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Leibniz Institute For Baltic Sea Research Warnemünde

Towards a better understanding of the eutrophication in the Stettin Lagoon

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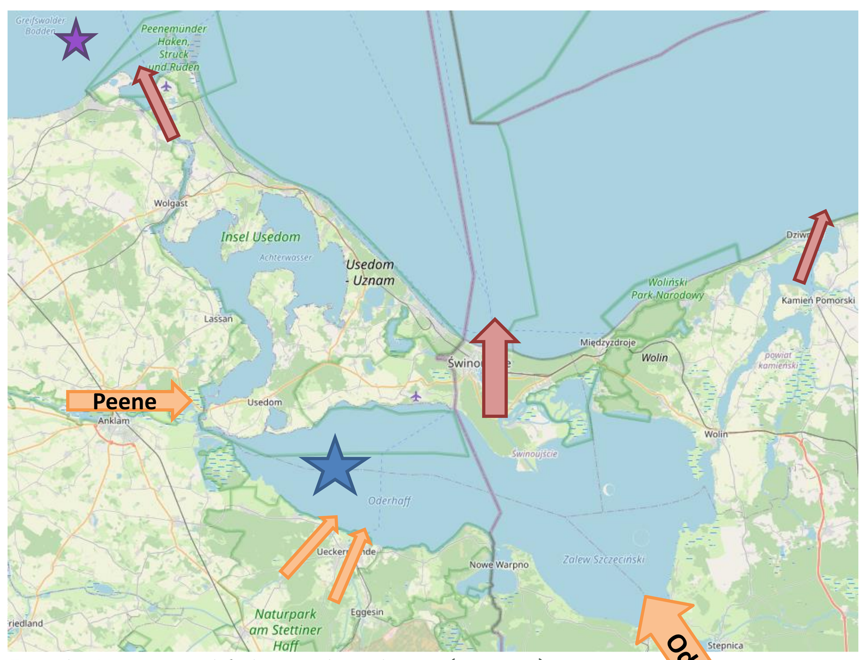
BLUES

Background

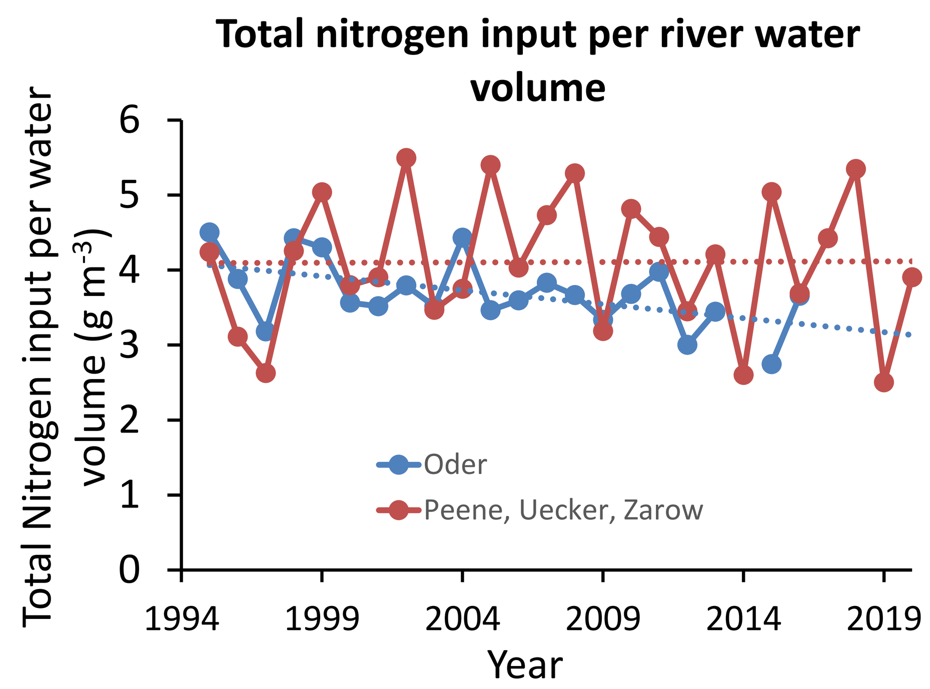
- **Eutrophication** is a major stressor in the Baltic Sea
- Measures like nutrient input reduction show **marginal improvement** of ecological status
- High water residence time facilitates **intense nutrient recycling**



