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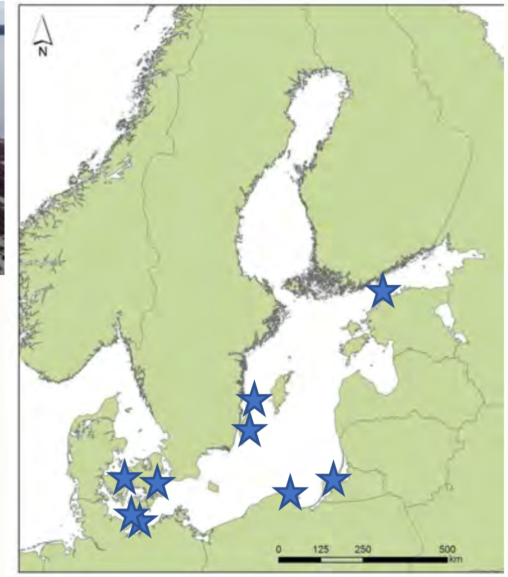
CONTRA
BALTIC BEACH WRACK
CONVERSION OF A NUISANCE TO A RESOURCE AND ASSET

Natural life cycle of beach wrack

Möller, T., Woelfel, J., Beldowski, J., Busk, T., Gorbunova, J., Hogland, W., Kotwicki, L., Martin, G., Quintana, C.O, Sachpazidou, V., Schmieder , F., Schubert, H., Schätzle, P.-K., Taevere, T., Torn, K.

- **Amounts**
  - Seasonality
  - Volume
  - Coverage
  - Weight
- **Species composition of BW**
- **Biodiversity BW supports***- Lech*
  - Macrofauna
  - Meiofauna
- **Litter**
- **Residence time –how long?**
- **Aeolian transportation – how far?**
- **Nutrient availability** *- Jacek*
- **Hazardous substances** *- Jacek*
- **Decomposition** *- Cintia*
  - Natural degradation
  - GHG emissions



Management

- **Management activities**
- **Noise pollution**
- **Scare effect**
- **Biodiversity**
  - Birds
  - Meiofauna

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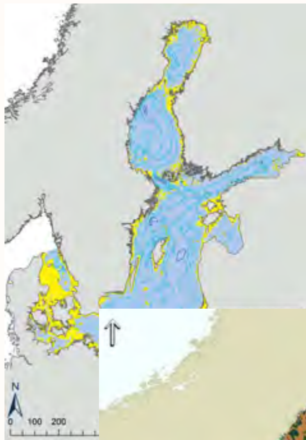
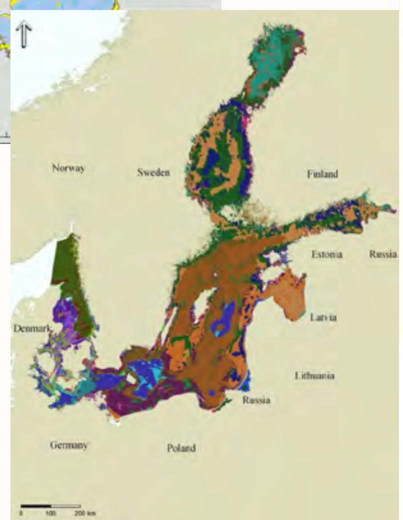
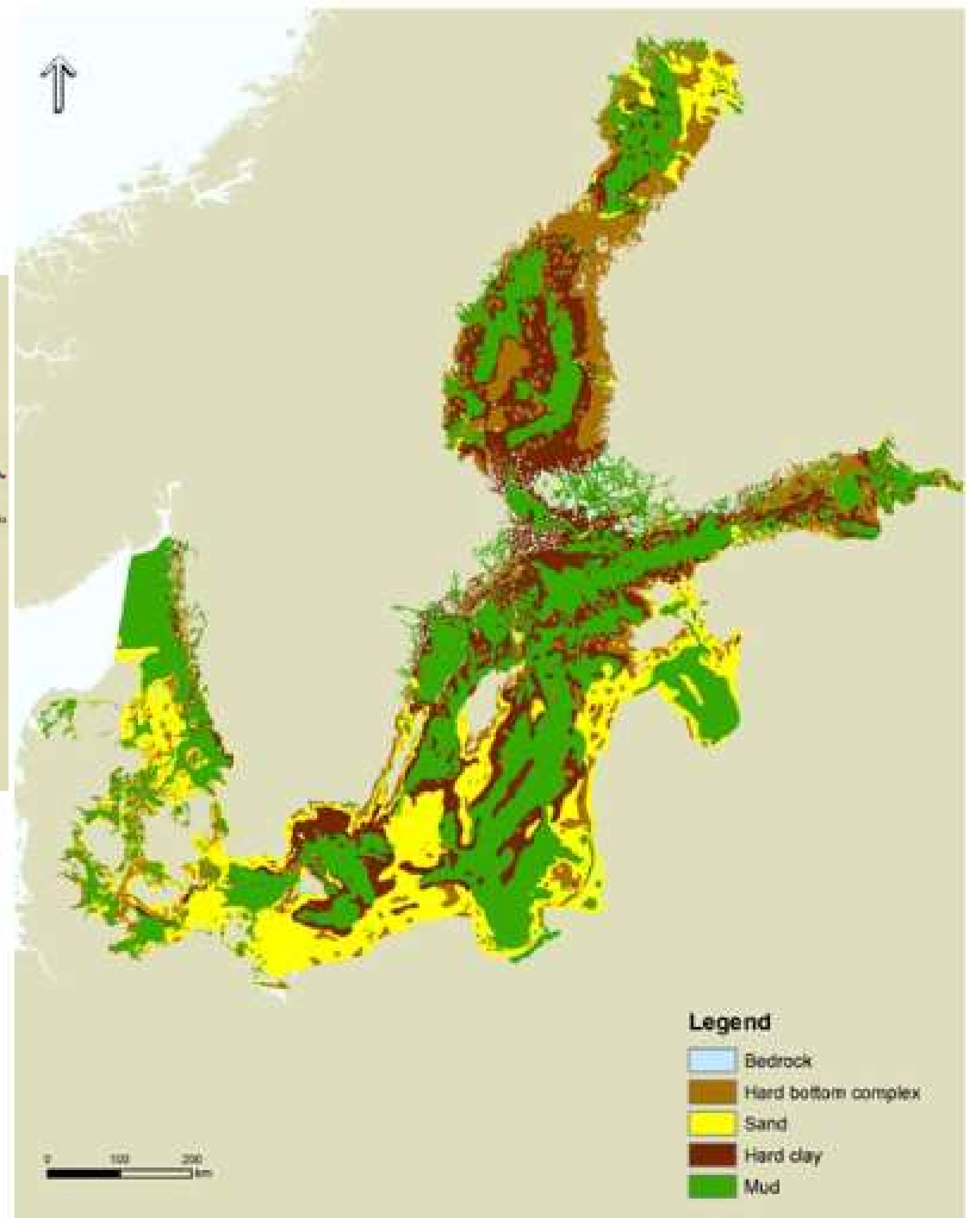
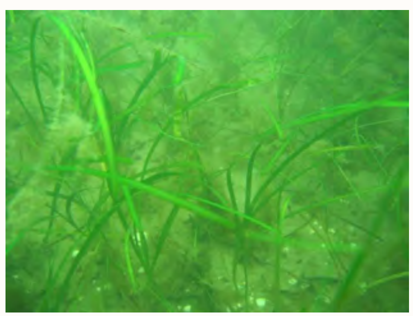
Baltic Sea marine seabed sediments, aphotic zone & benthic habitats









http://balance-10eu.org/xpdf/balance-interim-report-no-10.pdf

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TM4

P.-K. Schätzle

Slide 5

TM4 Tiia Moller, 6/1/2021

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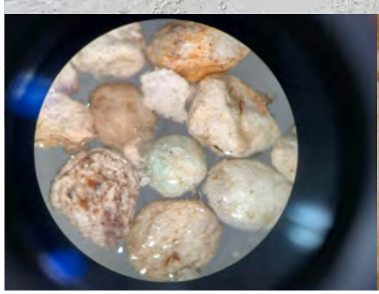
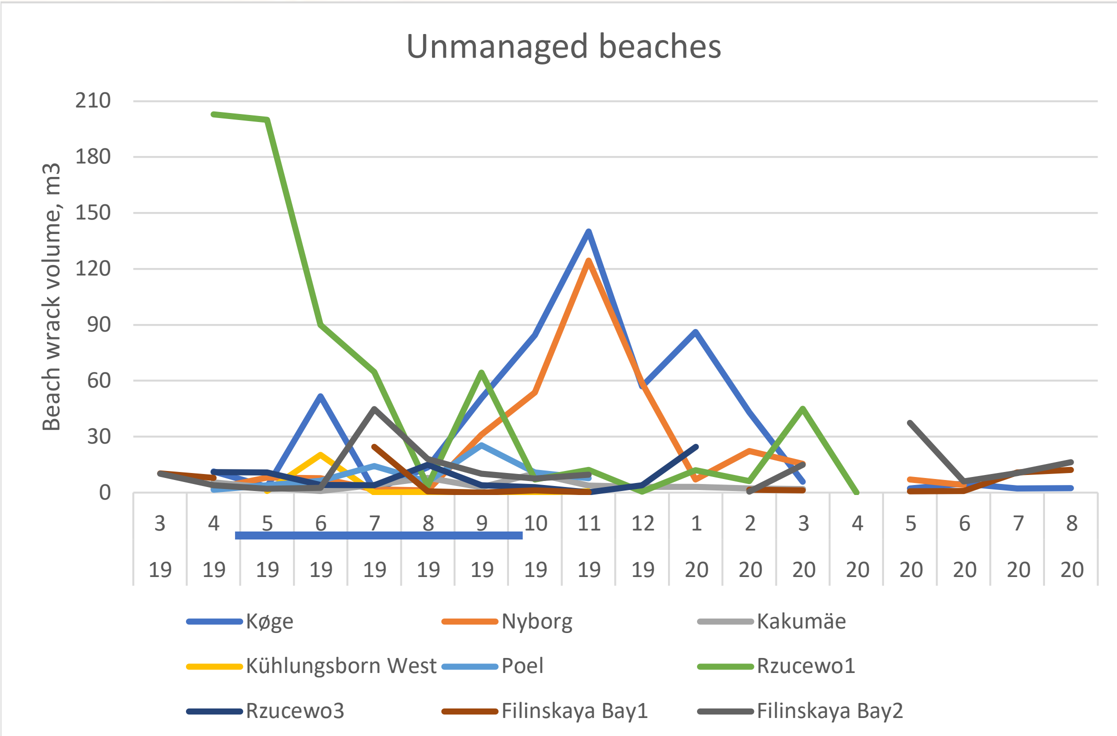
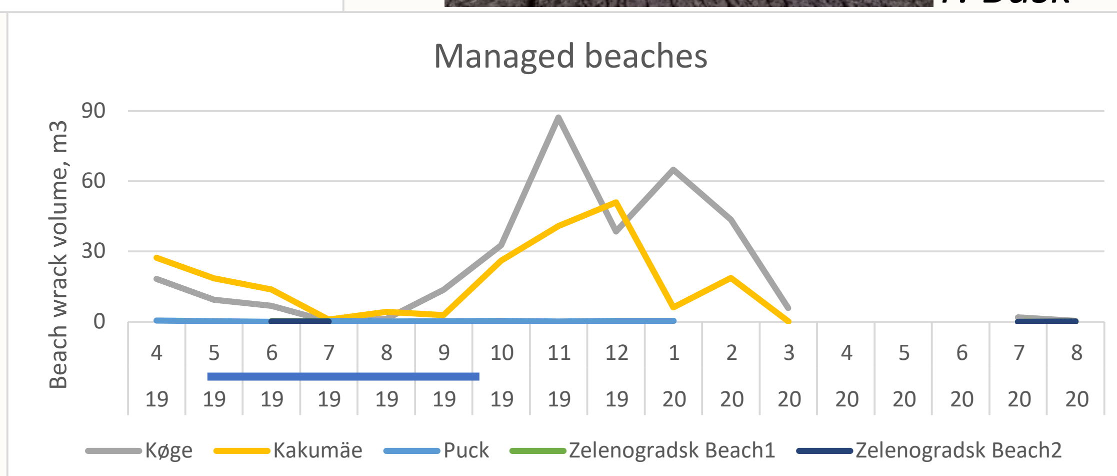


