Baltic Breakfast: Blue Carbon ecosystems

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What is Blue Carbon (BC)?

• “Carbon that is captured and stored by the oceans and coastal ecosystems, particularly by vegetated coastal ecosystems” (Macreadie et al. 2019)

• Main BC ecosystems:
  ▪ Seagrass meadows
  ▪ Coastal marshes, saline meadows
  ▪ Mangrove forests
  ▪ Macroalgal belts (kelp & seaweeds)

• Capture CO\textsubscript{2} from the atmosphere and store it in the seafloor

• Short-term storage and long-term sequestration
The blue carbon wealth of nations

Christine Bertram¹, Martin Quaas², Thorsten B. H. Reusch², Athanasios T. Vafeidis³, Claudia Wolff⁴ and Wilfried Rickels⁴

~ US $190 000 000 000 per year to blue carbon wealth
Global distribution of BC ecosystems
Kelp and other macroalgae have long been overlooked!

Kelp takes up CO₂ via photosynthesis

Plant detritus floats out to sea

Exported dissolved carbon travels to the deep sea

Plant detritus sinks

Carbon is sequestered in the deep sea

Fig: Blog by Hurlimann & Zucker (2019), adapted from Krause-Jensen & Duarte (2016)
BC ecosystems in the Baltic Sea

Seagrass meadows

Macroalgal belts

Coastal meadows and reed beds
Coastal meadows

Fig: Eionet Forum 2016
Biodiversity and environmental context modifies carbon and nutrient cycling
Why are these ecosystems so important for C cycling?

- Primary productivity
- Biodiversity hotspots
- Produce organic matter
- Trap organic material from the water
- Nutrient sinks
Ecosystem services

- Food security
- Natural protection against storms
- Stabilise the seafloor, protect against erosion
- Water quality
- Ocean acidification
- Recreation and tourism

Fig: J. Lokrantz/Azote, BalticSTERN 2013
What do we know?

• Maintain important ecosystem functions and services

What do we not know?

• How do these ecosystems function as sinks over time and space?

• How does the biodiversity in these ecosystems contribute to C cycling?
Take-home messages

- The Baltic Sea contains many important BC ecosystems
- Links between coastal biodiversity and C cycling need to be explored in more detail
- The implications of climate change on the functioning of these ecosystems remains veiled