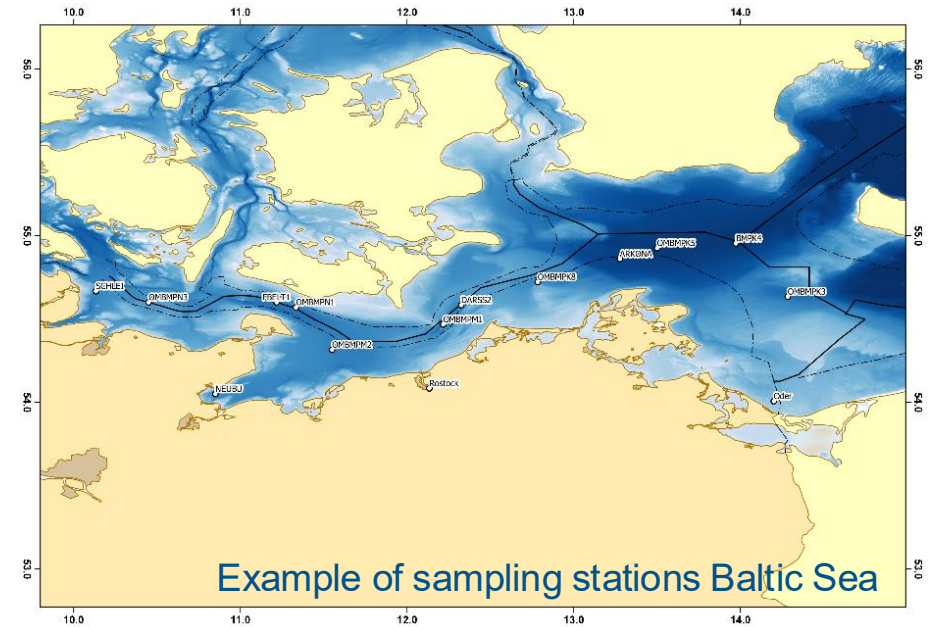
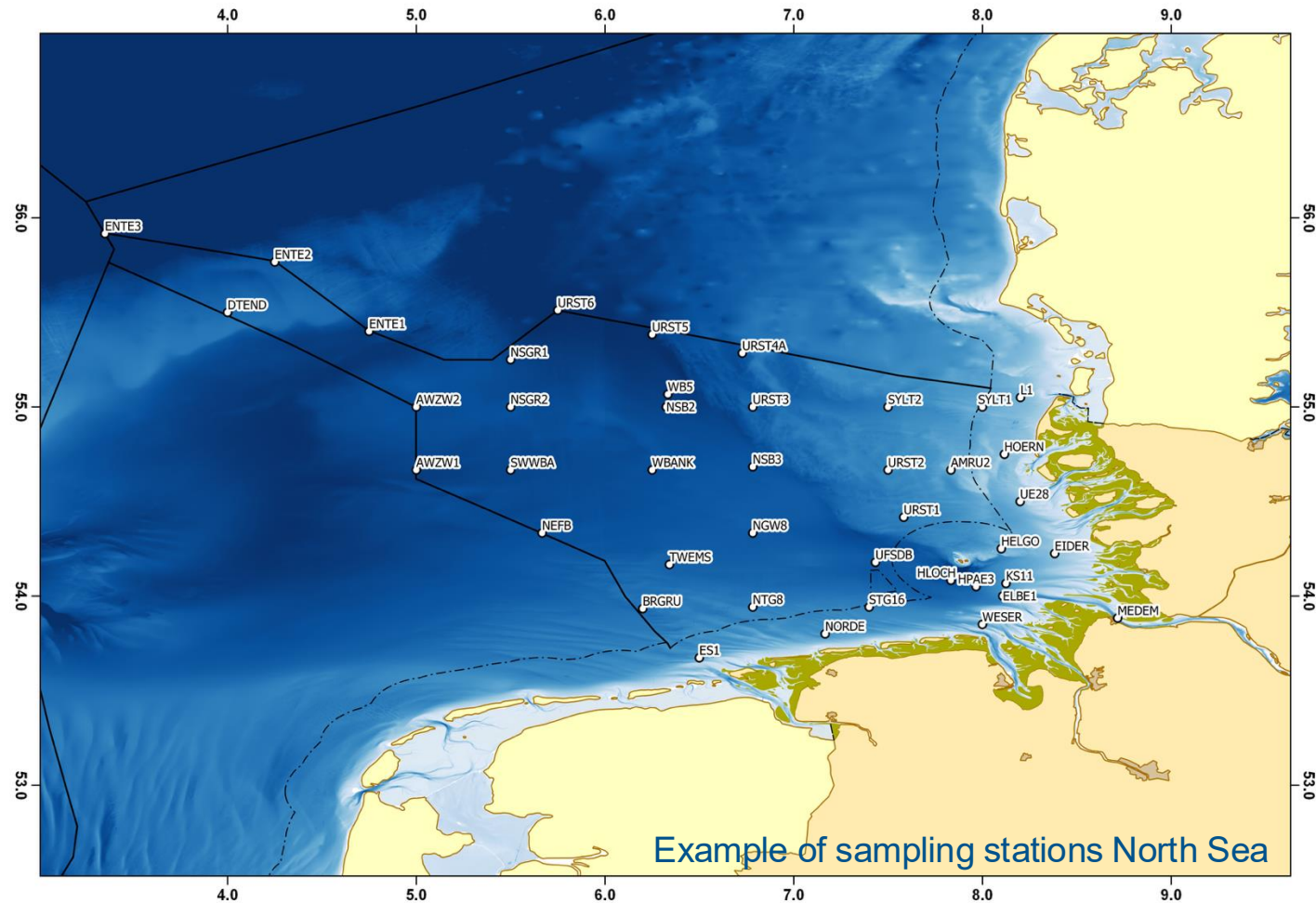
Polybrominated diphenyl ethers (PDBE) (e.g. sum BDE)

Polychlorinated biphenyls (PCB) (e.g. PCB 118)

Polycyclic aromatic hydrocarbons (PAH) (e.g. Benzo[a]pyrene)

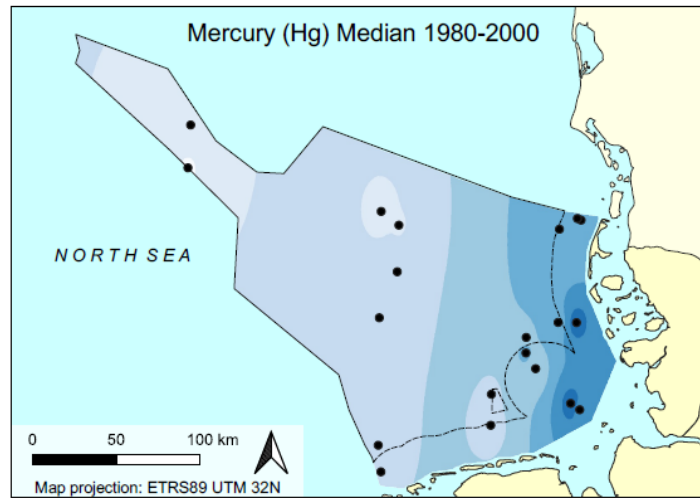
***OSPAR assessment criteria**

BSH Monitoring



- 25 sediment stations
- 40 water stations

Monitoring Data: Mercury

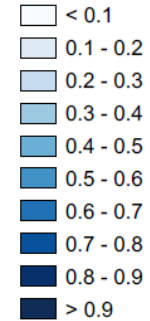


Distribution map

Mercury (Hg) in surface sediment

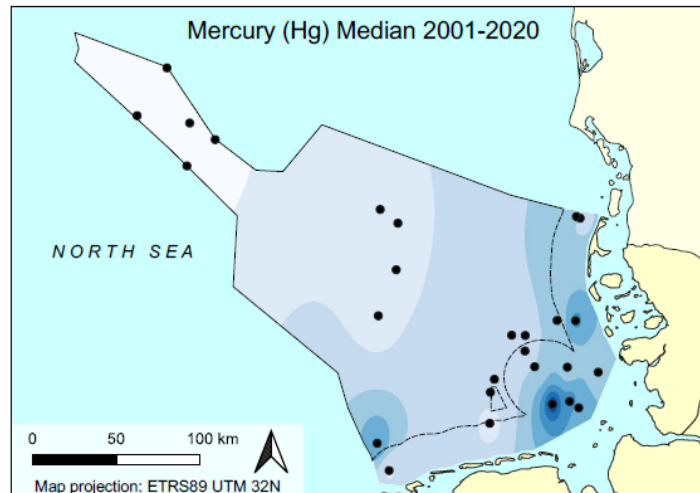
Scale 1 : 3 000 000

Concentration [mg/kg] Median (<20 μ m fraction)