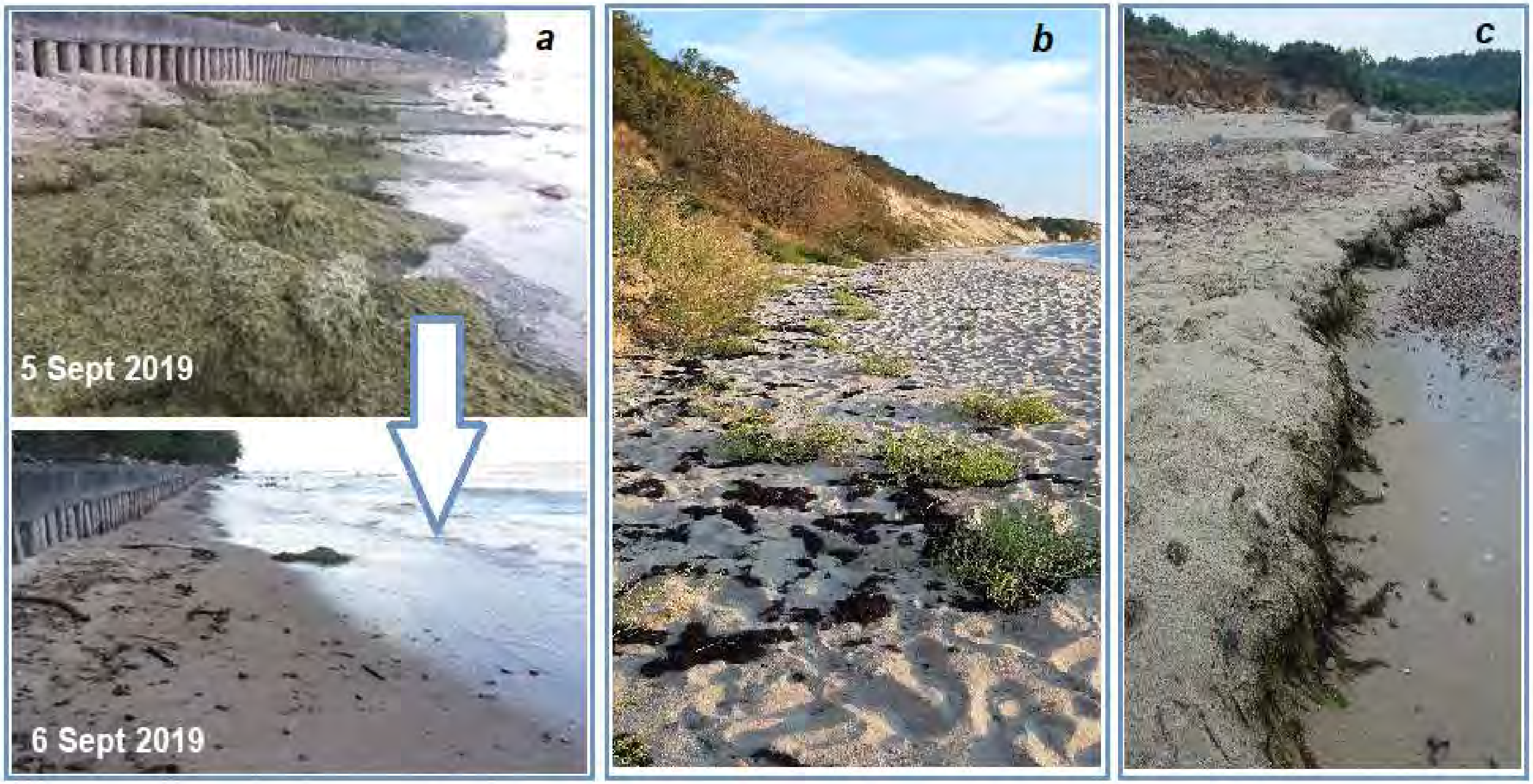
Beach wrack thickness measuring March 2019, Filinskaya Bay, by J.Gorbunova)



T. Busk

Beach wrack volume per 100 m long beach section





J. Gorbunova

A stay on the beach/flushed back to the sea

B disperse inland by wind and waves

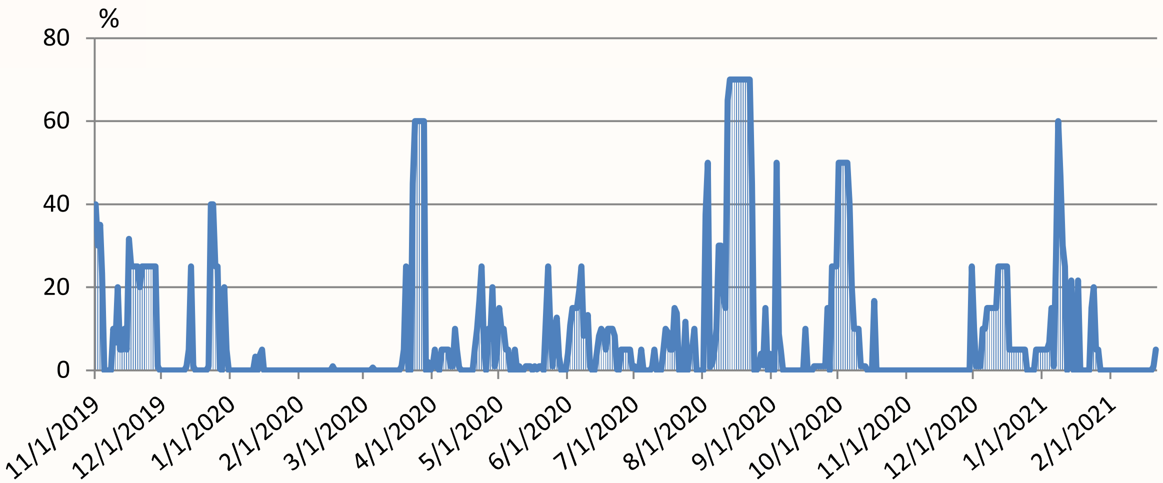
C buried under the sand

Rällä, SWE. *W. Hogland*

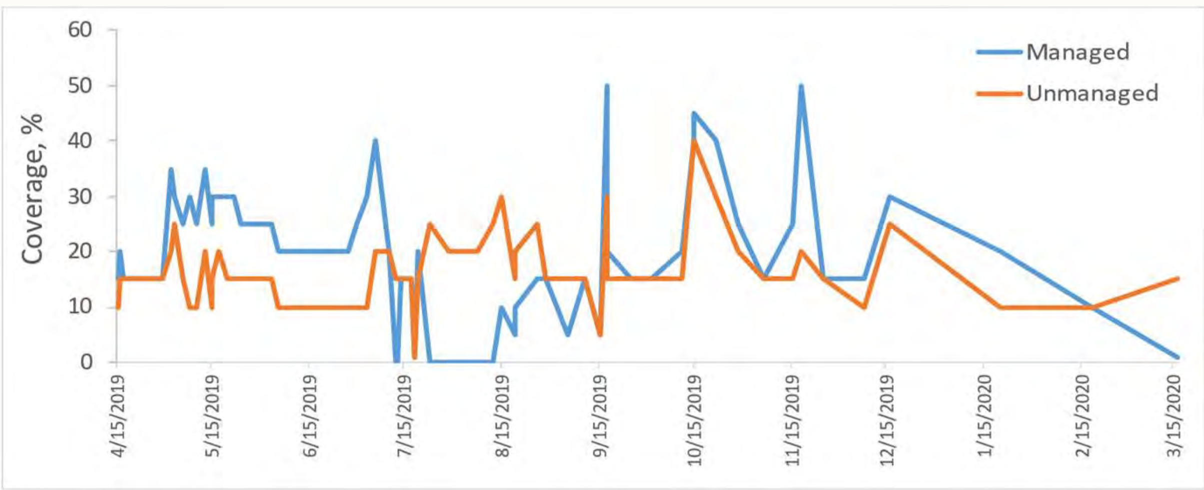
Kakumäe, EE

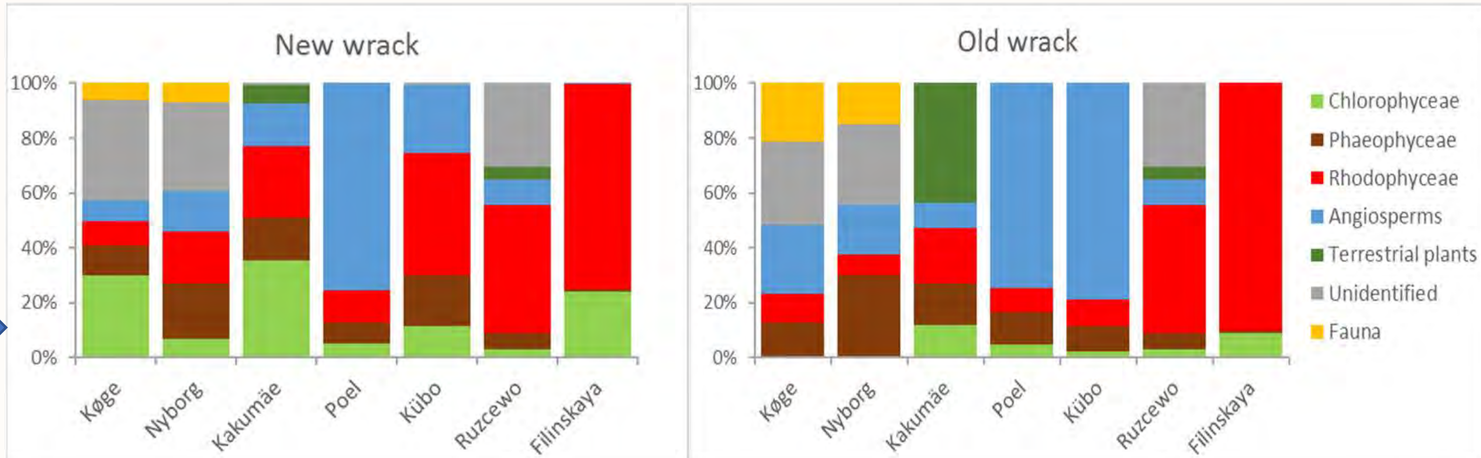
Rzuzewo, PL. *K. Deja*

Otradnoye, Kaliningrad - exposed



Kakumäe, Estonia - sheltered




New wrack
Old wrack
100%
80%
60%
40%
20%
0%
Køge
Nyborg
Kakumäe
Poel
Kübo
Ruzcewo
Filinskaya
Chlorophyceae
Phaeophyceae
Rhodophyceae
Angiosperms
Terrestrial plants
Unidentified
Fauna

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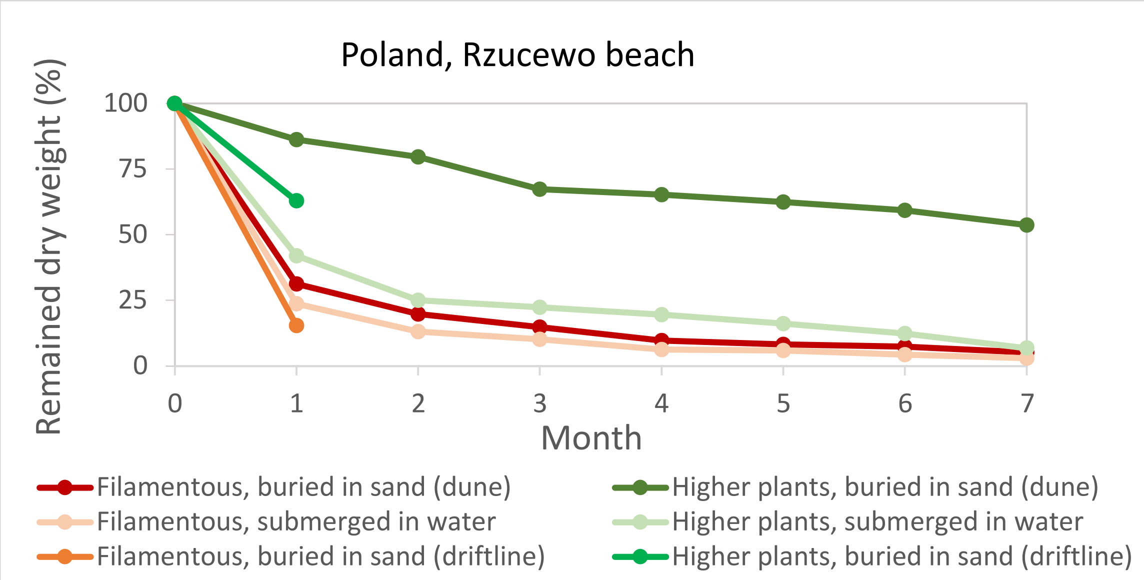
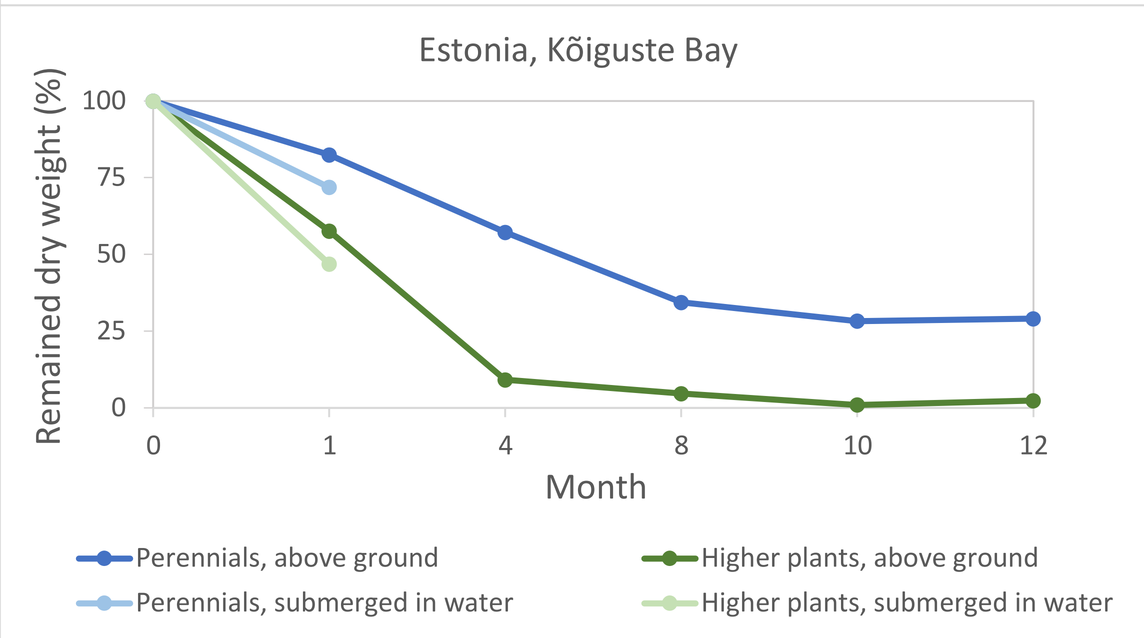
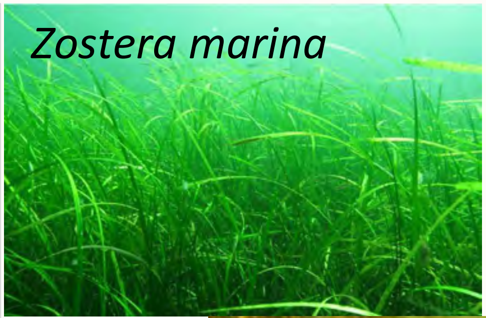
BALTIC BEACH WRACK