Stettin Lagoon with incoming rivers (orange), outflows (red) and sampling stations (blue – Stettin Lagoon; purple – Greifswalder Bodden)

Site description

- **Brackish, shallow** water body
- Frequent wind-induced mixing
- Continued **high nutrient input** from Odra & Peene river
- Low water exchange, **high water residence time** (approx. 60 days)

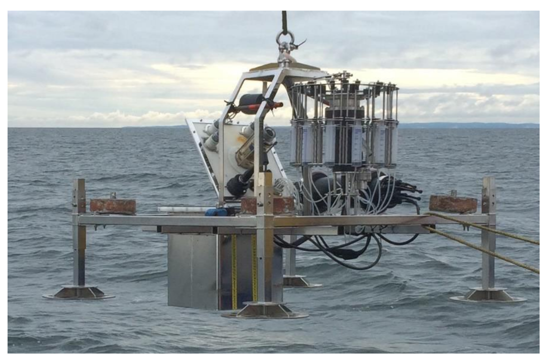


Hypothesis

The Stettin Lagoon functions as a **coastal nutrient filter** for the coastal waters by incorporating riverine nutrients in biomass.

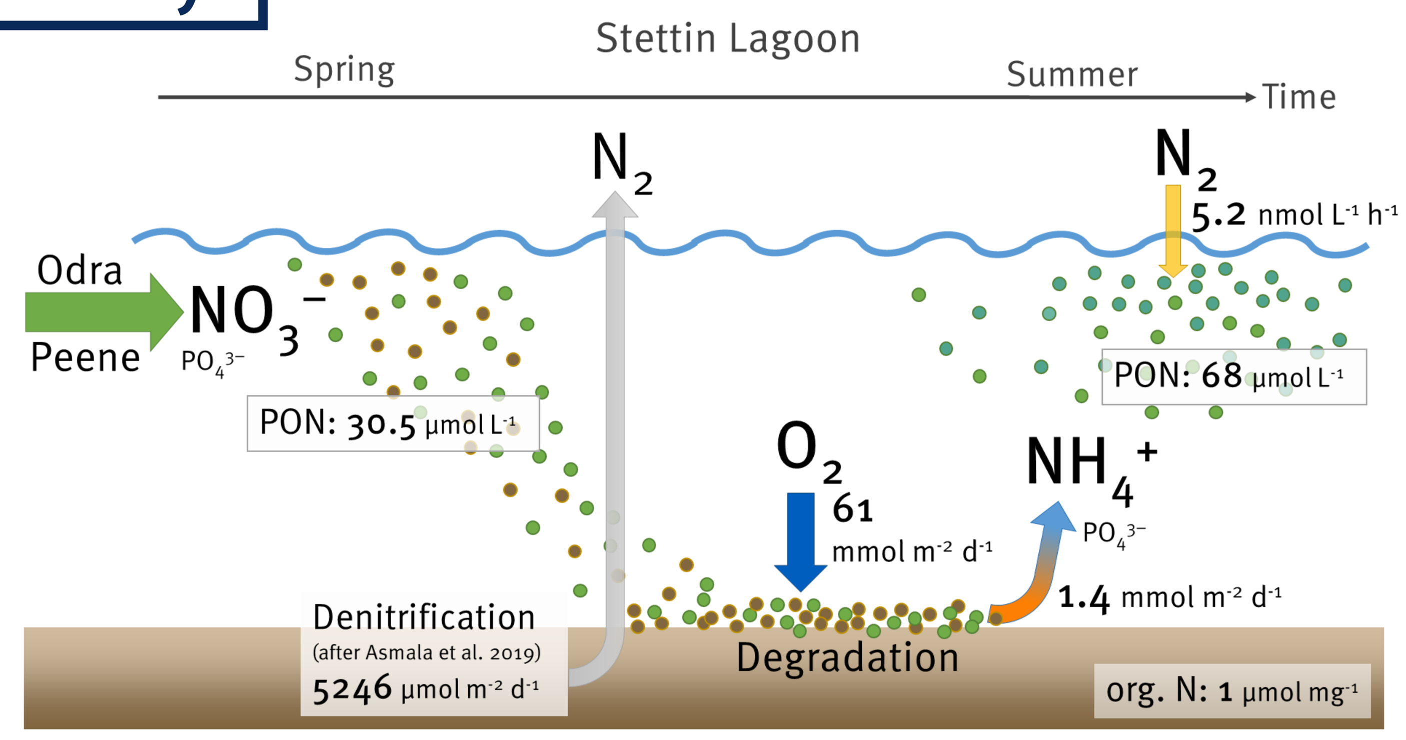
Methods

- Seasonal sampling in the Stettin Lagoon & Greifswalder Bodden in 2021 & 2022



- **Measurements in water column**
  - → abiotic variables
  - → nutrient concentrations
  - → primary production (PP) and nutrient uptake rates
- **Bottom chamber lander**
  - → sedimentary oxygen consumption
  - → nutrient fluxes from the sediment