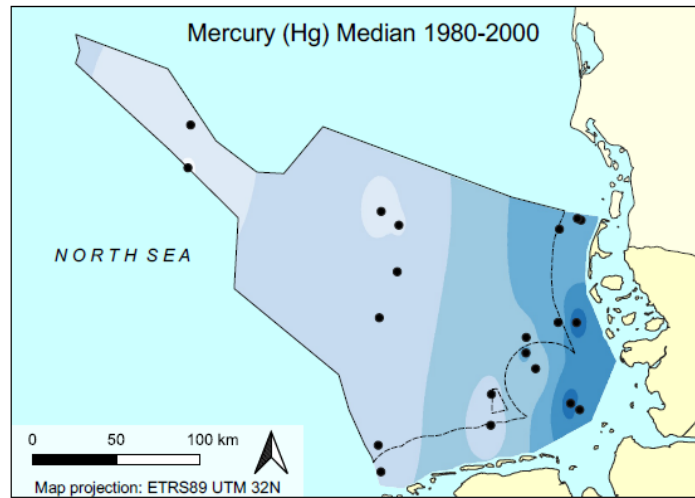


Legend

- Sampling station
- Exclusive economic zone (EEZ)
- - 12-Miles-Zone



Monitoring Data: Mercury

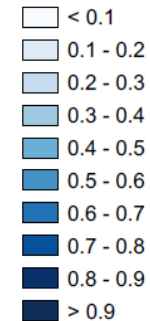


Distribution map

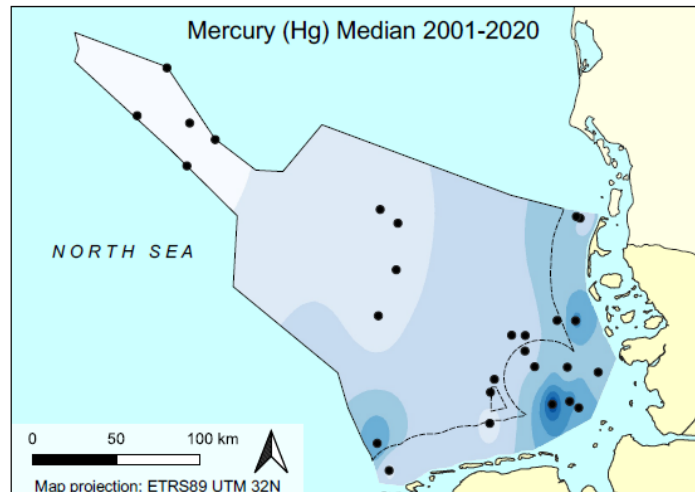
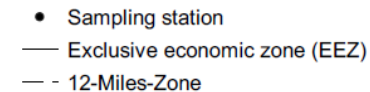
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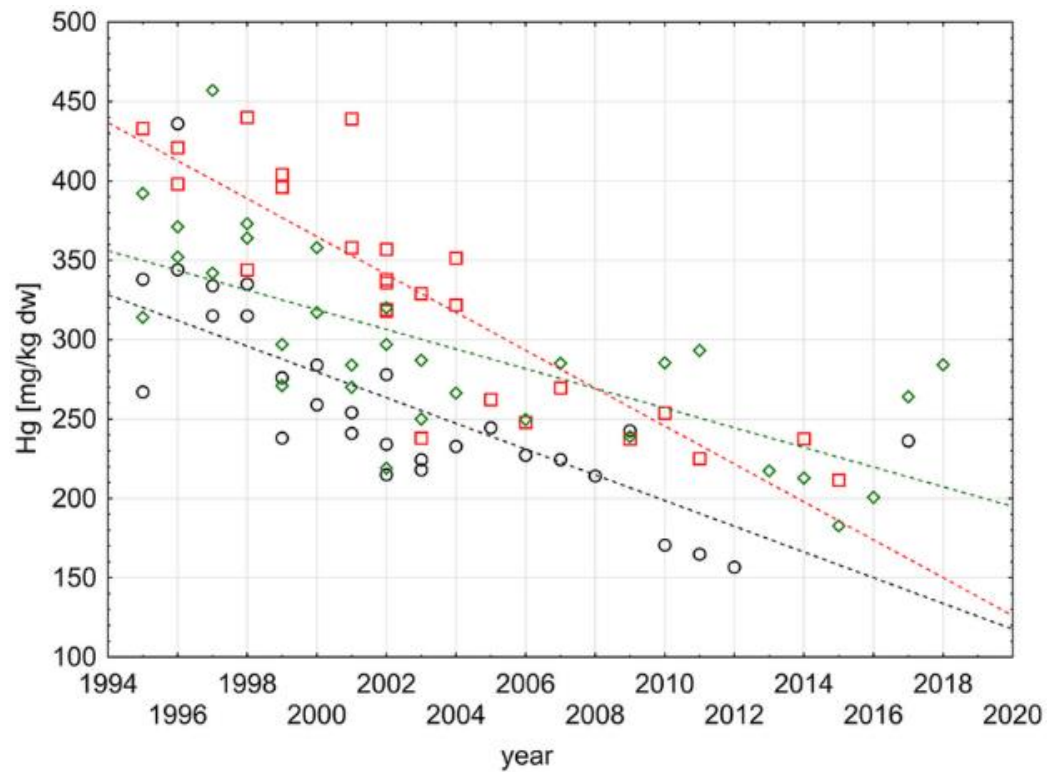


Legend



- Marine sediments are an important sink for Hg
- Decreasing concentrations (since 1990s)
- Stations further offshore under 0,15 mg/kg (OSPAR Assessment Criteria, ERL)

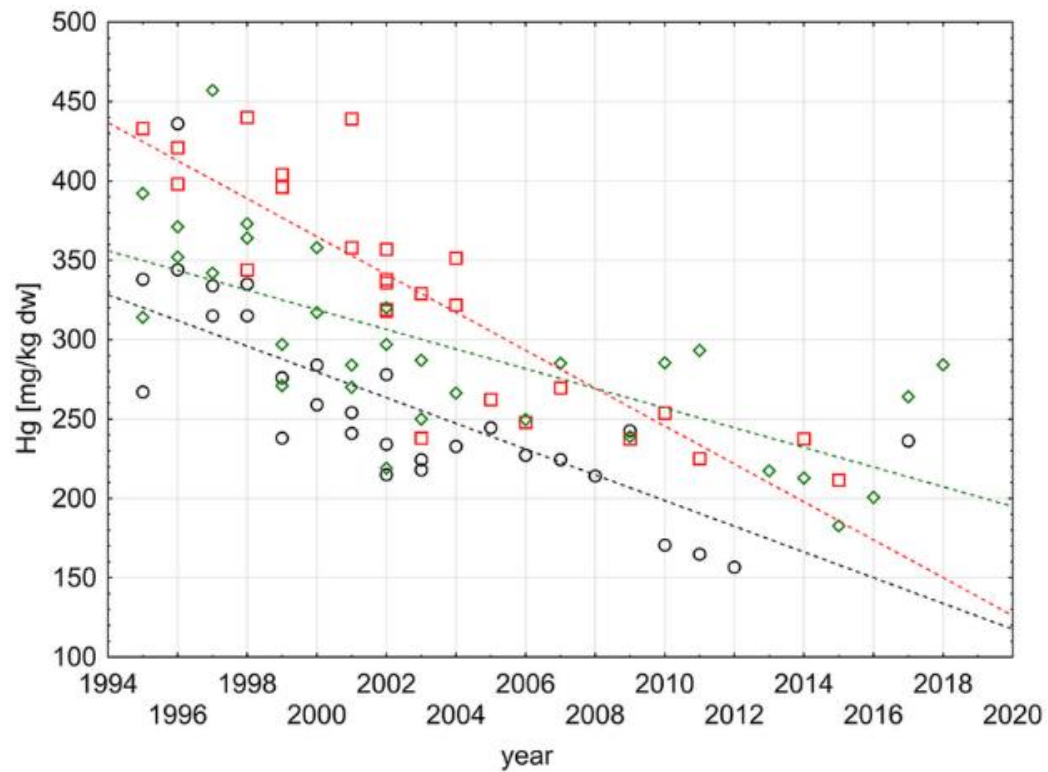
Monitoring Data: Mercury



Time series of Hg concentration in sediment in the German Bight

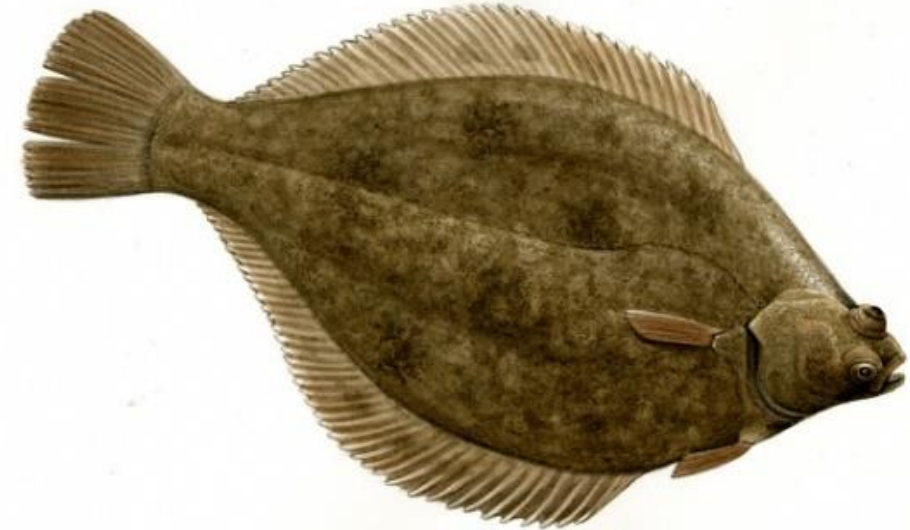
(Kammann et al., 2022)