Thank You!

tiia.moller@ut.ee
University of Tartu,
Estonian Marine Institute

Beach wrack cycling and management in Køge Bay, Denmark:

Cintia O. Quintana*

Thomas Busk

*cintia@biology.sdu.dk

@CintiaOQuintana

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BALTIC BEACH WRACK

CONVERSION OF A NUISANCE TO A RESOURCE AND ASSET

SDU

UNIVERSITY OF SOUTHERN DENMARK

Køge Beach in Denmark

Temporal changes in Beach Wrack

1000 to 10000 tons per year

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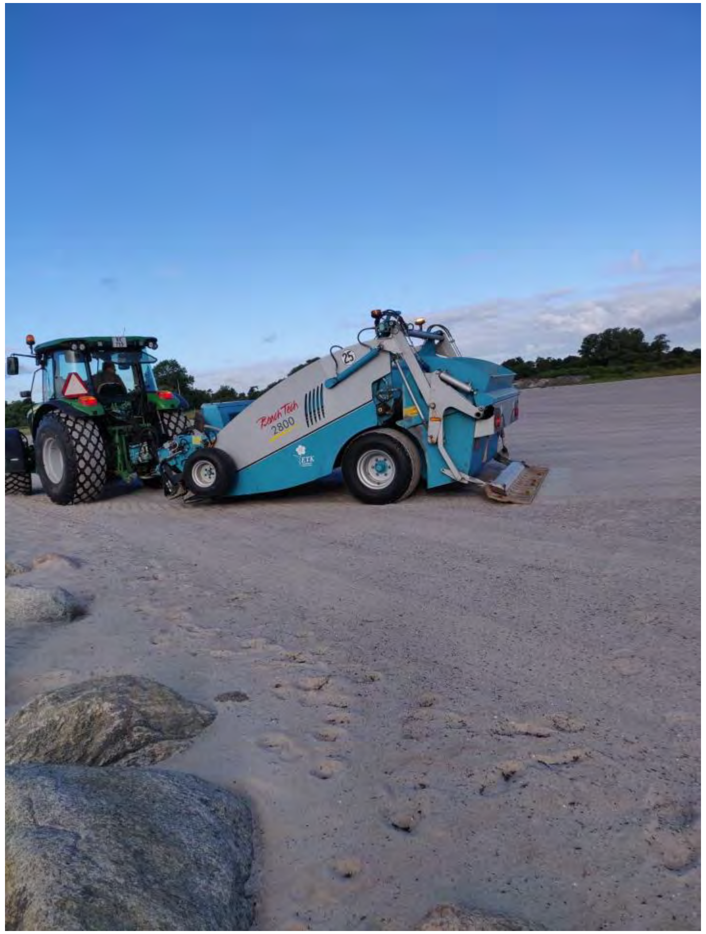
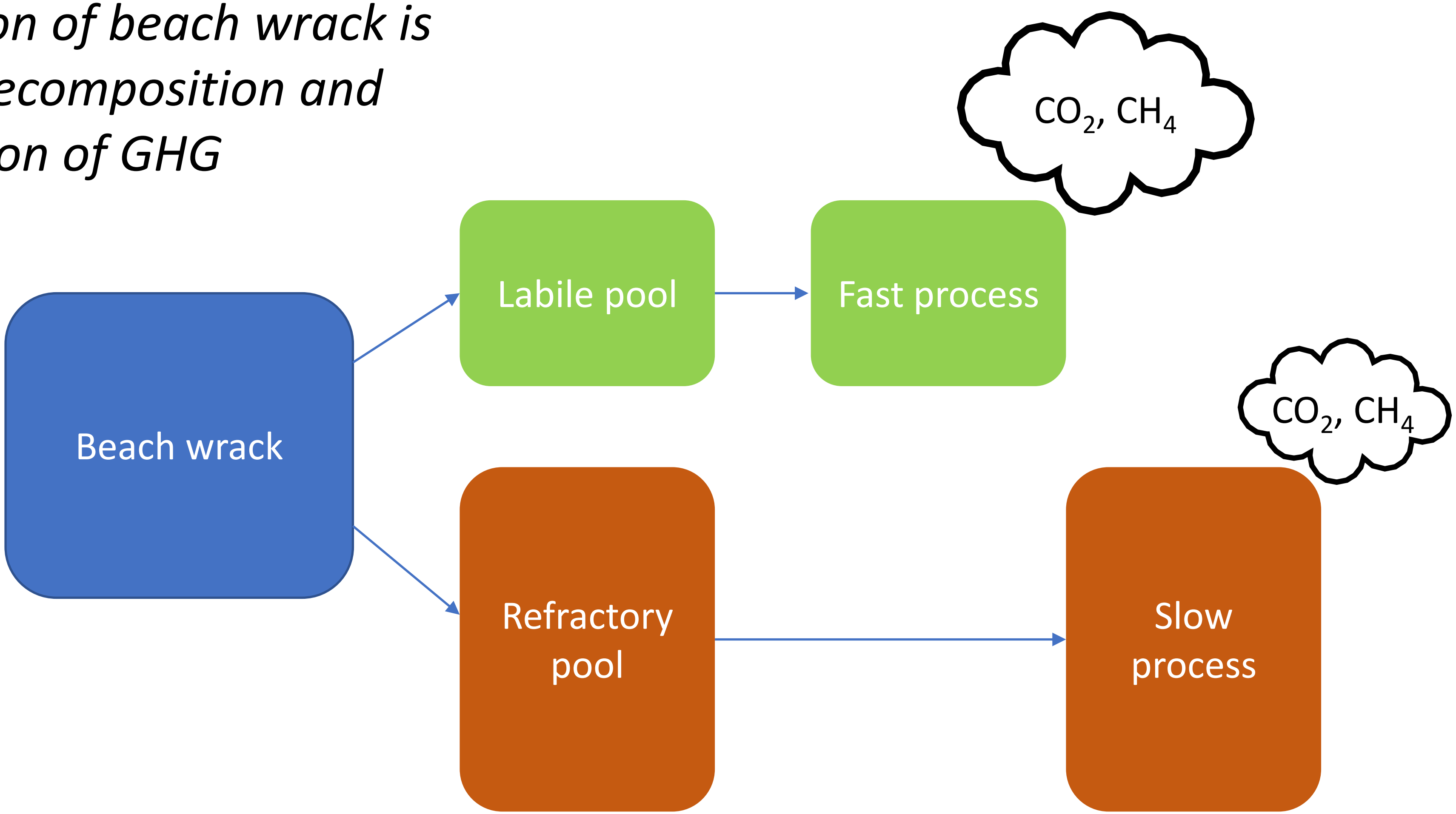
Cleaning of the beach with machines



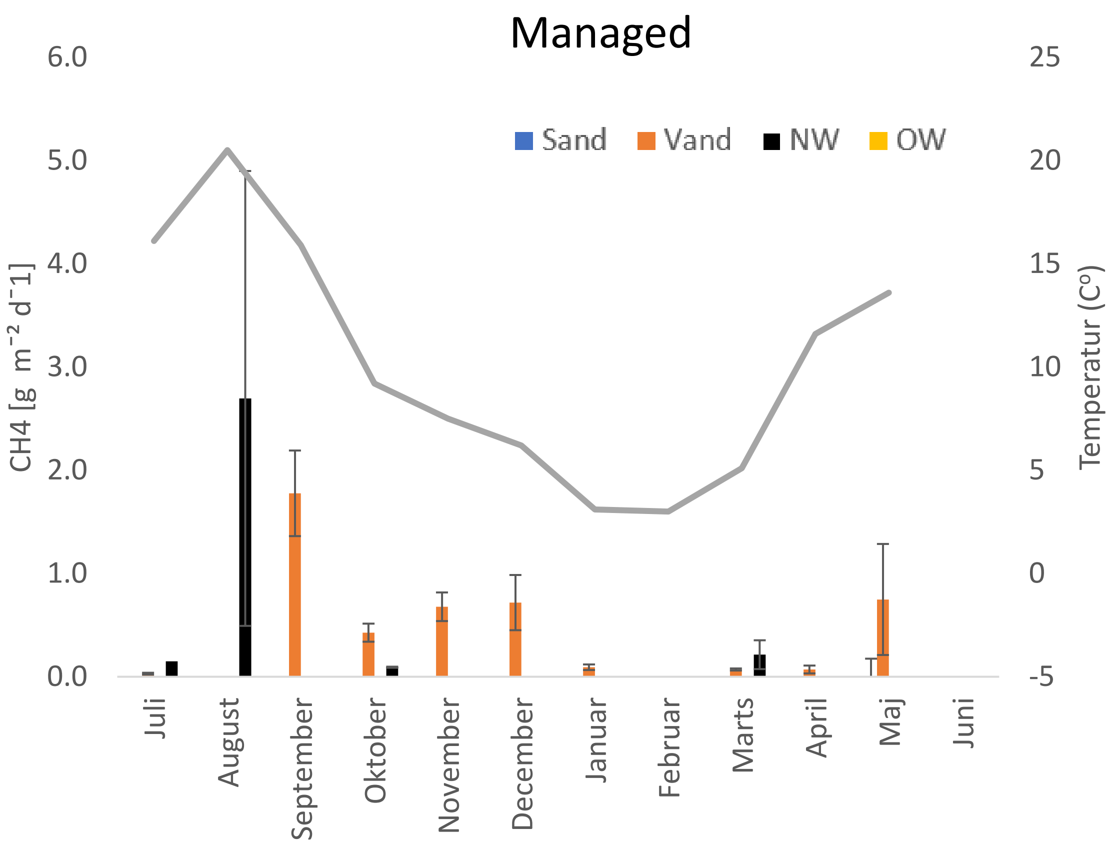
The accumulation of beach wrack is followed by decomposition and emission of GHG