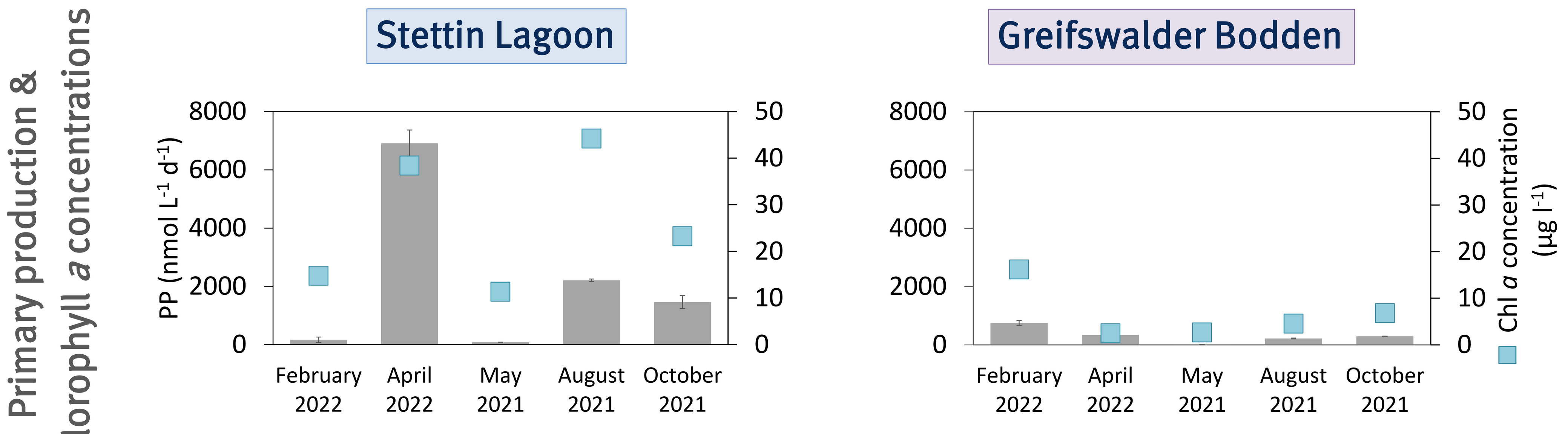
Summary



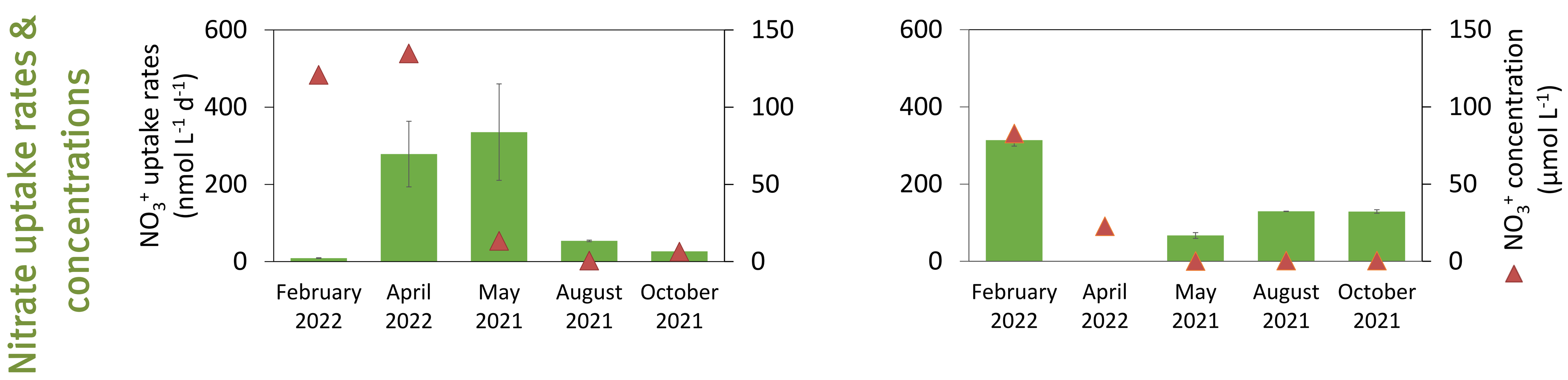
Results

Water samples

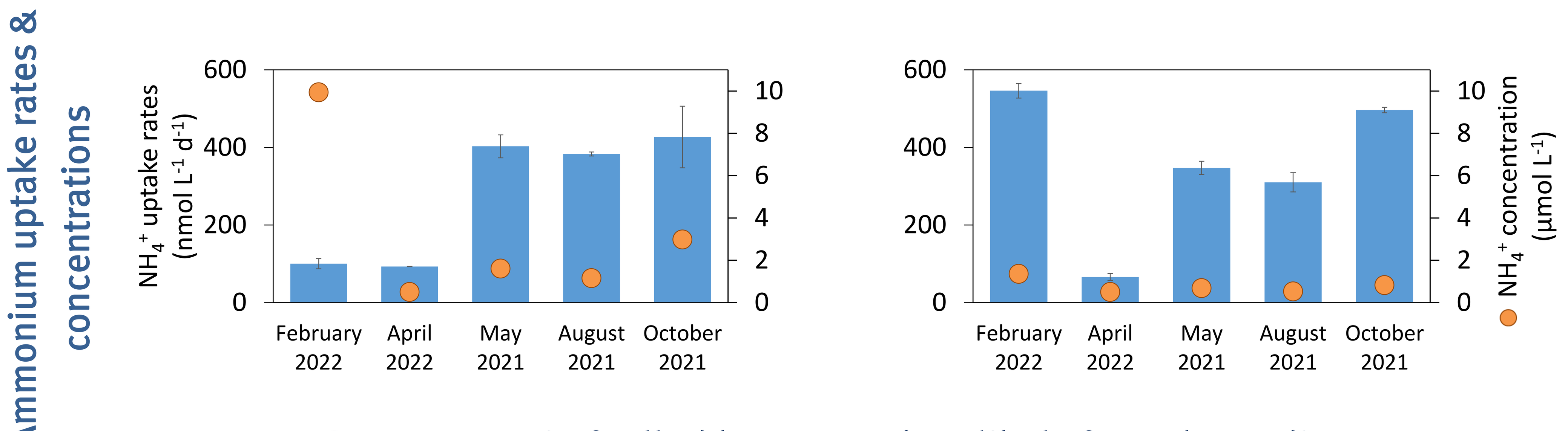
Stettin Lagoon | Greifswalder Bodden



- **PP** is, as expected, highest in spring and summer



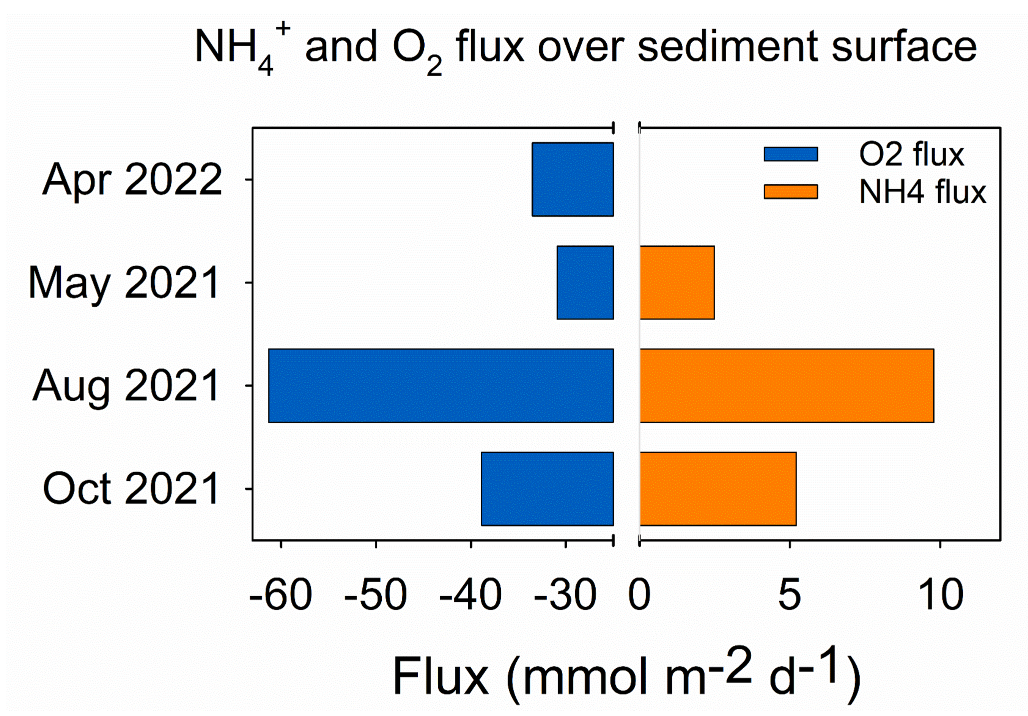
- Spring: PP is supported primarily by **nitrate** from the Odra River or Peene Strom



- Summer: PP in fuelled by **ammonium** likely from the sediment

Bottom chamber lander

- **Degradation of organic matter** originating from the spring bloom produces **recycled ammonium**
- Simultaneously **oxygen is consumed**
  → hypoxic or even anoxic bottom waters during periods with low wind-induced mixing
- Summer 2021: 3 days of calm weather led to **hypoxic bottom waters**



→ Not only riverine nutrients facilitate eutrophication in the Stettin Lagoon but also internal nutrient pools and cycling.

→ Coastal sites in the Odra outflow region do not act as filter for nutrients.

Implication

Measures to improve the ecological status of the Odra outflow region must be expanded and made more efficient!

BMBF financed

References | Friedland, René, et al. "Managing eutrophication in the Szczecin (Oder) lagoon-development, present state and future perspectives." Frontiers in Marine Science 5 (2019): 521. Input of nutrients by the seven biggest rivers in the Baltic Sea region 1995-2017. Baltic Sea Environment Proceedings No. 178. HELCOM (2021). Asmala, E., Gustafsson, C., Krause-Jensen, D. et al. Role of Eelgrass in the Coastal Filter of Contrasting Baltic Sea Environments. Estuaries and Coasts 42, 1882–1895 (2019).