Monitoring Data: Mercury



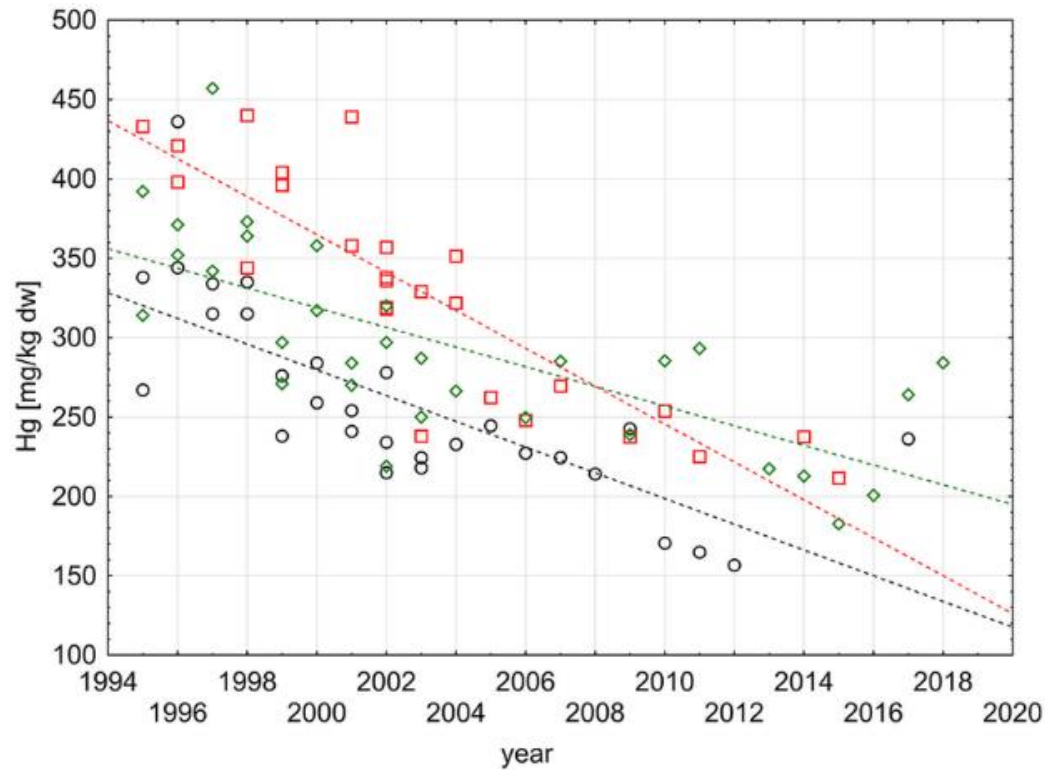
Time series of Hg concentration in sediment in the German Bight

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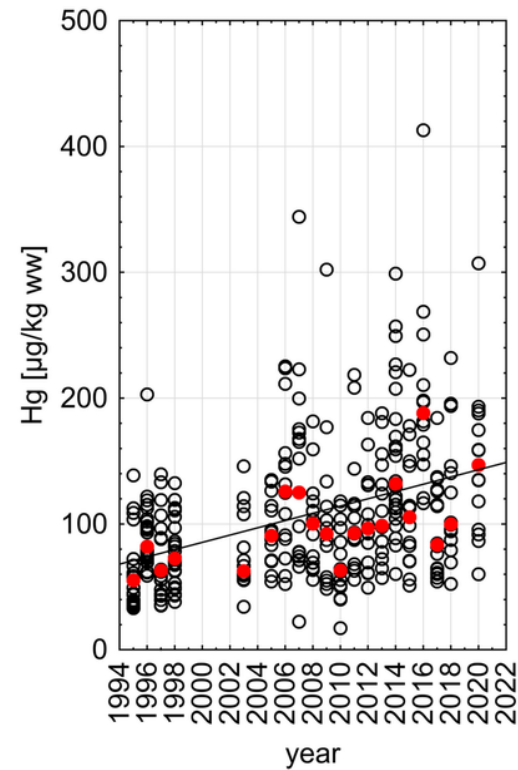
<https://www.nationalpark-wattenmeer.de/wissensbeitrag/die-kliesche/>

Monitoring Data: Mercury



Time series of Hg concentration in sediment in the German Bight

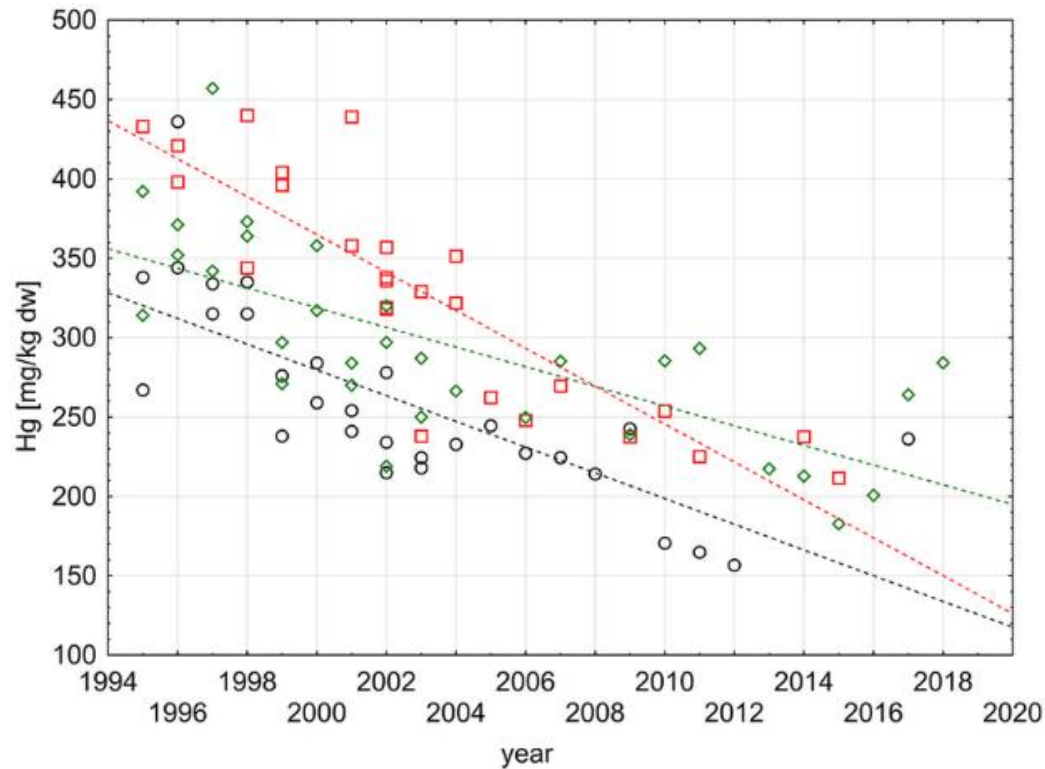
(Kammann et al., 2022)



Time series of Hg concentration in dab muscle in the German Bight

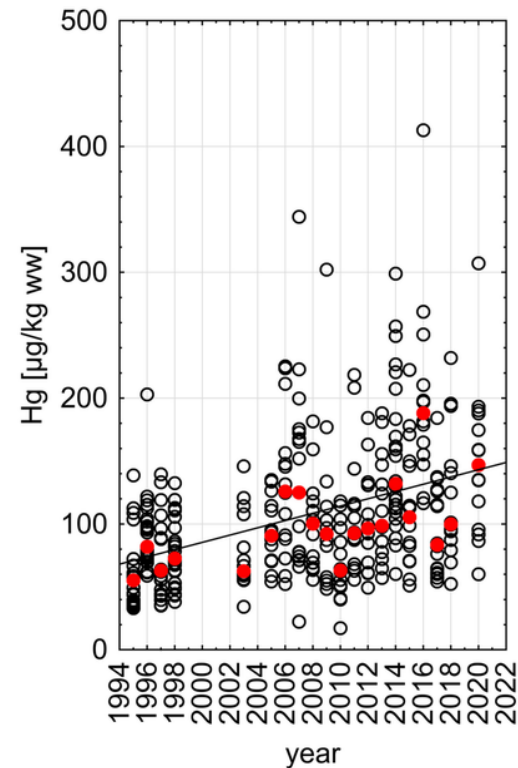
(Kammann et al., 2022)