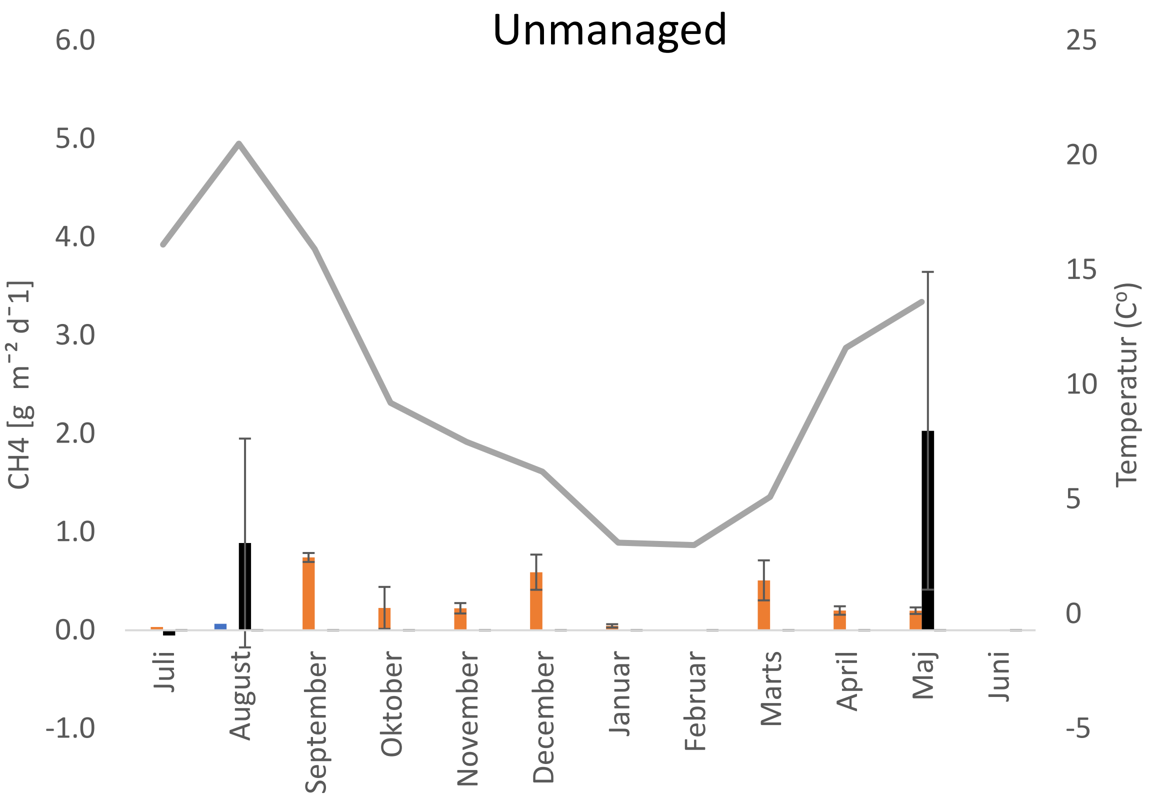
Decomposition depends on:

- Species
- Temperature
- Moisture
- Size of POC



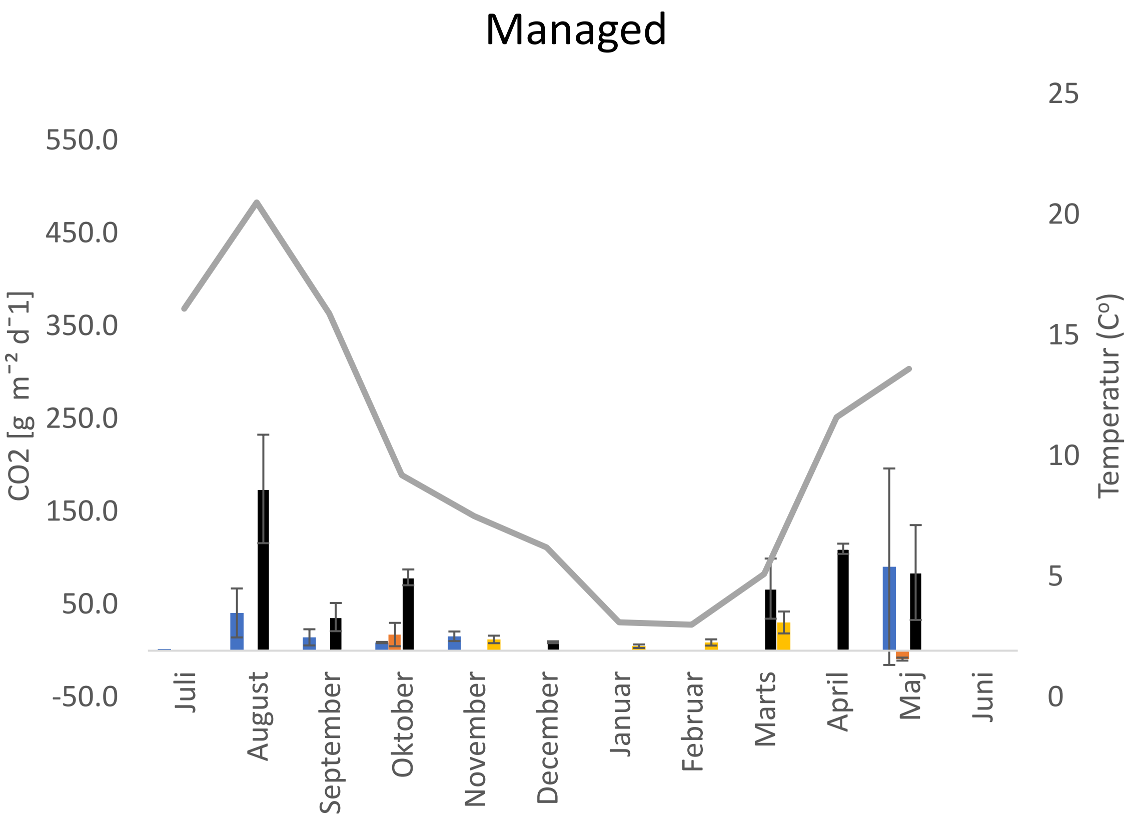
Temporal dynamics of CH_4 emission

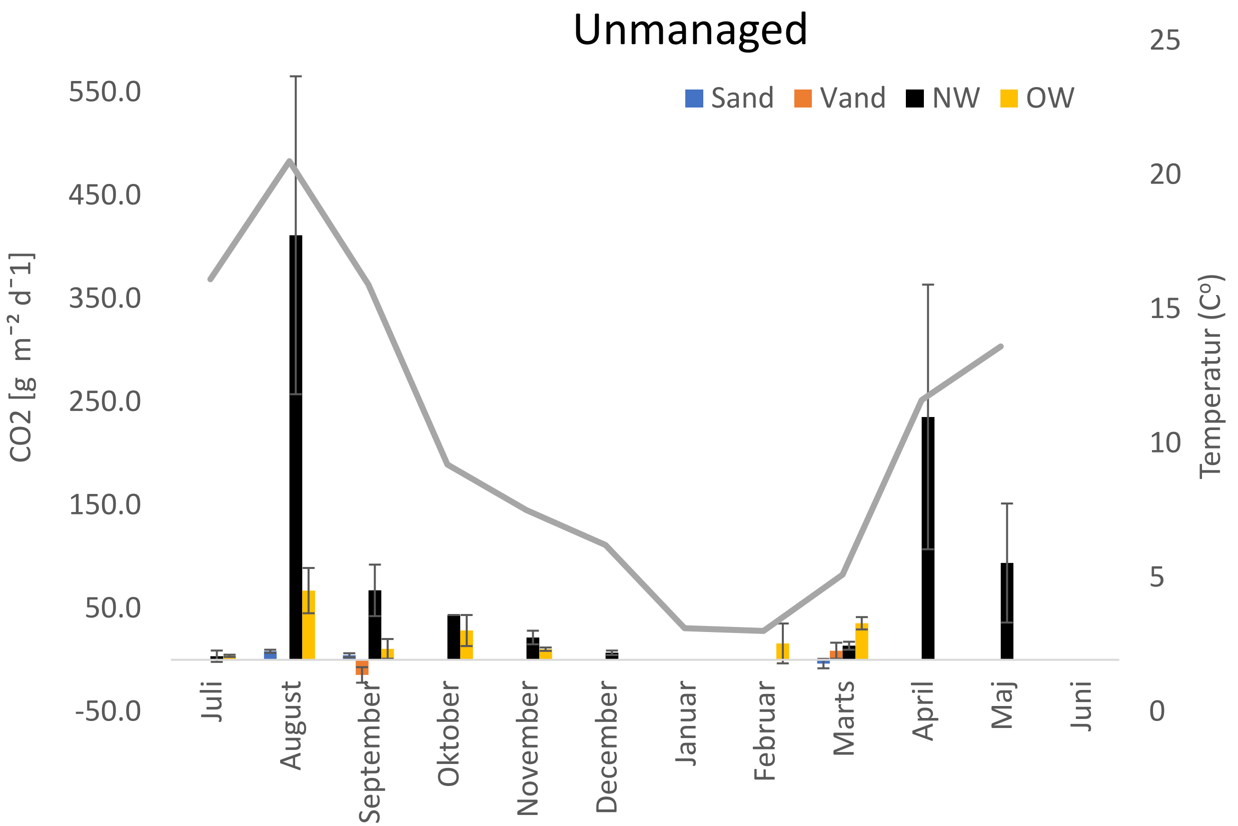




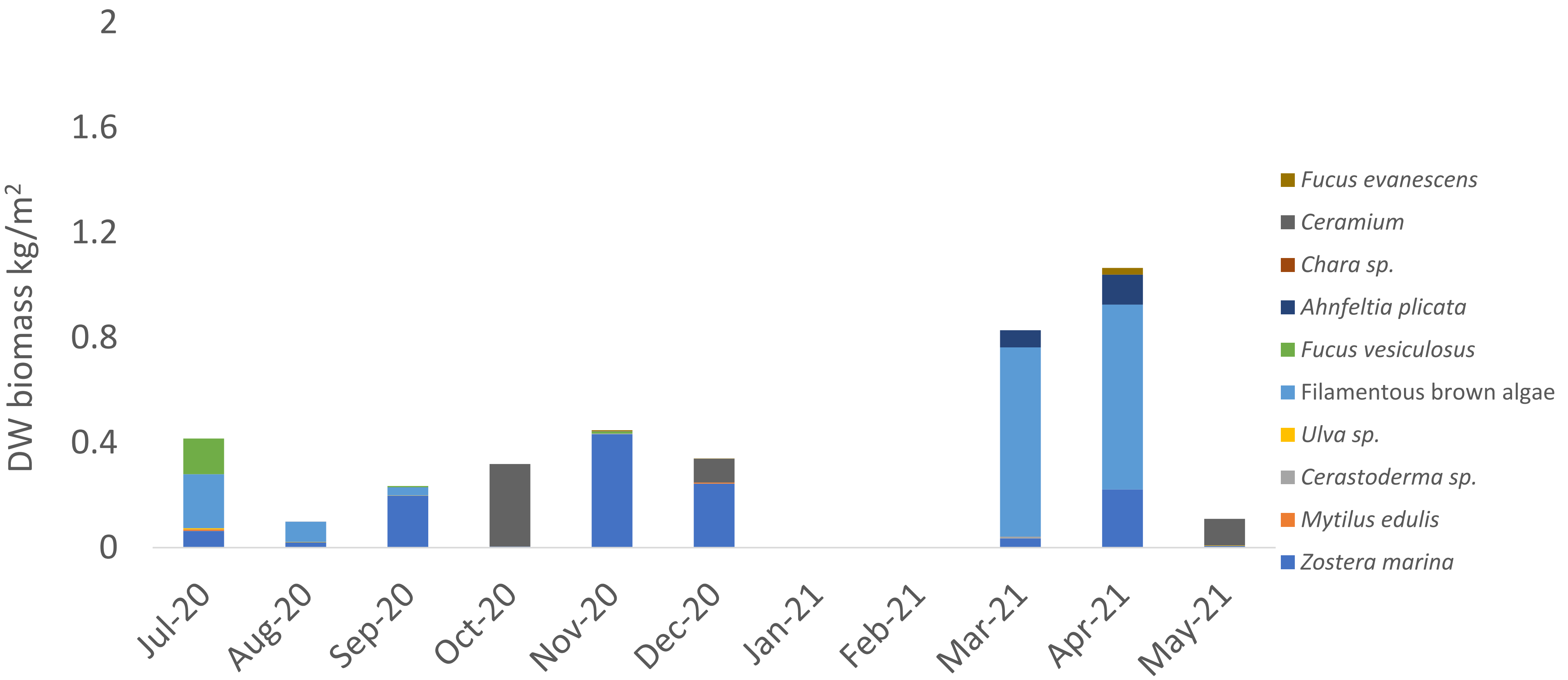
Comparable to rates found in organic rich freshwater wetlands: 0.2 to 8 g CH_4 m^{-2} d^{-1}

Temporal dynamics of CO_2 emission

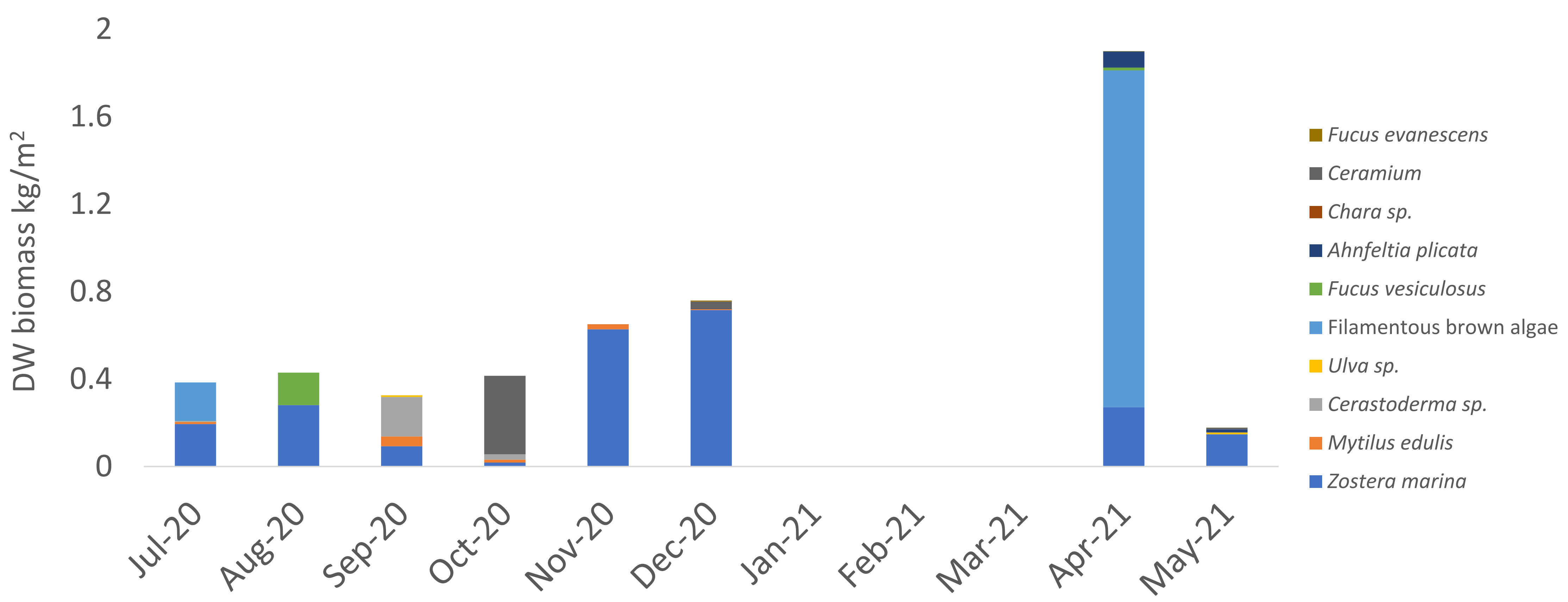




Køge Managed beach – New wrack



Køge Unmanaged beach – New wrack



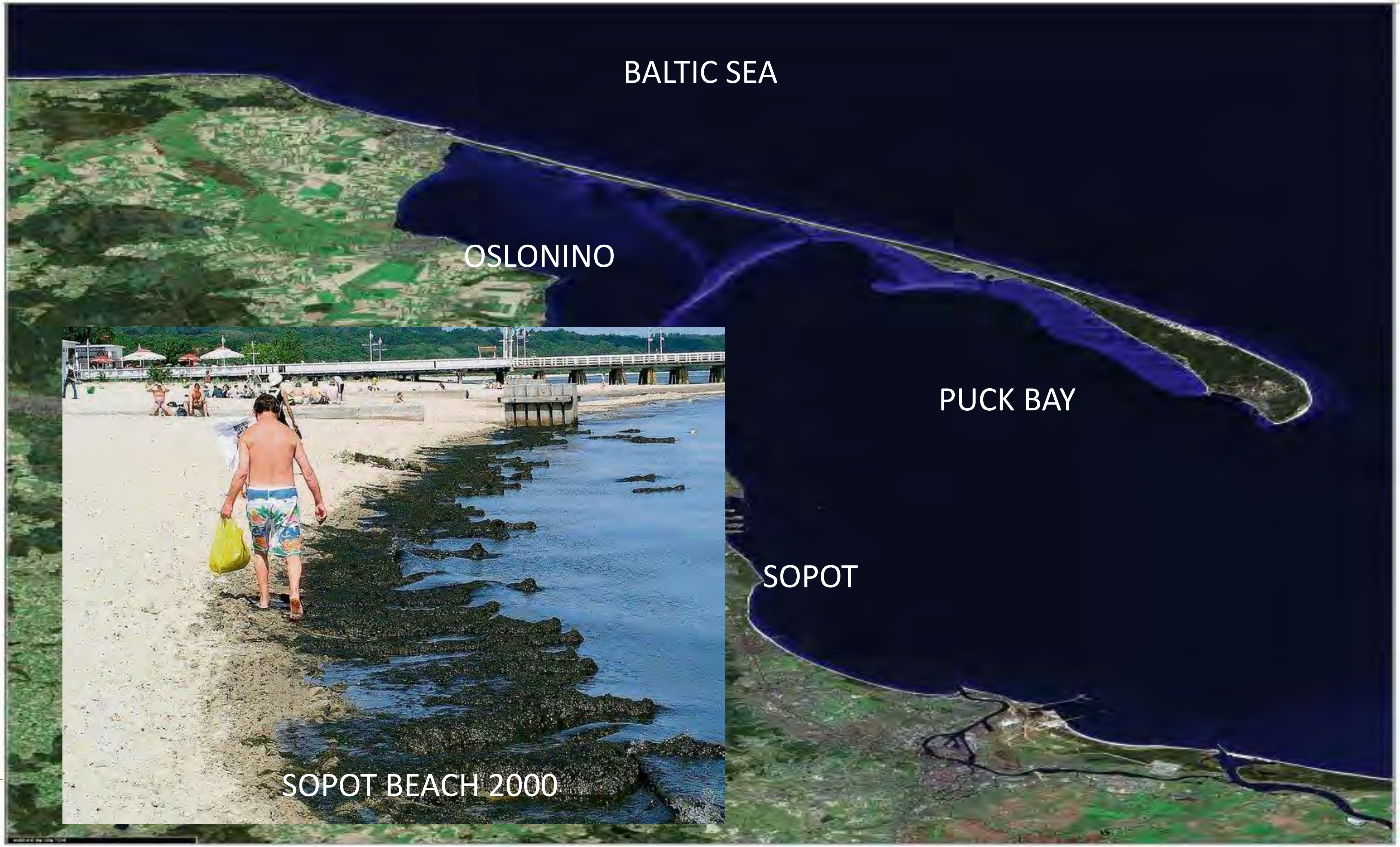
Summary

- Køge Beach accumulate large amounts of beach wrack, natural tendency, geomorphology, winds
- New freshly wrack and macrophyte material in the water have the highest CH_4 emission rates
- New/old wrack and sand have the highest CO_2 emission rates
- The GHG emissions was caused by the brown filamentous algae and eelgrass mixture
- Management practices should consider cleaning of macrophyte biomass in the water

Project Contra

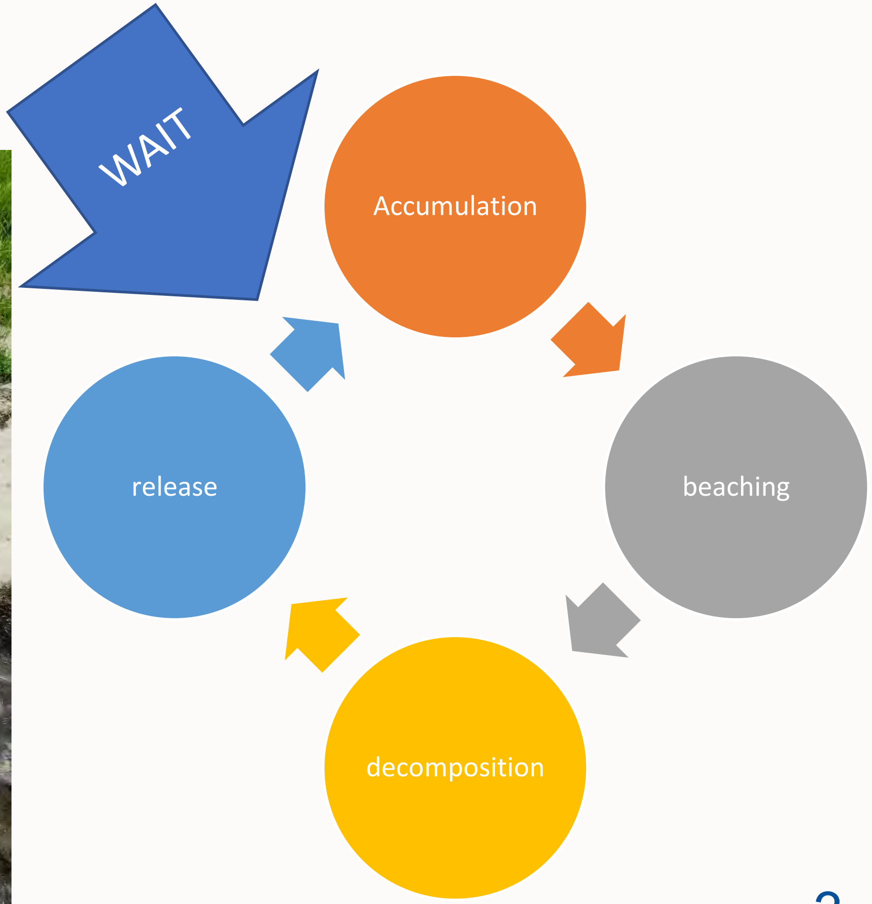
Convert nuisance into resource

CS 6a Analysis of pollutant flux to coastal zone originating from decaying algae & sea grass on beaches



WAIT

Marine ecosystem cleanup



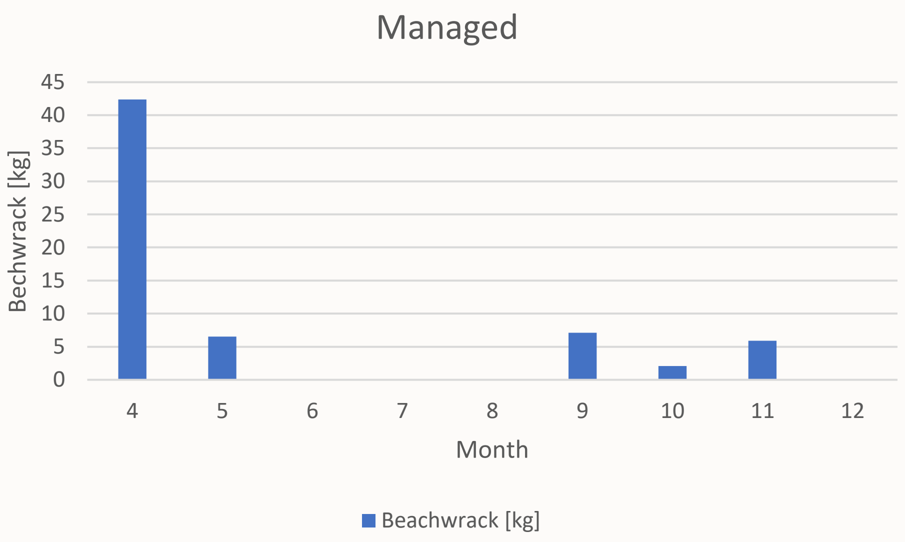
Chemical tasks

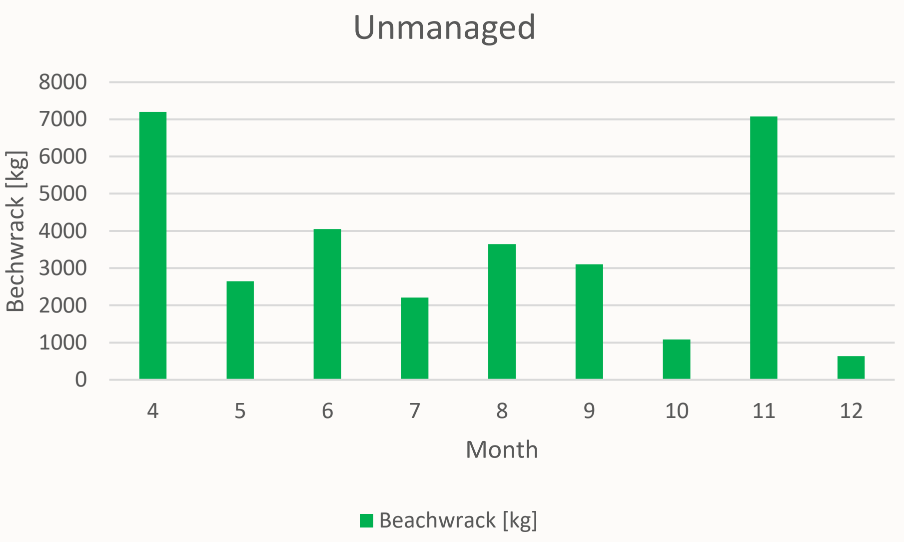
Assessment of the magnitude of pollutant flux to the coastal zone originating from decaying algae and seagrass on the beaches

Solid Samples: Cd, Pb, As, Hg, P(tot), N(tot), POPs
Liquid samples: Cd, Pb, As, As III/AsV, MeHg, Dissolved Hg

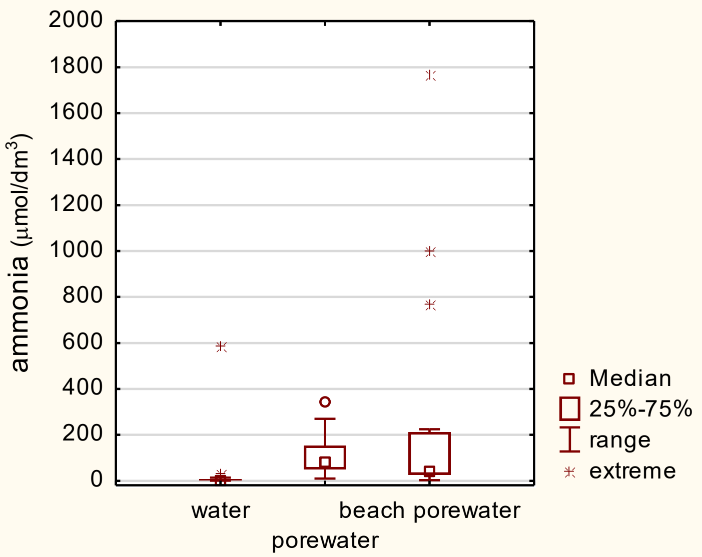
Strategies for removal of chemical pollution, progress towards reducing pollution and debris in regional sea basins and beyond, and towards restoring marine ecosystems

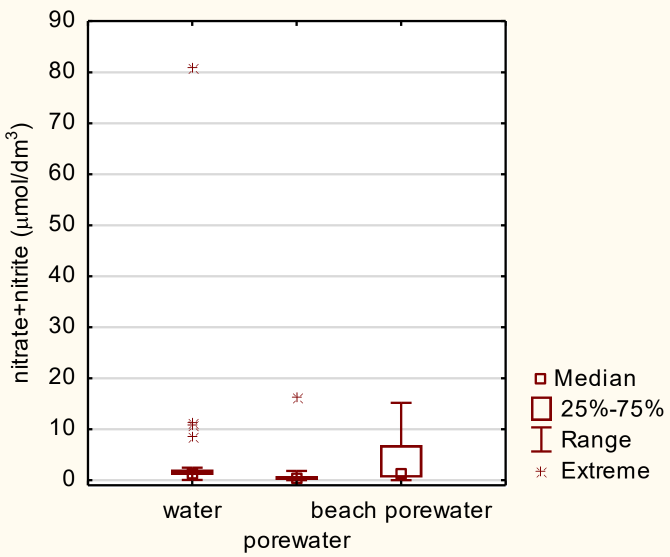
Mass of beachwrack

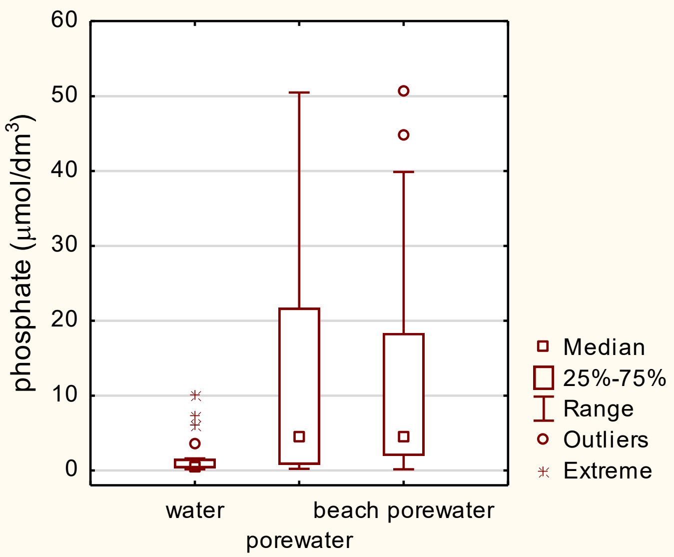




Nutrients – porewater release



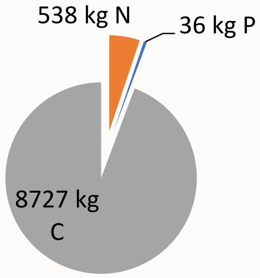




Nutrient Flux

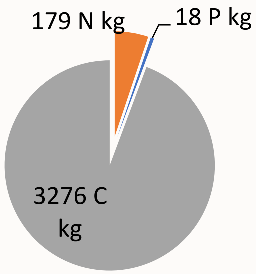
assuming total decomposition of beachwrack and P limitation

Rz1



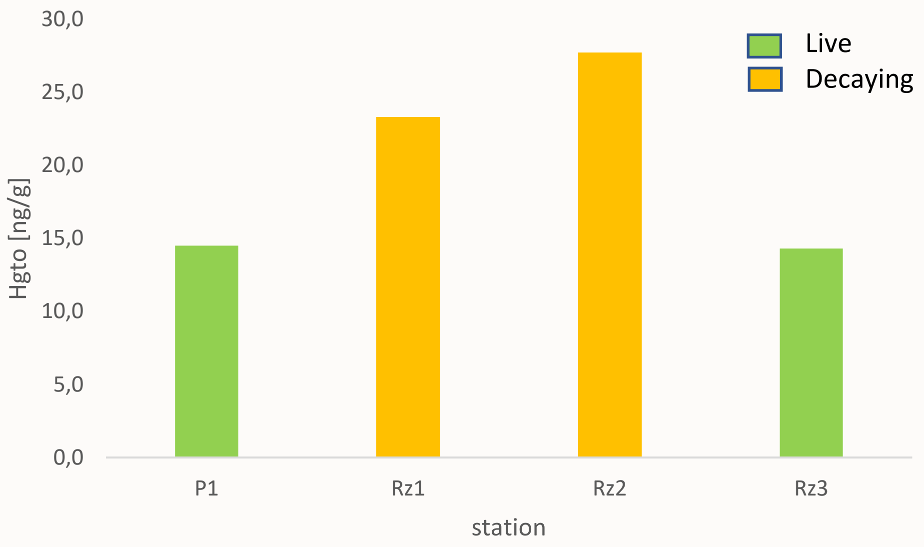
from 6 to 29 t of phytoplankton

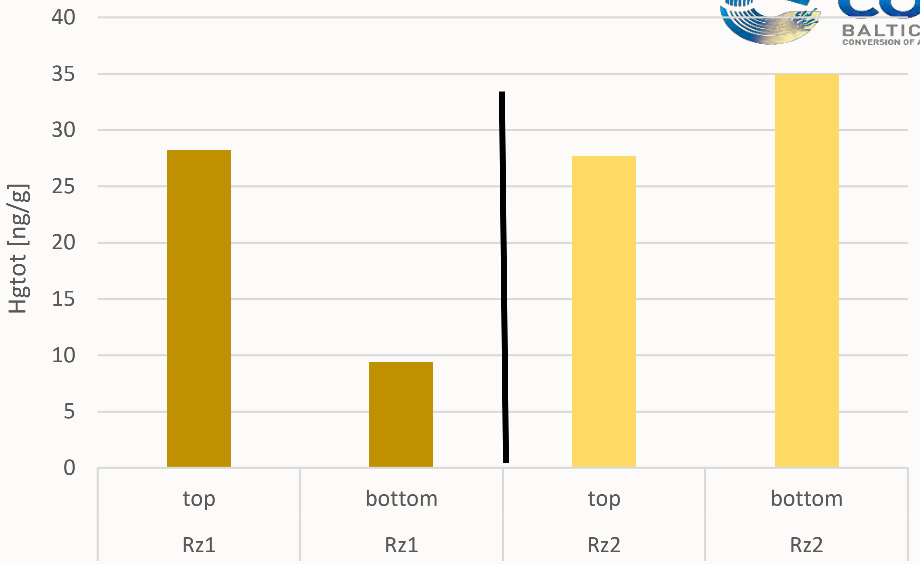
Rz3

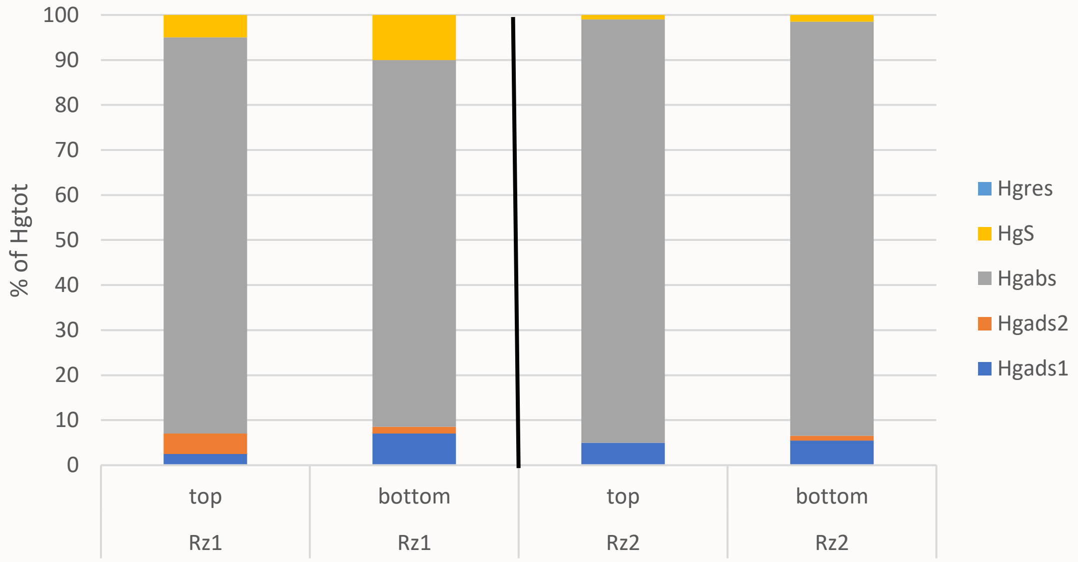


from 6 to 11 t of phytoplankton

Mercury

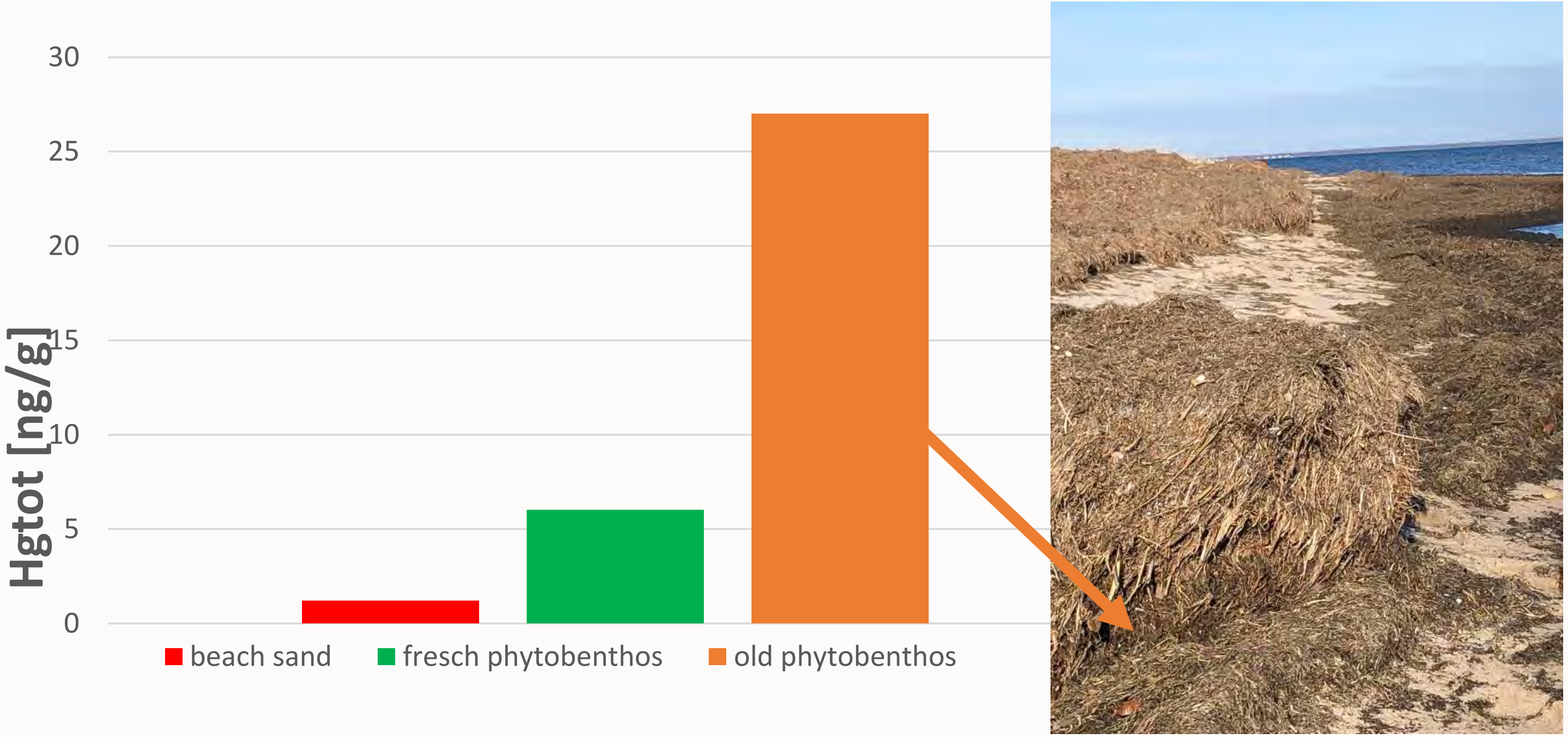

30,0
25,0
20,0
15,0
10,0
5,0
0,0
Hgto [ng/g]
P1
Rz1
Rz2
Rz3
station
Live
Decaying


40
35
30
25
20
15
10
5
0
Hgtot [ng/g]
top
bottom
top
bottom
Rz1
Rz1
Rz2
Rz2

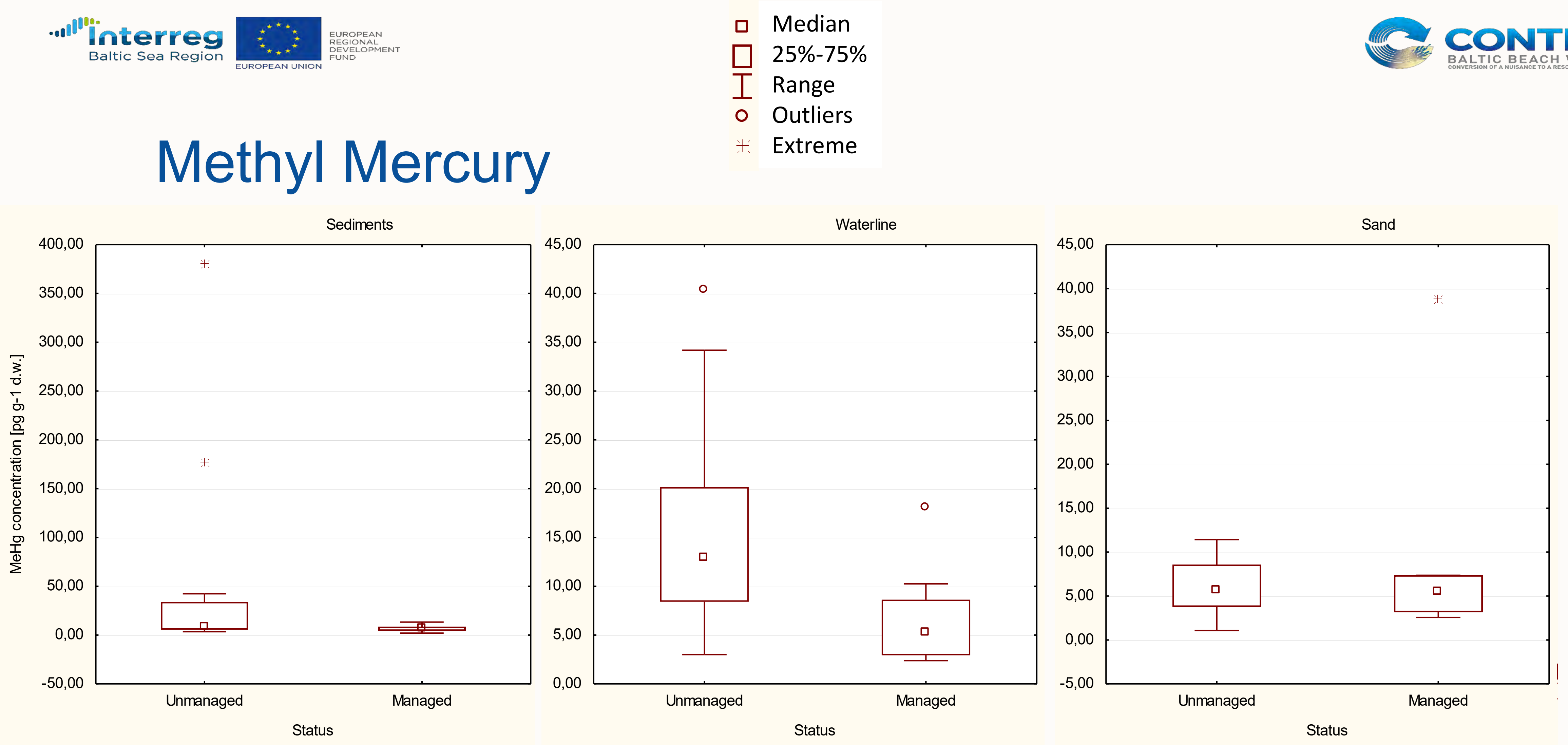

100
90
80
70
60
50
40
30
20
10
0
% of Hgtot
top
bottom
top
bottom
Rz1
Rz1
Rz2
Rz2
Hgres
HgS
Hgabs
Hgads2
Hgads1

Hgtot concentration in live macroalgae 4 Times smaller than in decomposing ones.

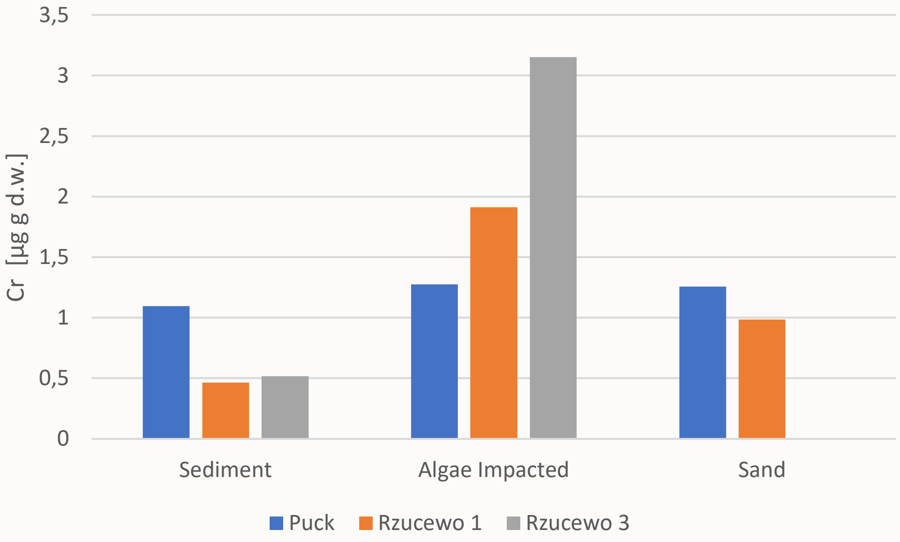
Probably originated from deeper, more polluted regions of the Bay

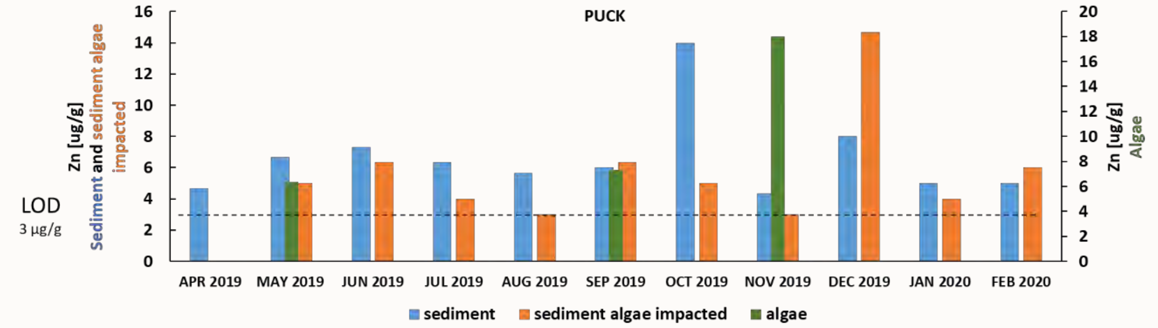


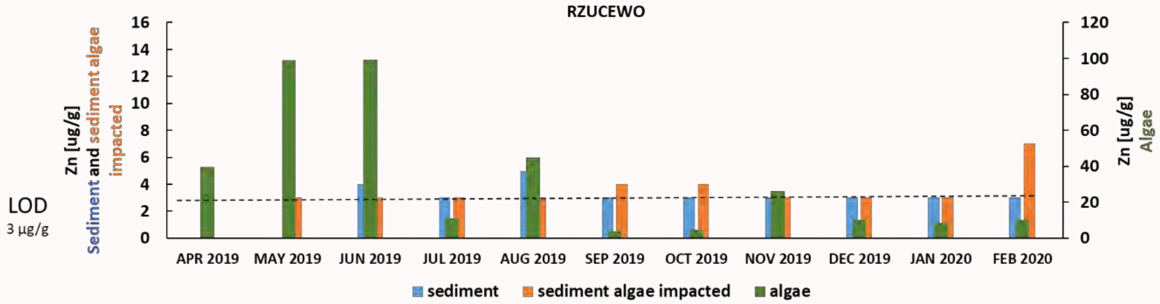
Methyl Mercury



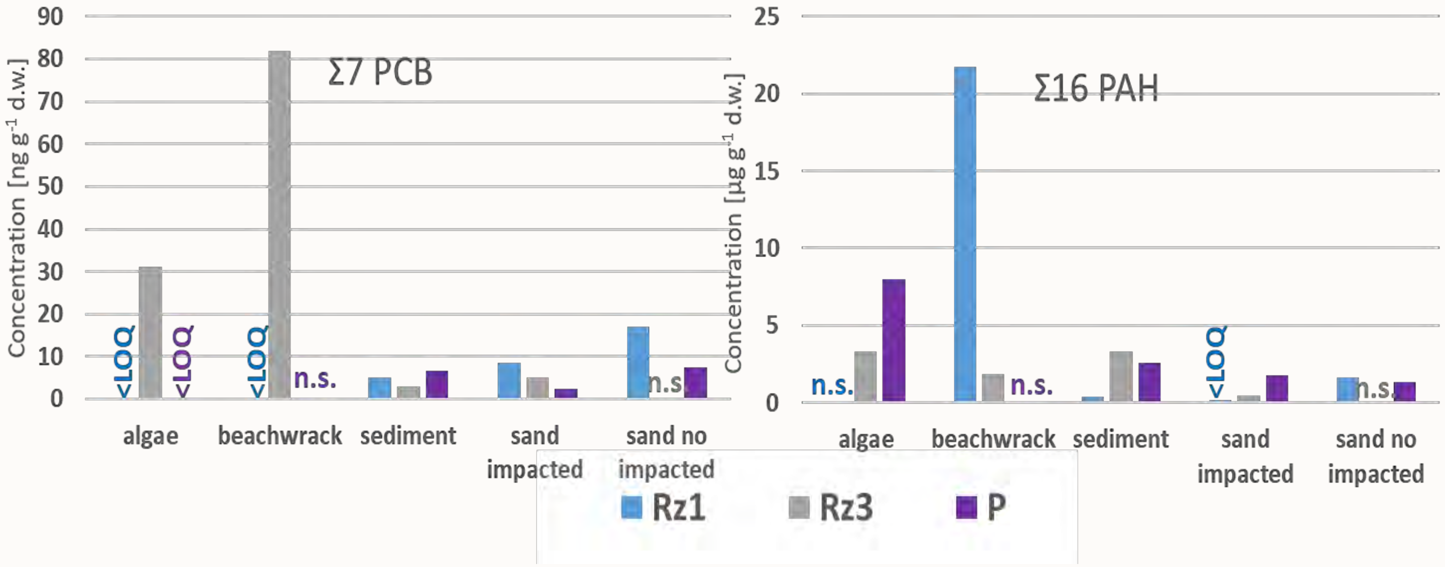
Other metals

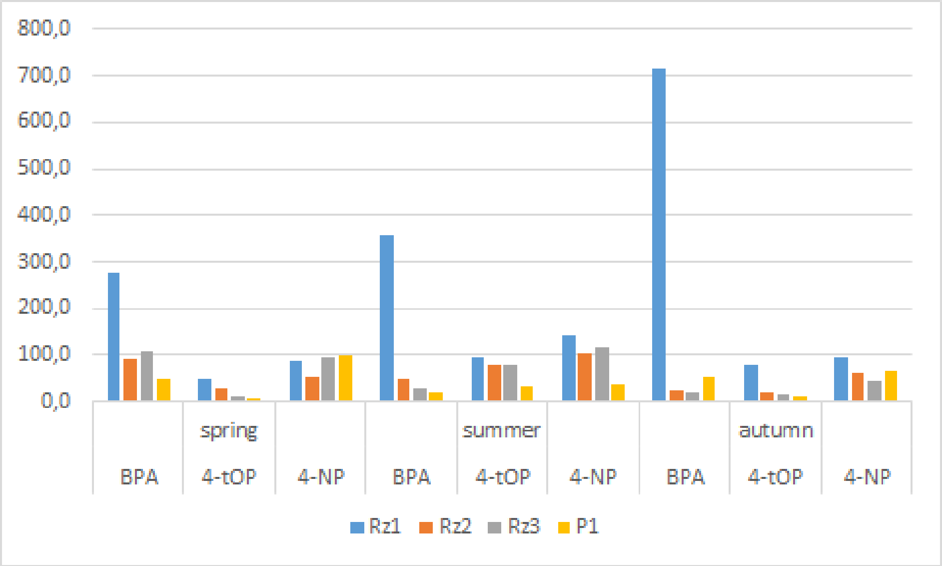






Organic contaminants





Conclusions

- Marine plants and algae accumulate pollution
- After deposition accumulation continues
- Loads released to porewaters
- Beach cleanup=pollutants and nutrient removal
- Beachwrack – resource and natural cleanup

Thank you for your attention

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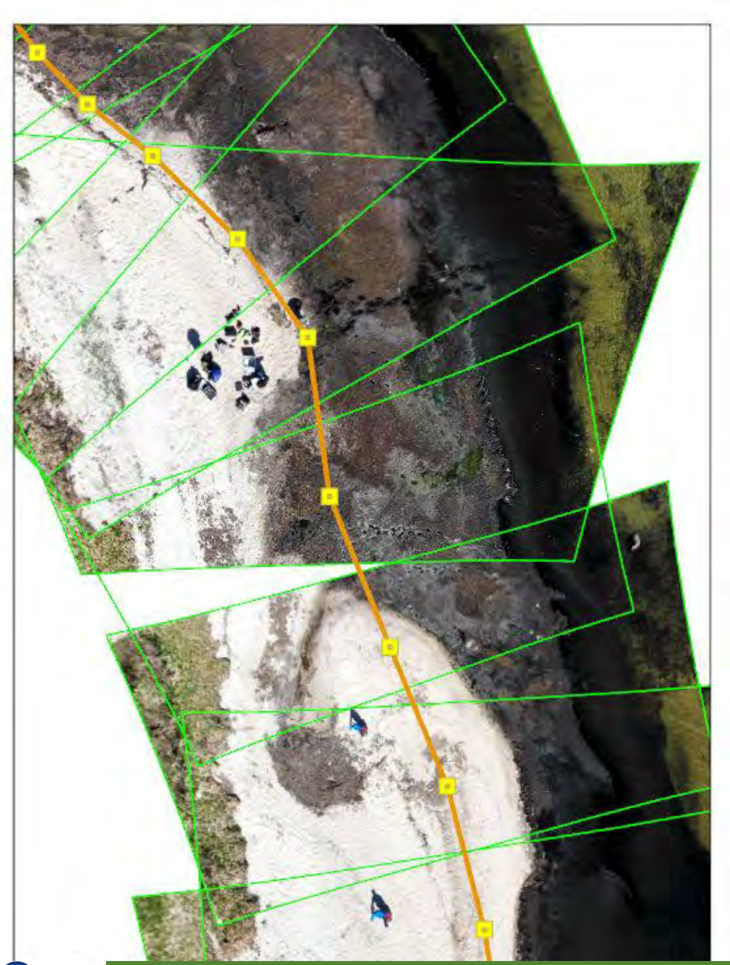
Beach cleaning = removal of pollutants & nutrients out of the Baltic Sea system



Institute of Oceanology Polish Academy of Sciences

Lech Kotwicki; Jacek Beldowski; Grzegorz Siedlewicz; Klaudia Gregorczyk

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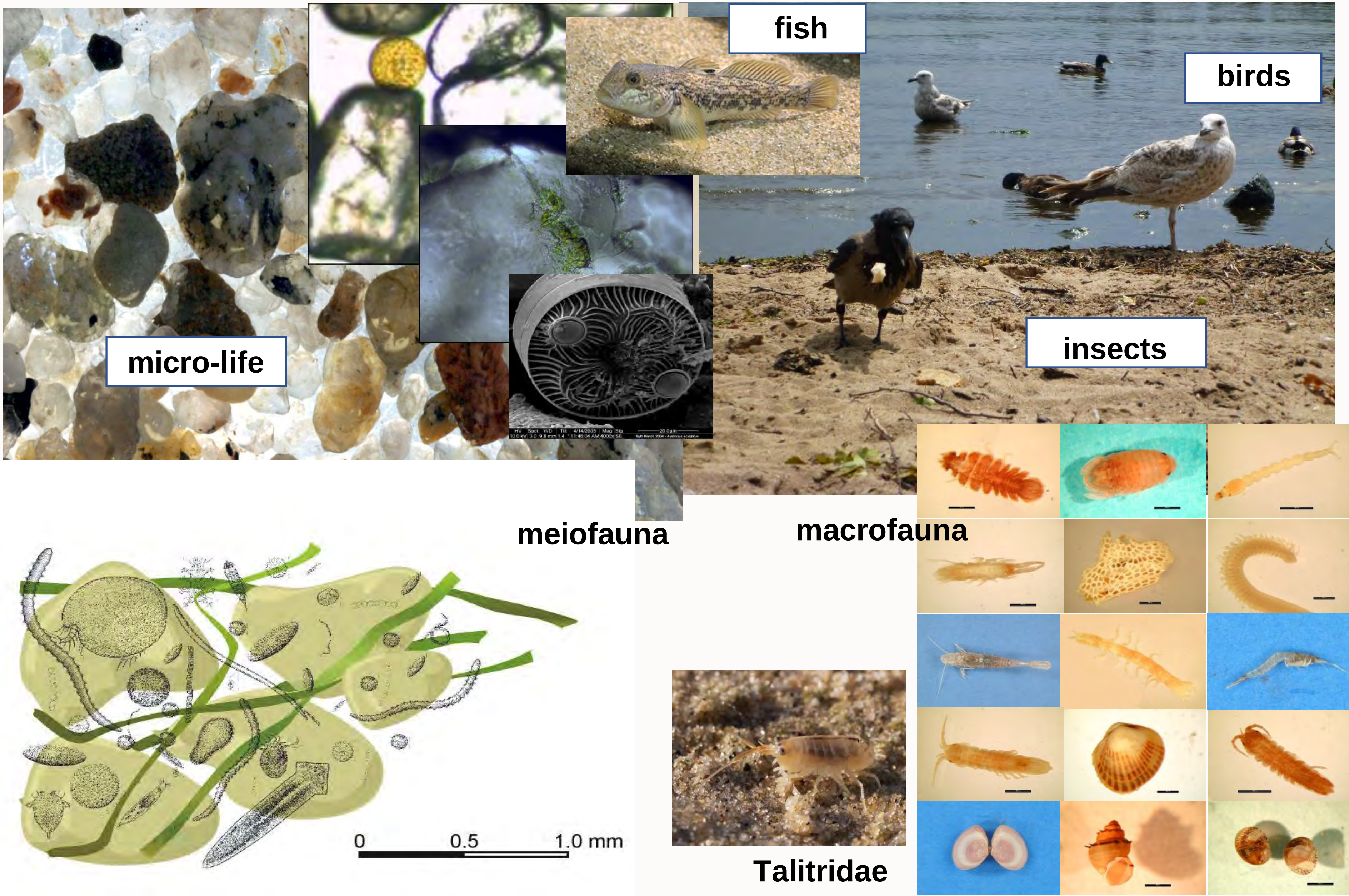
WE'RE STILL LOOKING FOR A COMPROMISE

While the economic and social values of beaches are generally regarded as paramount, sandy shores also have special ecological features and contain a distinctive biodiversity that is generally not recognized. Beaches also provide unique ecological services, such as filtration of seawater

it is not a desert !!!



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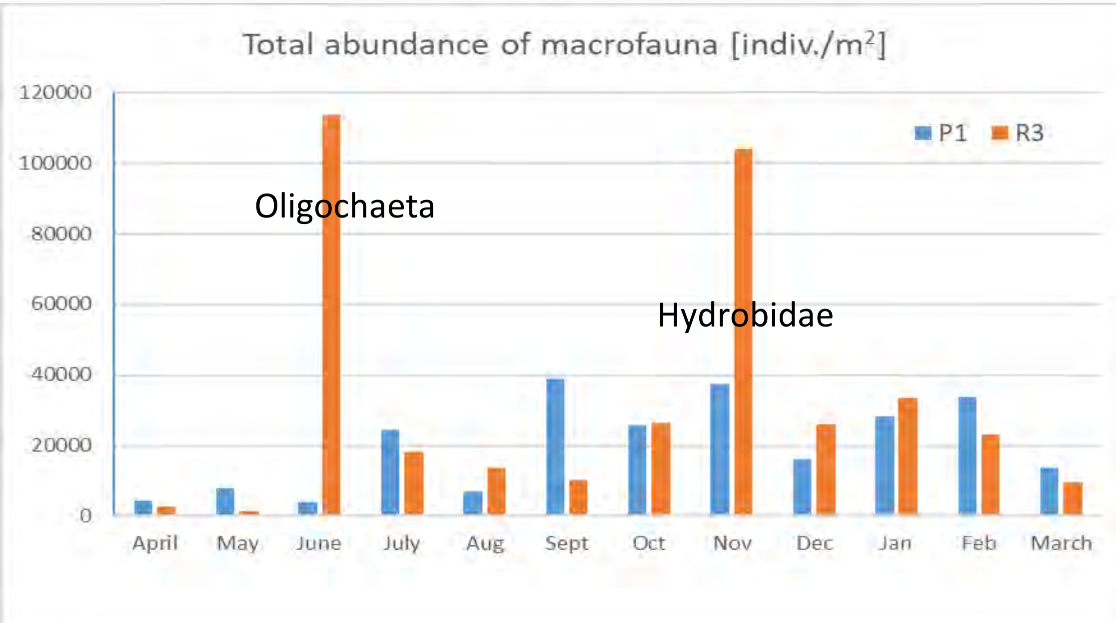

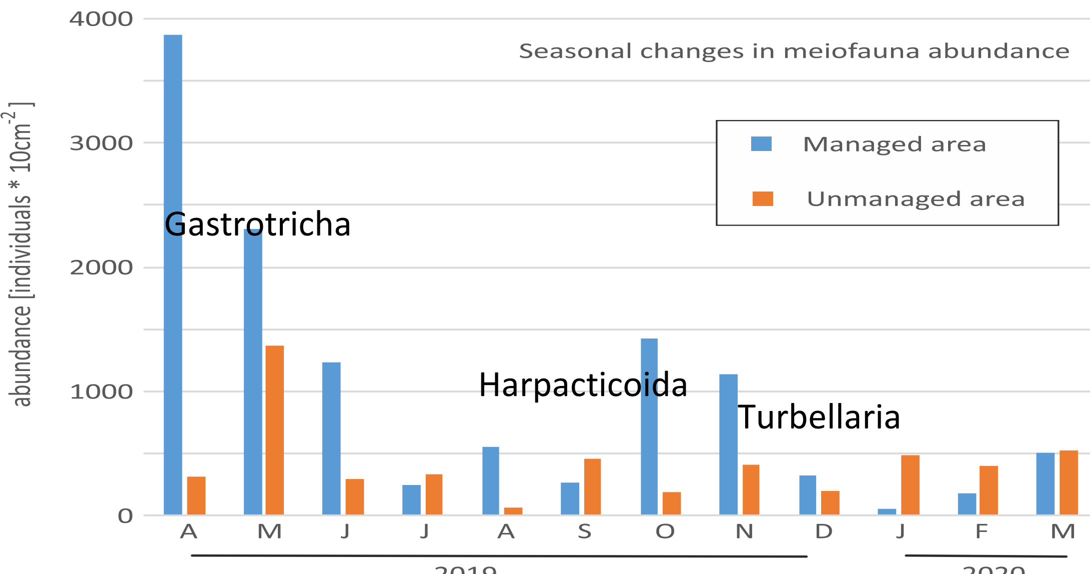

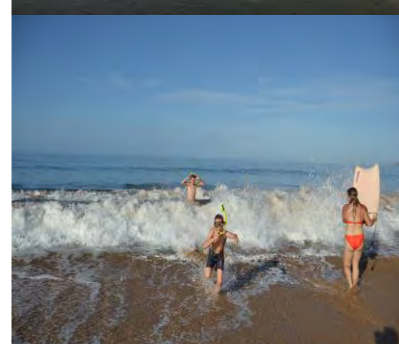

WE'RE STILL LOOKING FOR A COMPROMISE

There are two sides to every story…

Beach wrack provides:

- an important ecological link between land and sea.
- excellent feeding grounds for living organisms incl. meiofauna or macrofauna.
- an important food source for fish, insects and birds.
- …

Beach wrack causes:

- negative impacts on coastal tourism, becoming a socio-economic problem.
- an oxygen deficit in the coastal water, particularly in interstitial waters.
- a decline in the quantity and quality of meiofaunal organisms.
- …

A sustainable and site-specific approach to the problem as the only reasonable solution from both an ecological and a beach management perspective.