Monitoring Data: Mercury



Time series of Hg concentration in sediment in the German Bight

(Kammann et al., 2022)



Time series of Hg concentration in dab muscle in the German Bight

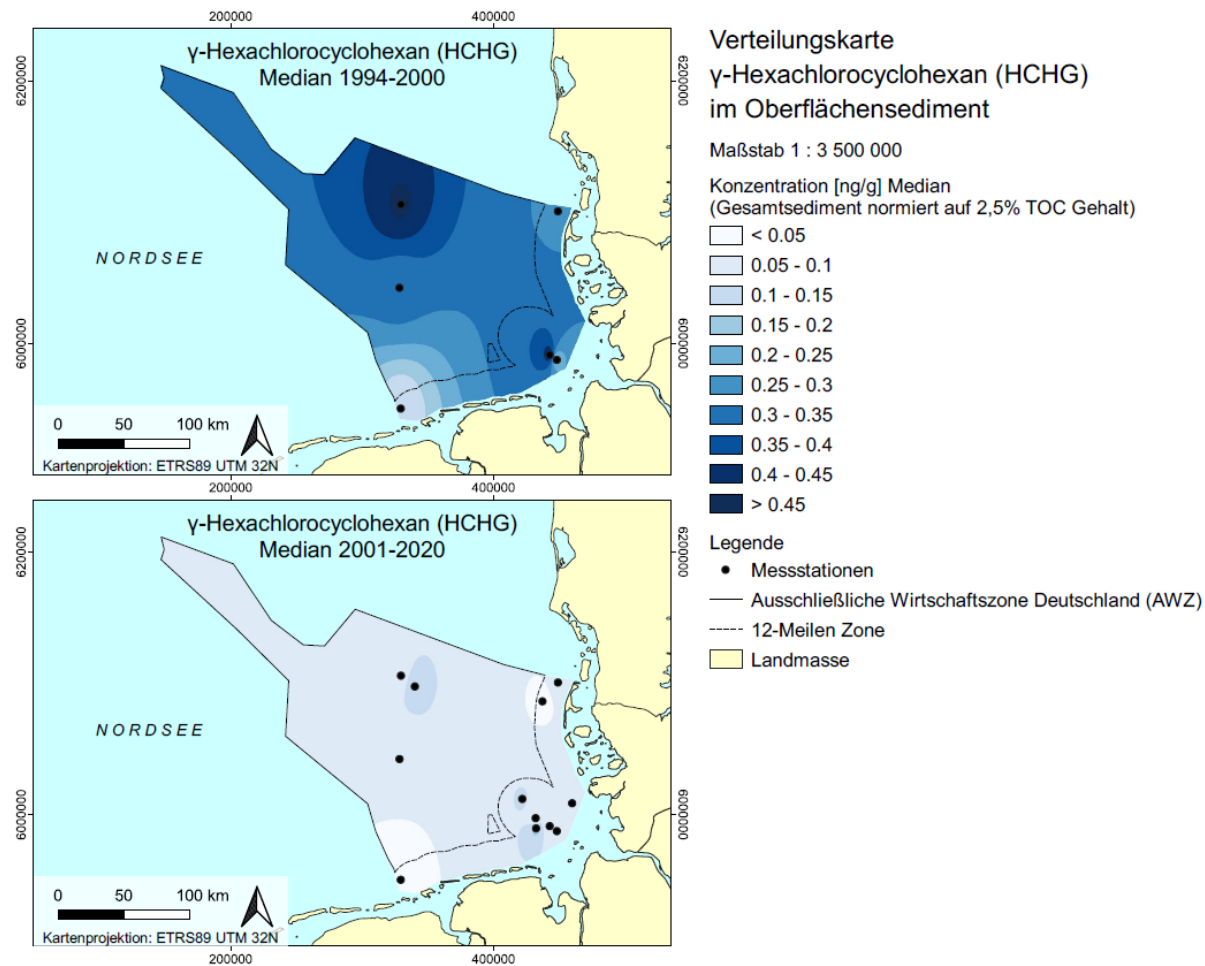
(Kammann et al., 2022)

- Contrary contamination trends:
 - Decrease in sediments ↓
 - Increase in fish ↑

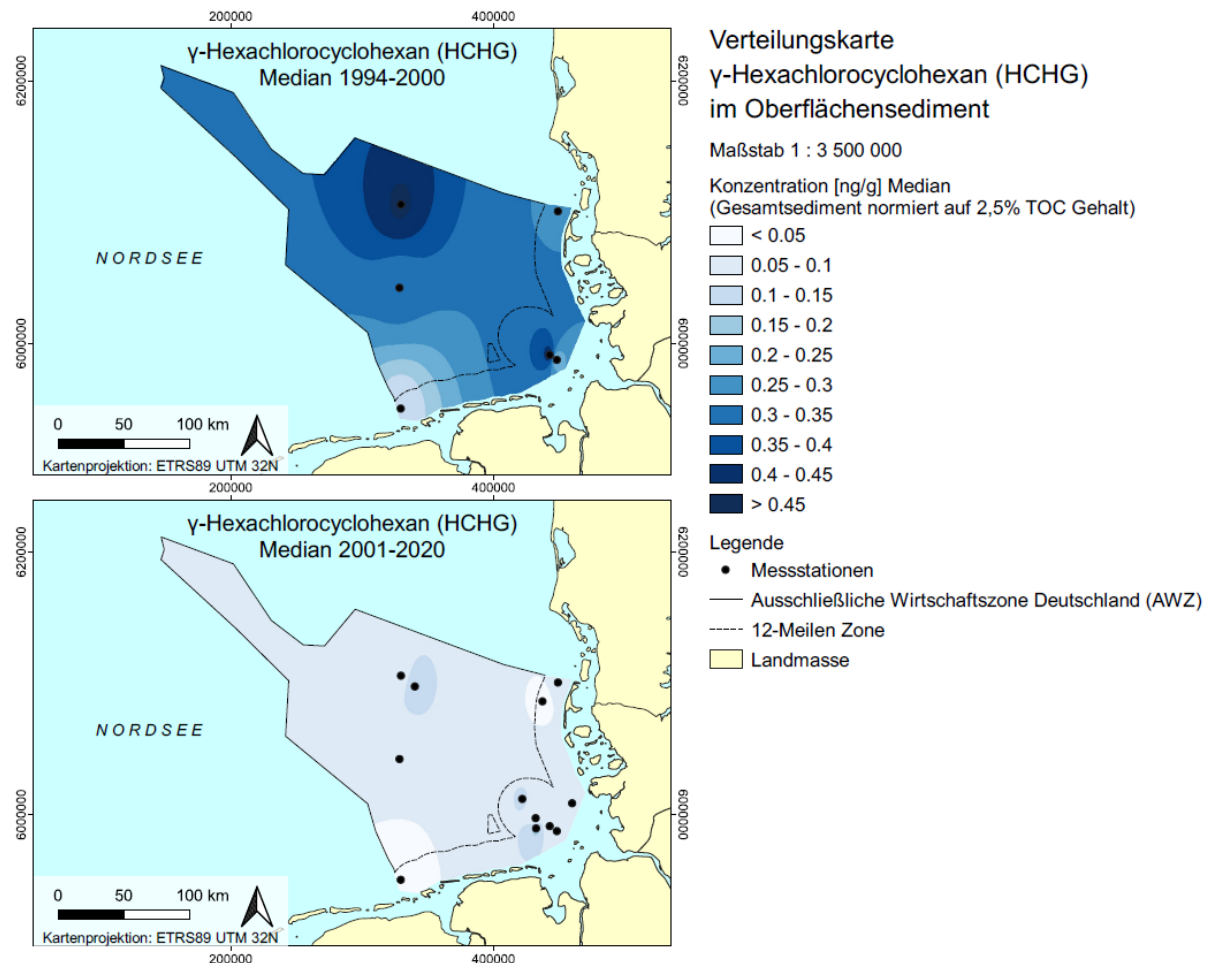
➤ **Necessity to look at different matrices**



Monitoring Data: Lindane

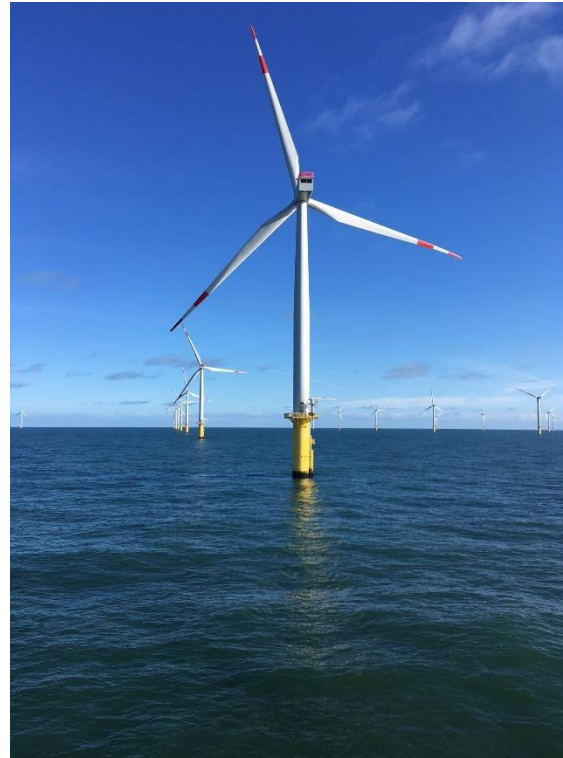


Monitoring Data: Lindane



- γ -HCH/Lindane: insecticide
- Decrease in sediment
- Banned under Stockholm Convention 2009
- Long term data can reveal effectiveness of substance bans

Potential New Sources: Offshore Wind Farms



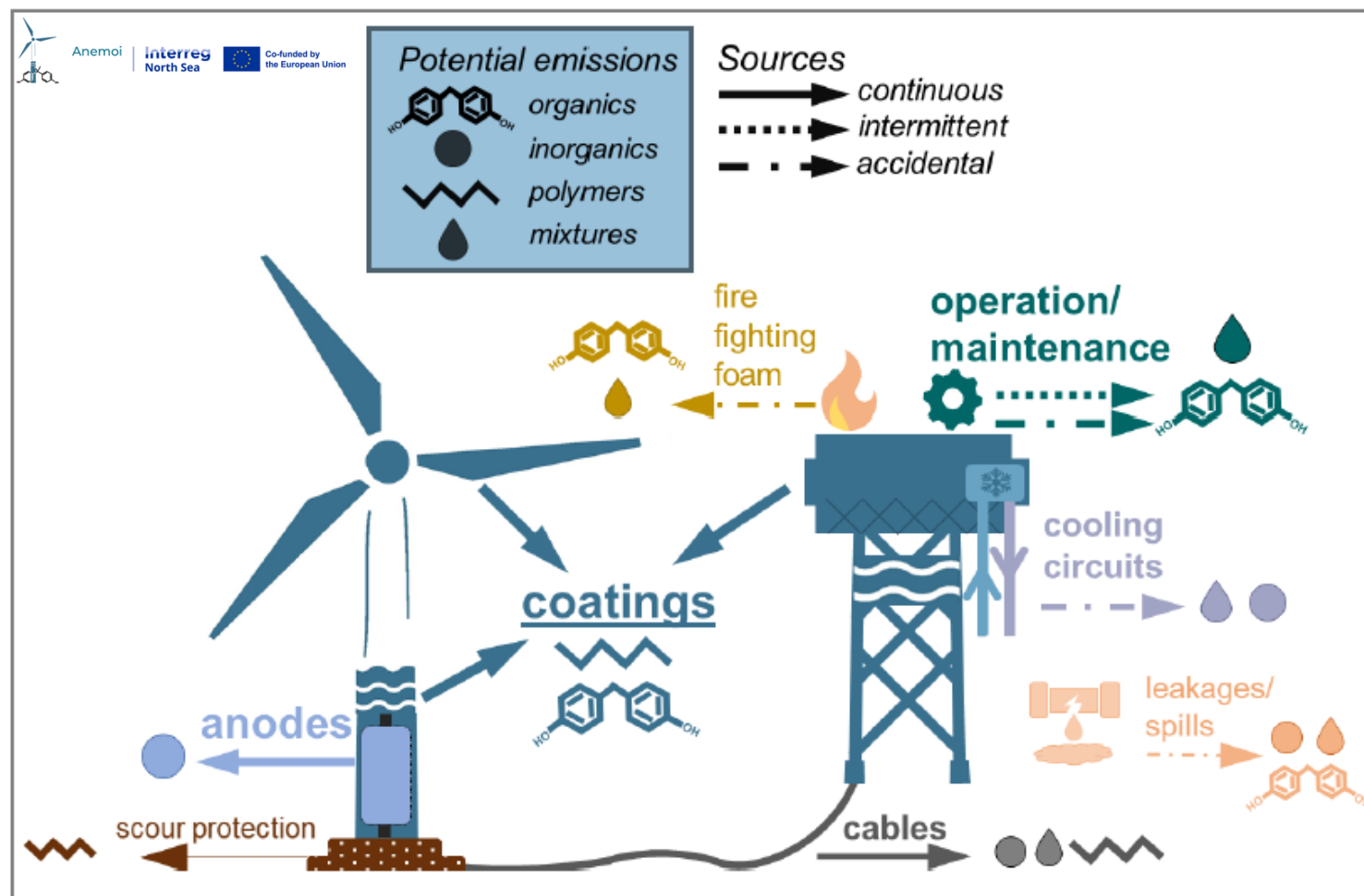
Targets Germany:

- Currently ~ 8,6 GW
~ 1550 wind turbines
~ 30 platforms
- 2045: 70 GW

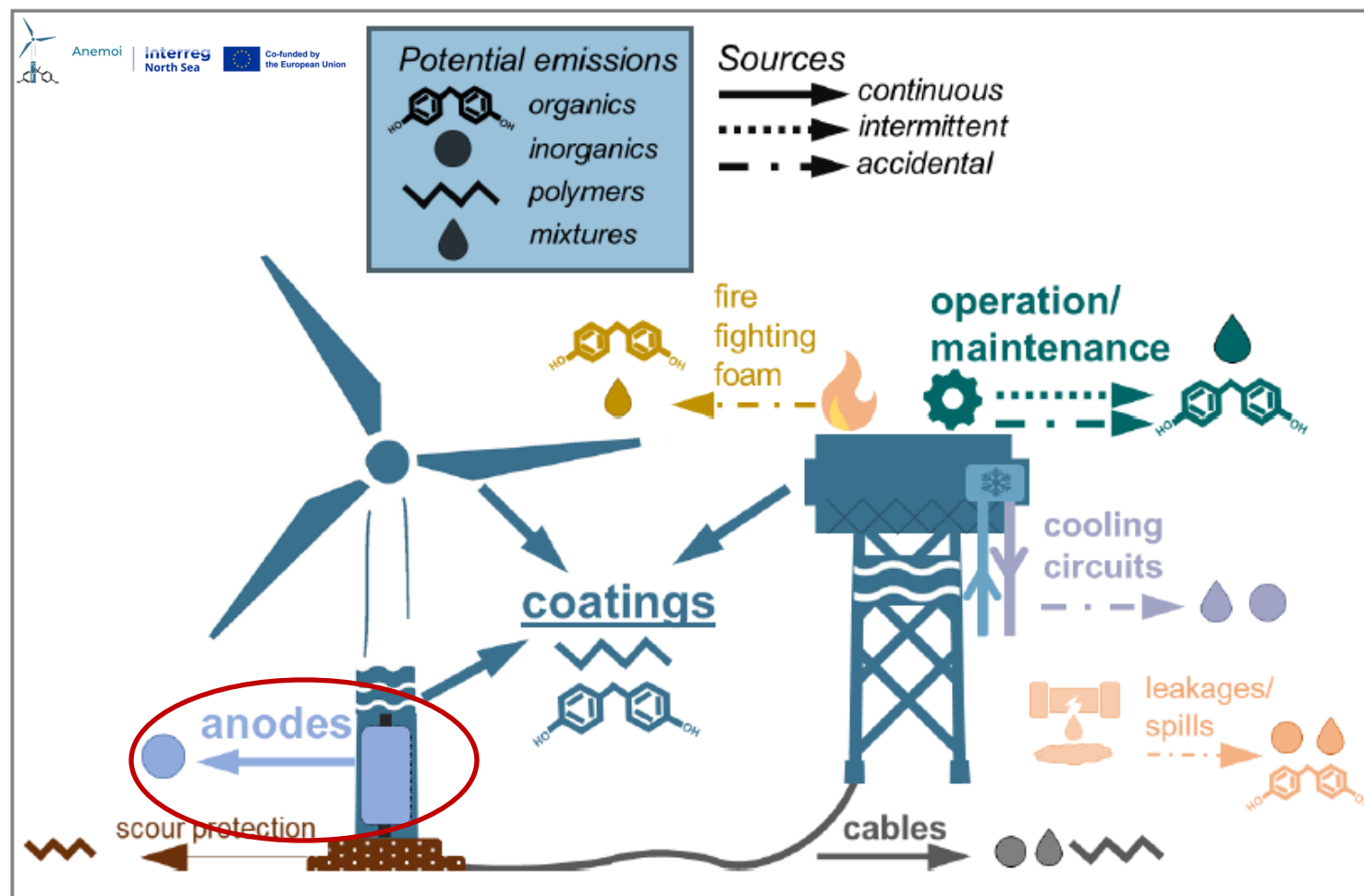
Targets EU

- currently ~ 32 GW
- 2050: 300 GW

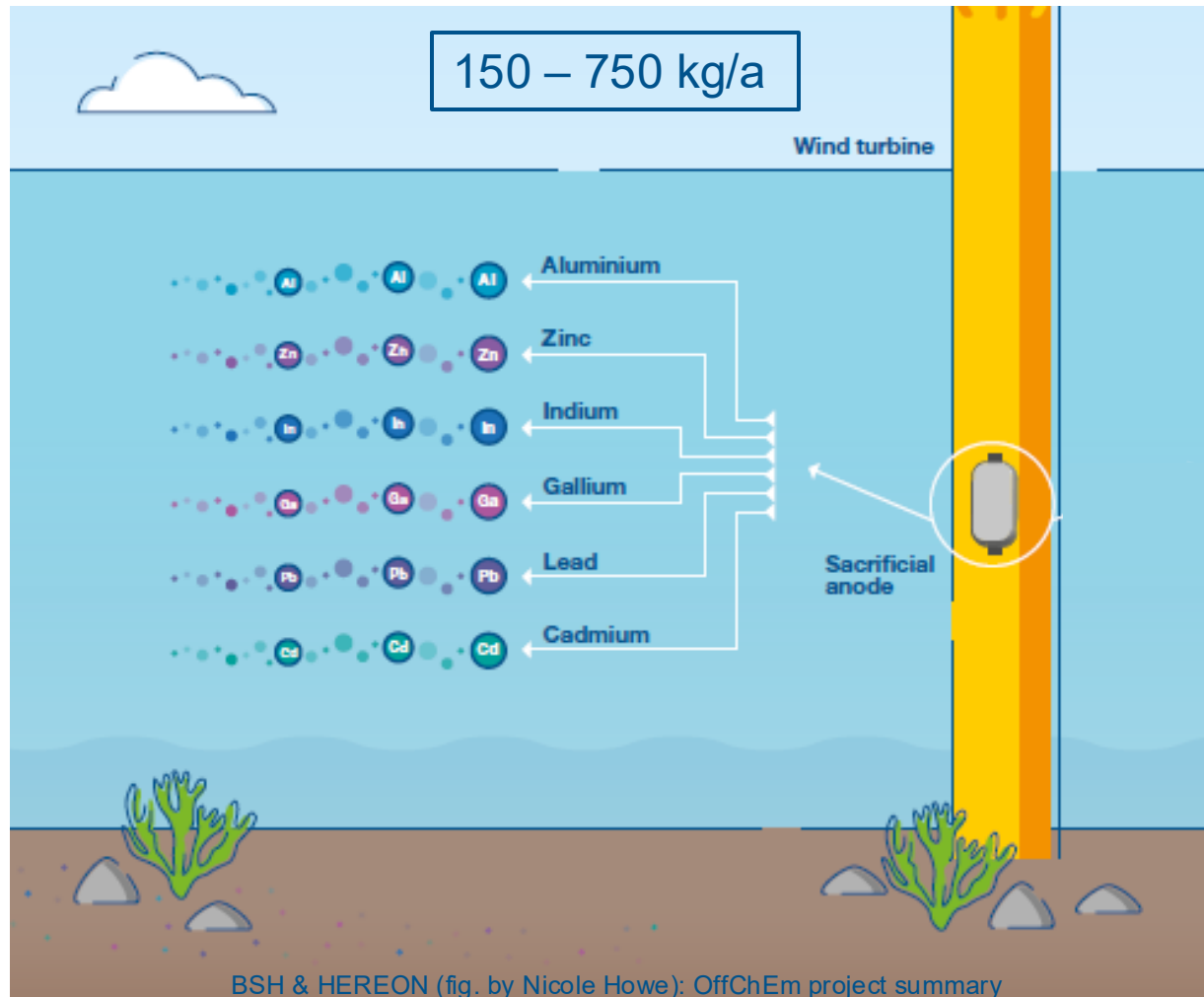
Potential New Sources: Offshore Wind Farms



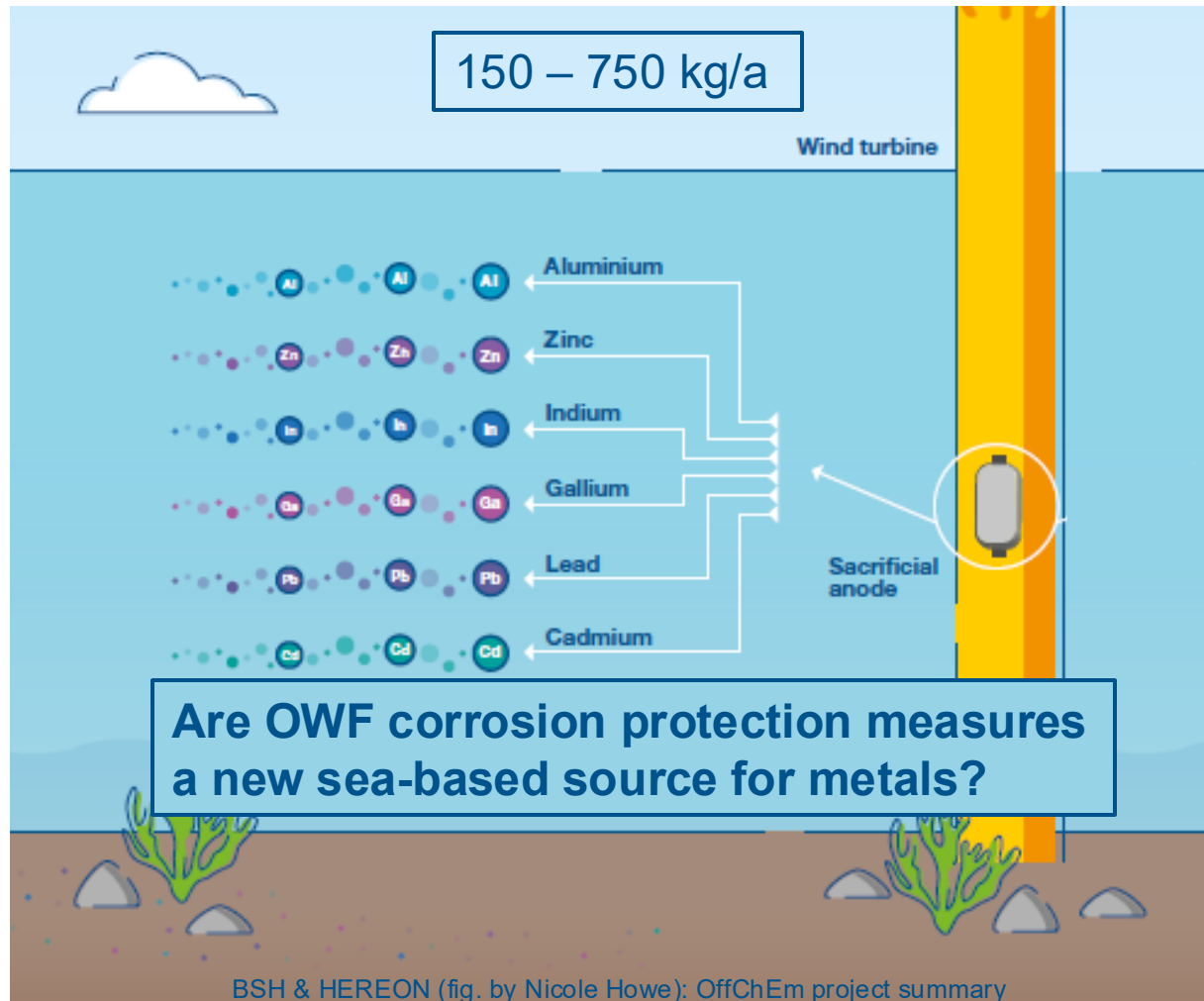
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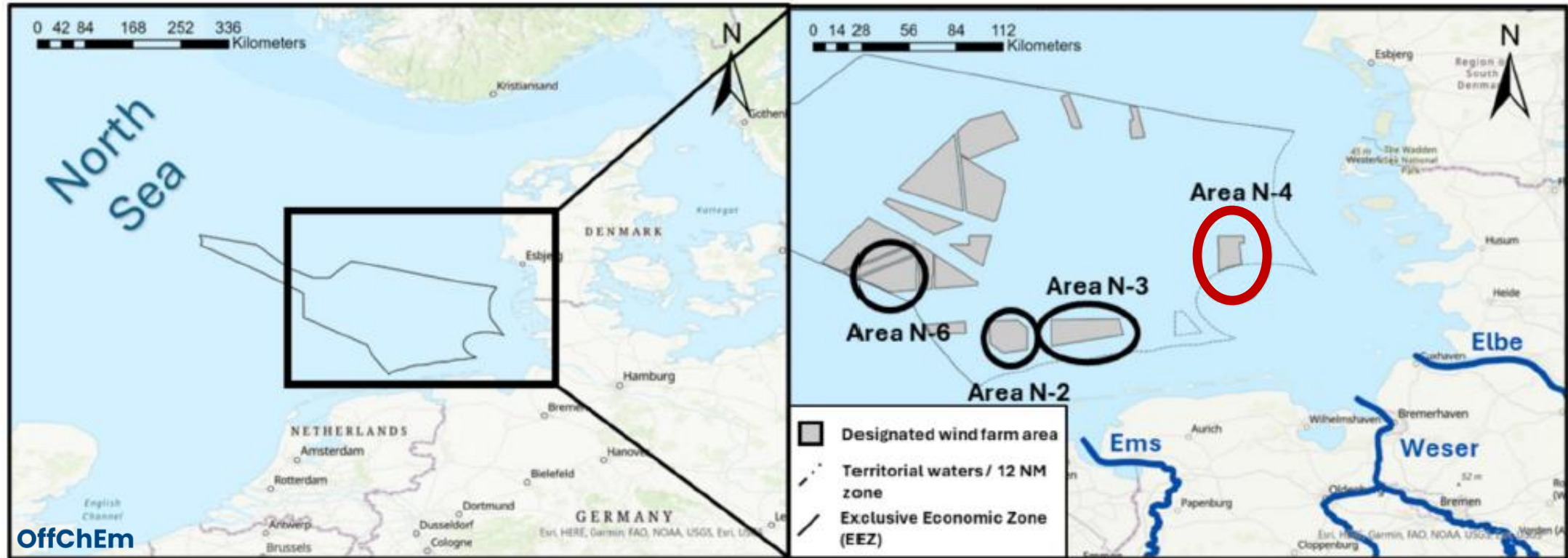
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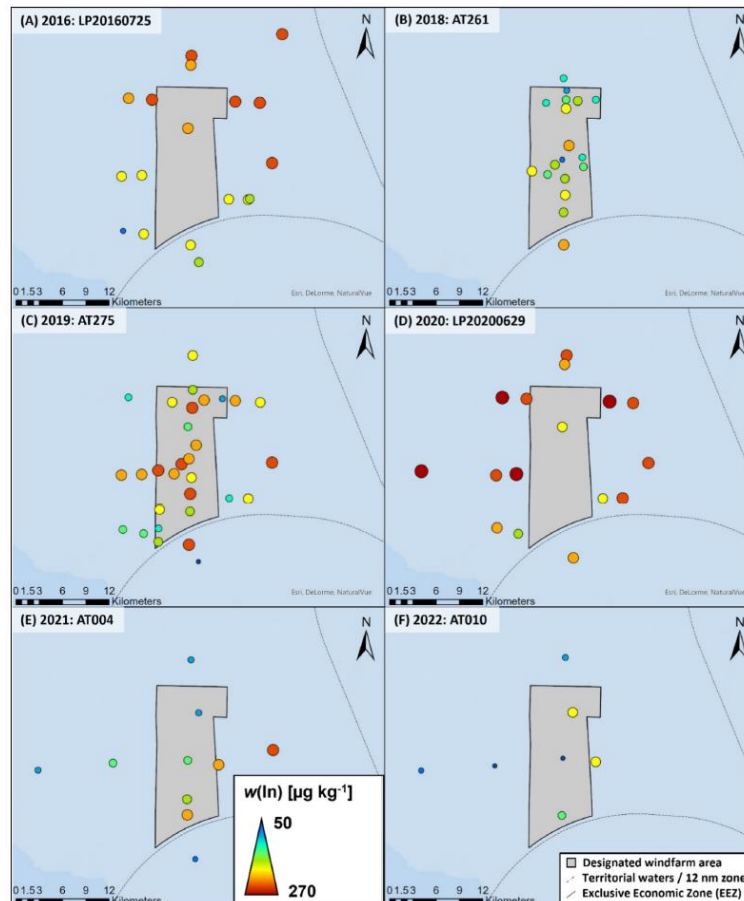


Potential New Sources: Offshore Wind Farms



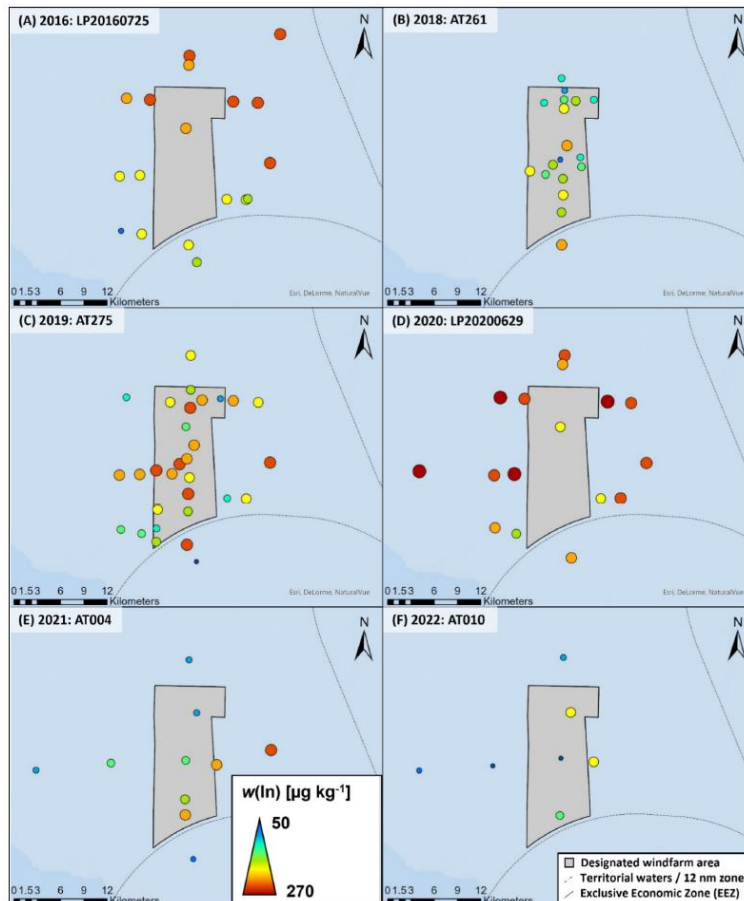
Sampling areas in and around OWFs in the German Bight (grey areas) within the German exclusive economic zone (Ebeling et al., 2025)

Potential New Sources: Offshore Wind Farms

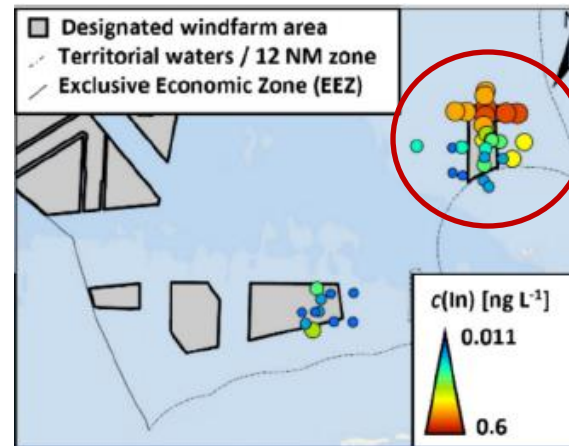


Time series of In mass fractions in sediments in and around OWF area N-4 (Ebeling et al., 2023)

Potential New Sources: Offshore Wind Farms

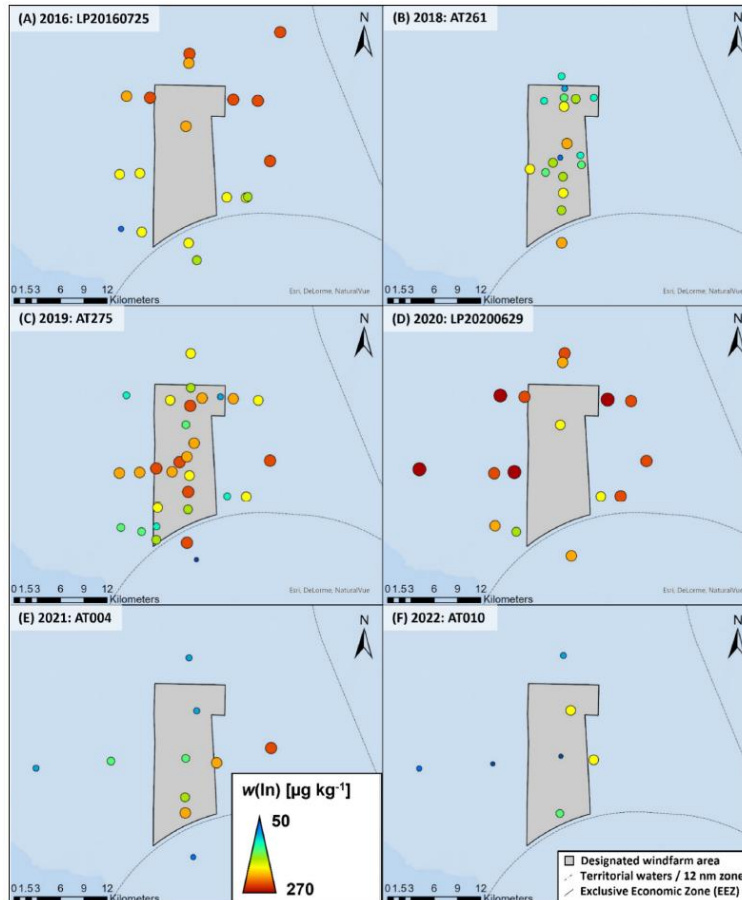


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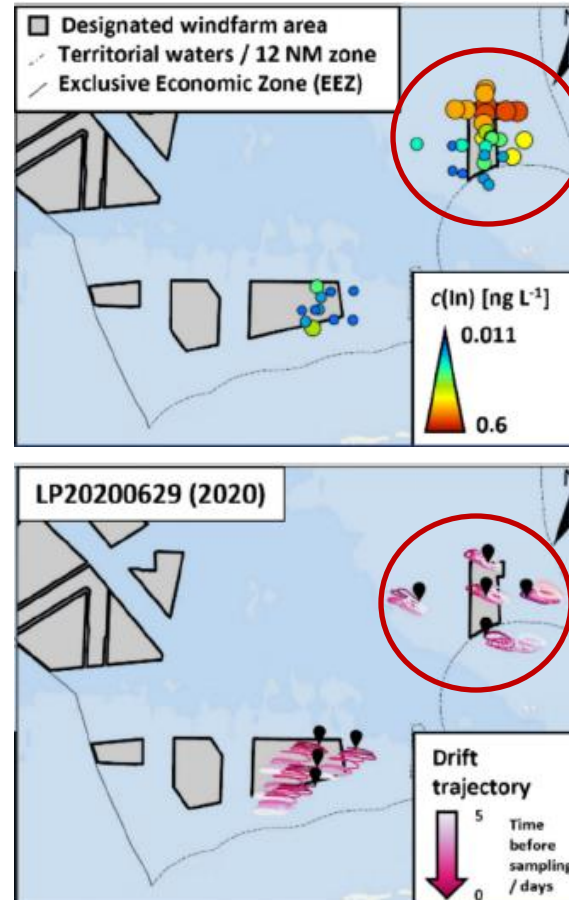


In concentration in water and back trajectory of water masses in and around OWFs (Ebeling et al., 2025)

Potential New Sources: Offshore Wind Farms

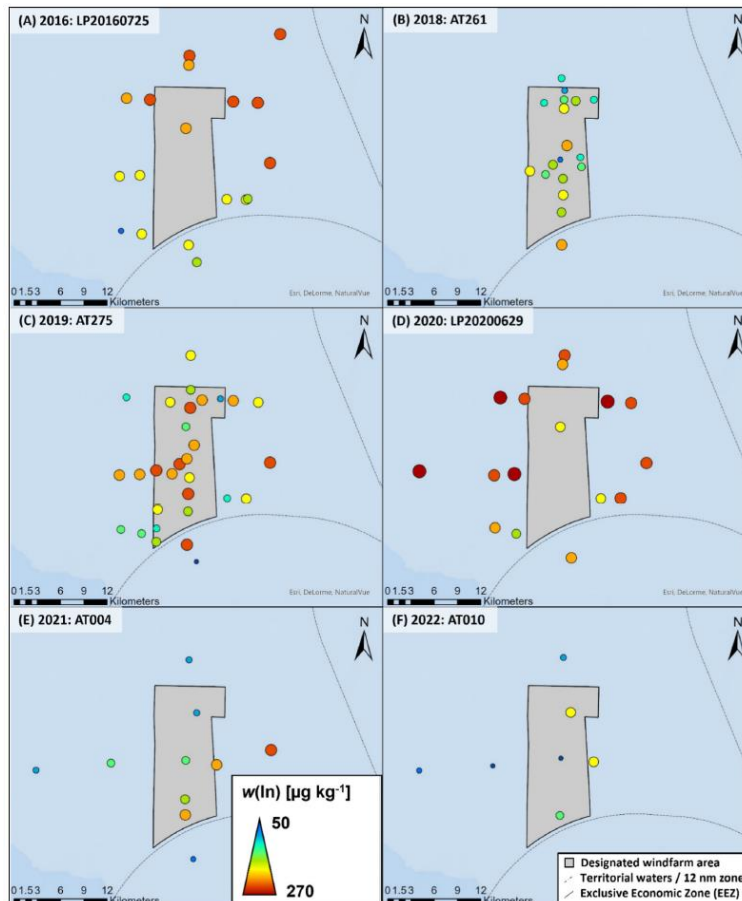


Time series of $\ln$ mass fractions in sediments in and around OWF area N-4 (Ebeling et al., 2023)

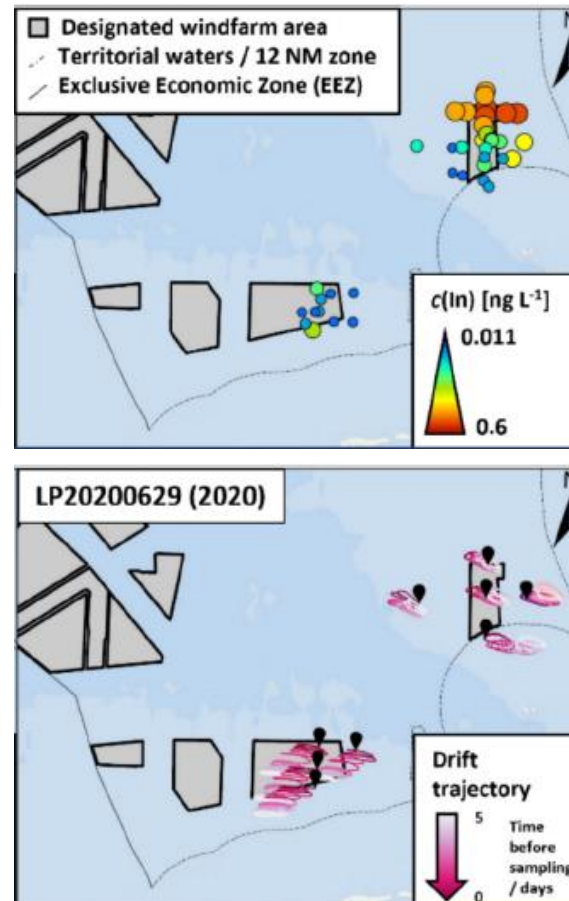


$\ln$ concentration in water and back trajectory of water masses in and around OWFs (Ebeling et al., 2025)

Potential New Sources: Offshore Wind Farms



Time series of In mass fractions in sediments in and around OWF area N-4 (Ebeling et al., 2023)



In concentration in water and back trajectory of water masses in and around OWFs (Ebeling et al., 2025)

- No clear enrichment visible in sediments yet
- First signal might be visible in water column (under stagnating conditions)
- **Monitoring to survey possible long term accumulation of new sources**
- **Monitoring and studies to further identify relevant chemical emissions and environmental impacts of OWF (EU ANEMOI project)**

Summary & Conclusions



BSH Lisett Kretschmann

Summary & Conclusions



- Continuous monitoring can reveal trends and changes in pollution levels

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- Monitoring of different matrices is important

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- Adaptive monitoring strategies and regular updates to identify emerging pollutants

Summary & Conclusions



- Continuous monitoring can reveal trends and changes in pollution levels
- Monitoring of different matrices is important
- Adaptive monitoring strategies and regular updates to identify emerging pollutants
- Monitoring results can lead to mitigation measures or verify the effectiveness of measures

FYI



Monitoring data (MUDAB):



ANEMOI project:



OffChEm project summary:

