

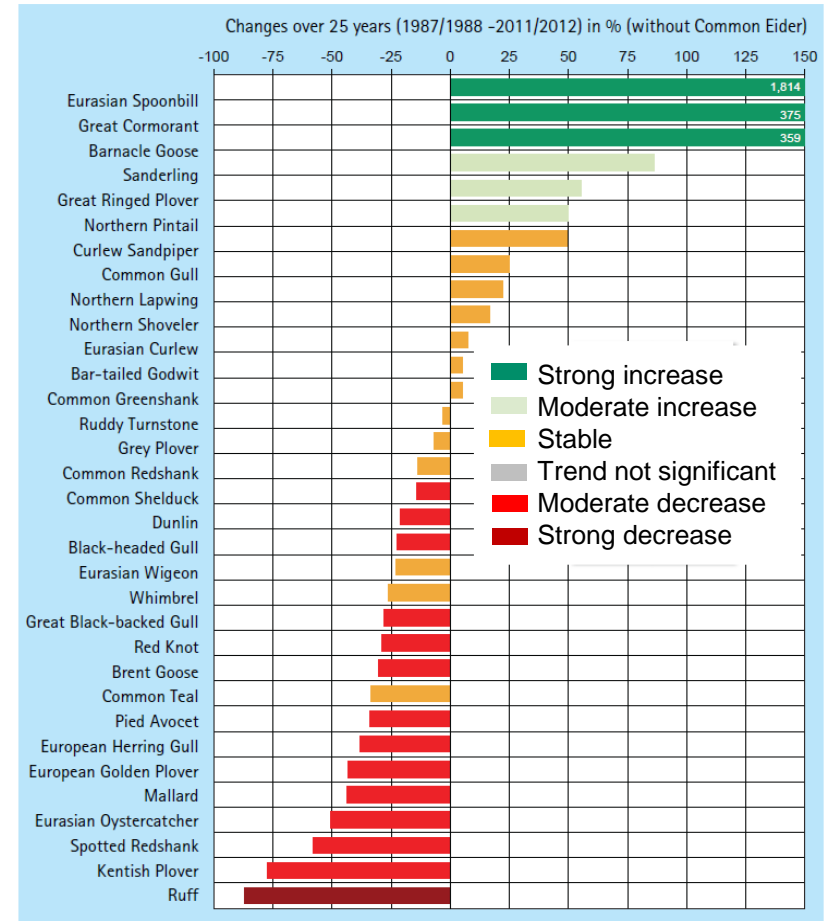
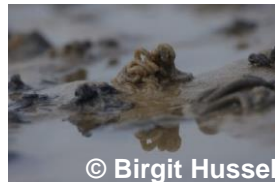


Interaction between birds and macrofauna within intertidal food webs

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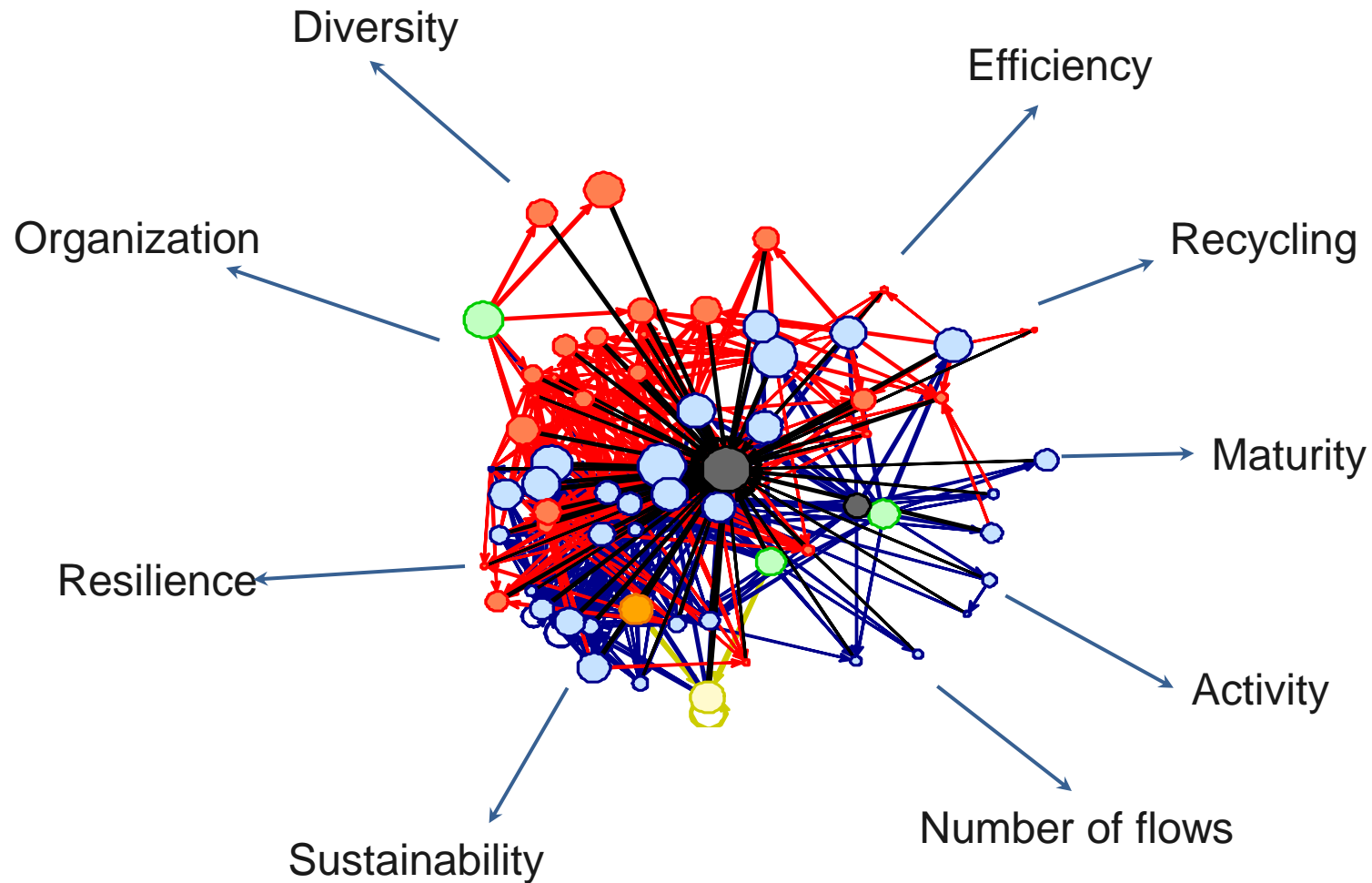
Introduction



Blew et al. (2015)

Holistic approach – Ecological network analysis

Ecological network analysis

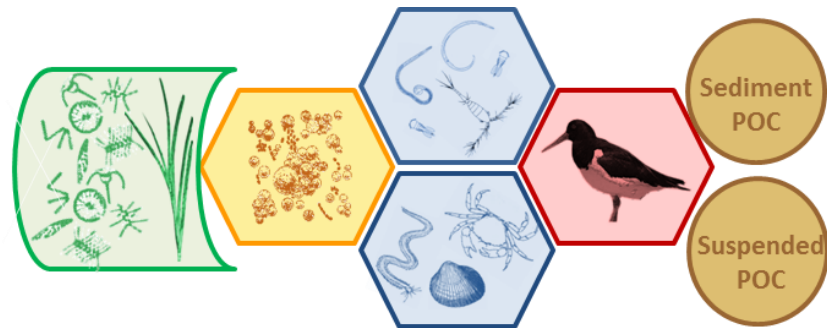
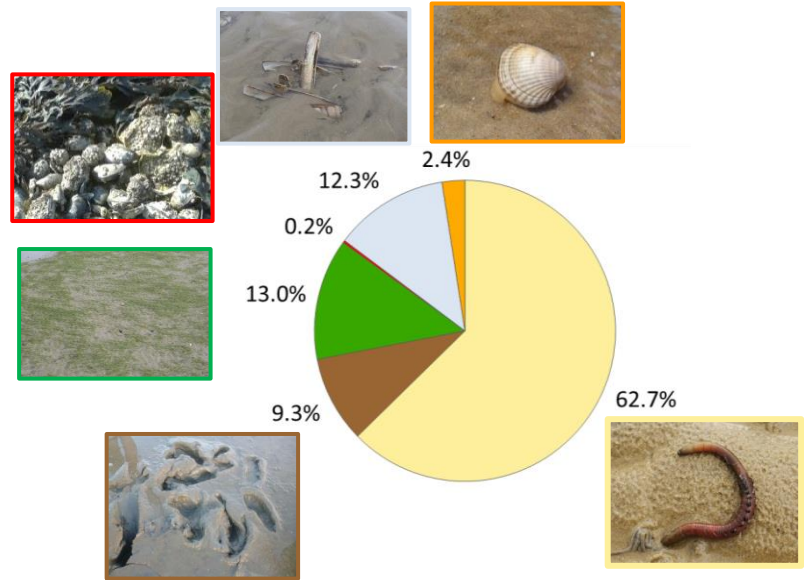
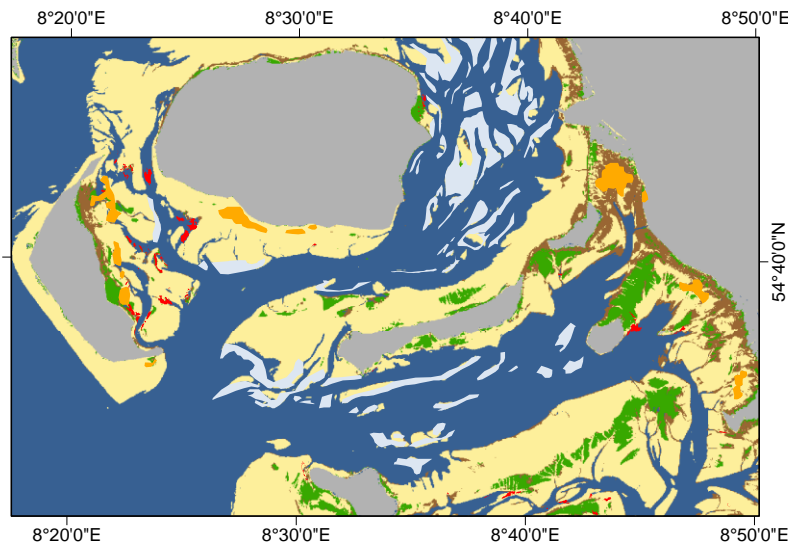


Objectives

- Structure and functioning of different habitats which are used by birds
 - Similarities and differences
- Focus on birds
 - How do birds impact the food web?
 - Do changes in the bird population alter the food web structure?

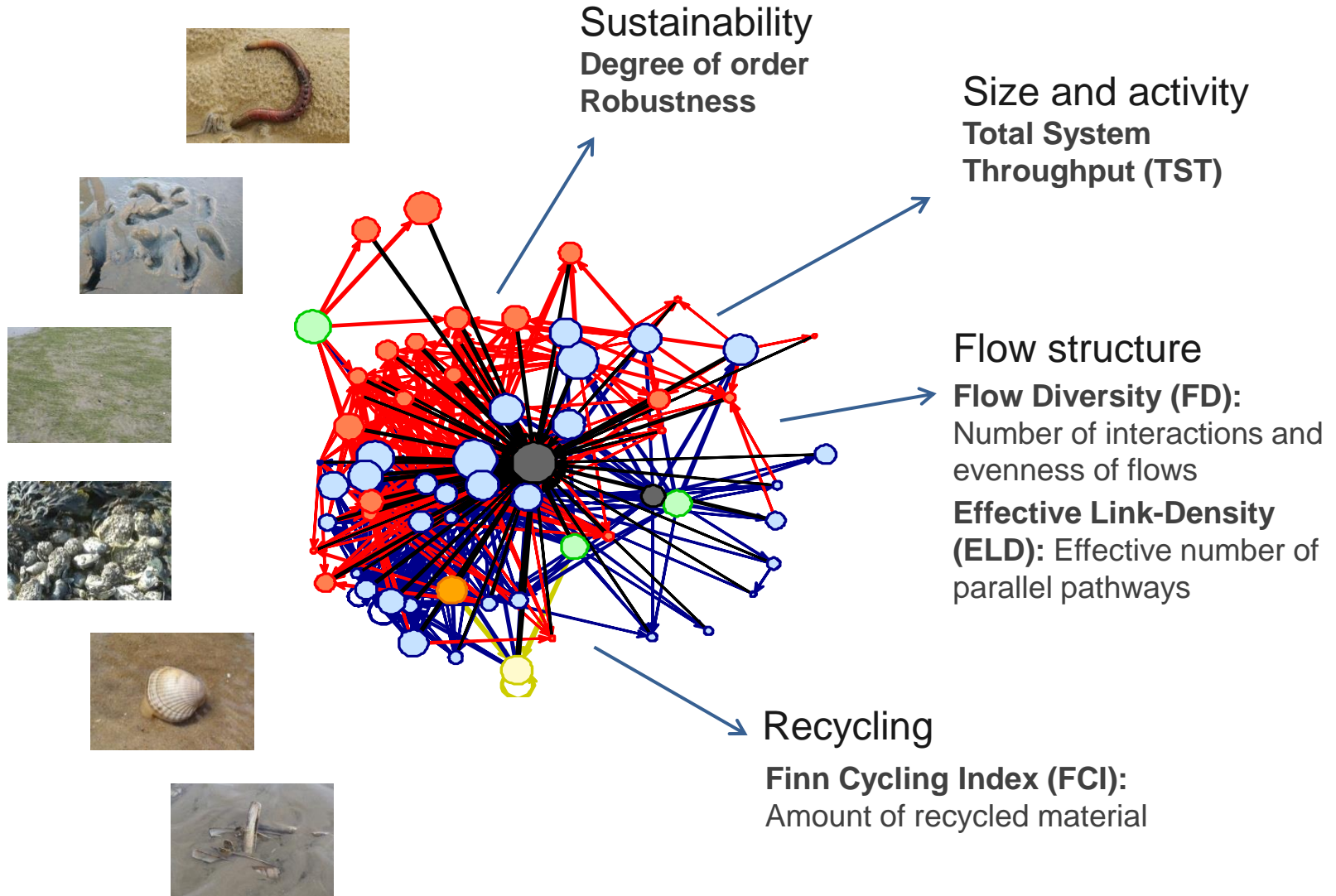


Study site



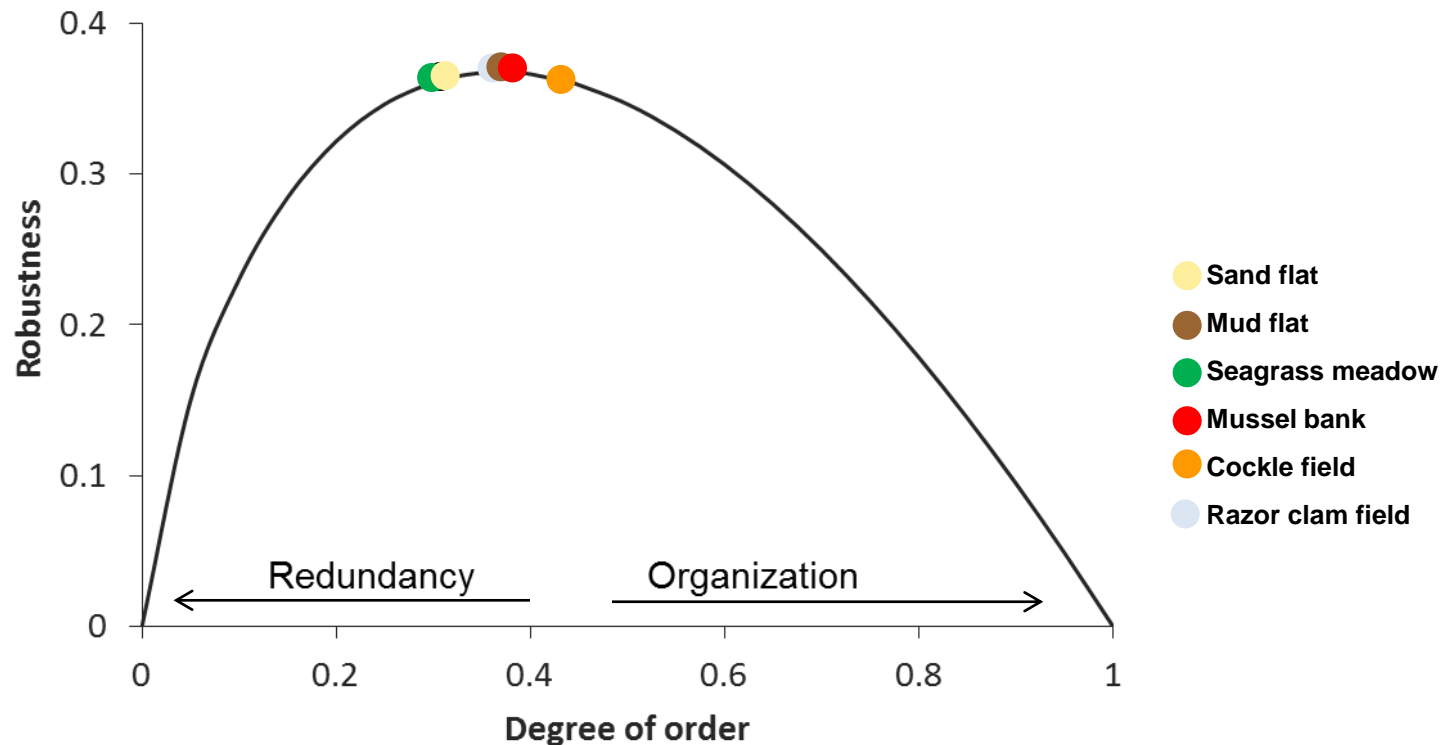
mg Carbon per m²

Ecological network analysis



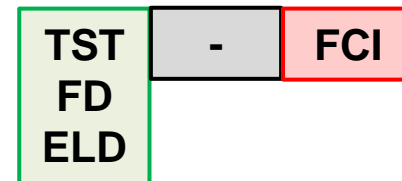
Sustainability

Efficient use energy resources (Organization), reserves of free energy to cope with perturbations (Redundancy)



Well-balanced between organization and redundancy

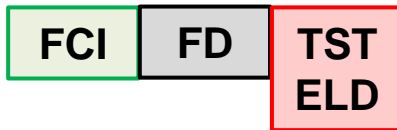
Cockle field and mussel bank



- Big and active systems
- Mussel bank more complex flow structure
- Low recycling -> dependent on external imports

Two big systems with strong reliance on phytoplankton imports

Razor clam field and mud flat



- Small system
- Simple pathways
- Efficient transfer from phytoplankton to razor clams to gulls

Simple, but efficient



- Active and productive
- Simple pathways, little recycling
- Probably vulnerable to disturbances

Fragile System

Sand flat and Seagrass meadow



FD	-	TST
ELD		
FCI		



FD	-	TST
ELD		
FCI		

- Small systems with capacities of free energy
- Complex flow structure
- Parallel pathways
- High recycling

Complex and stable systems with high importance for foraging birds

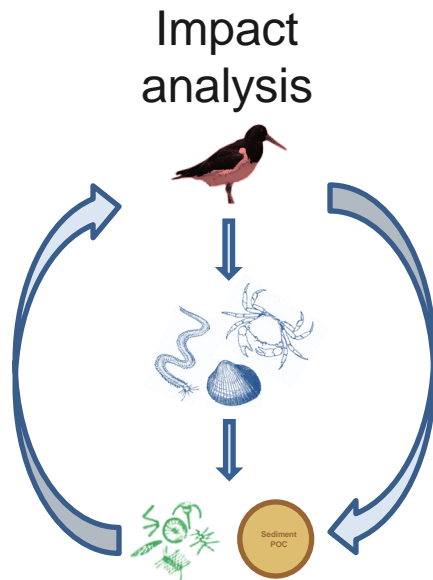
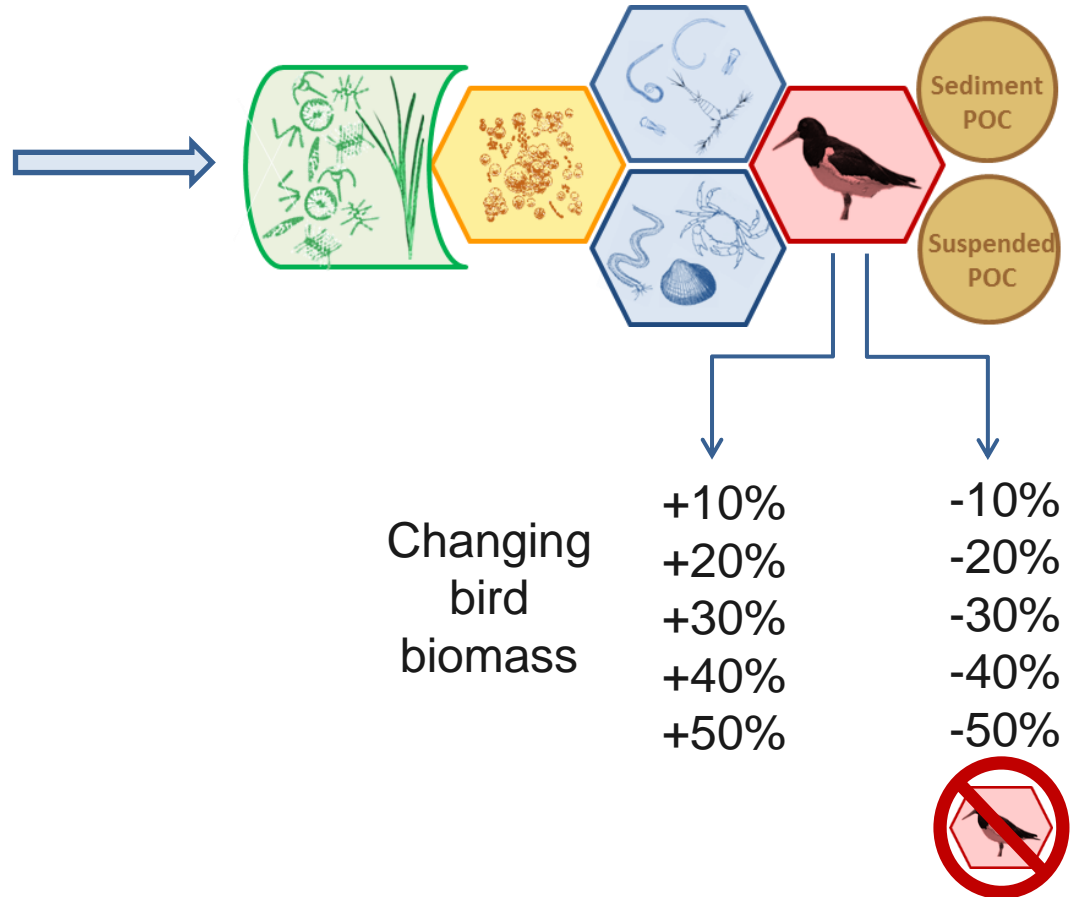
Summary: Habitat diversity



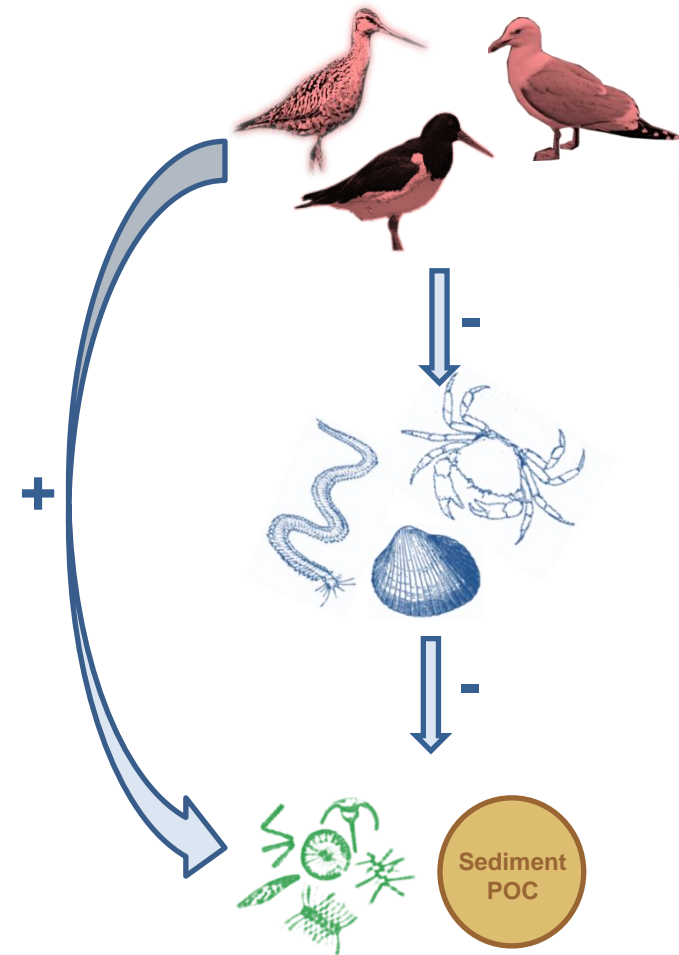
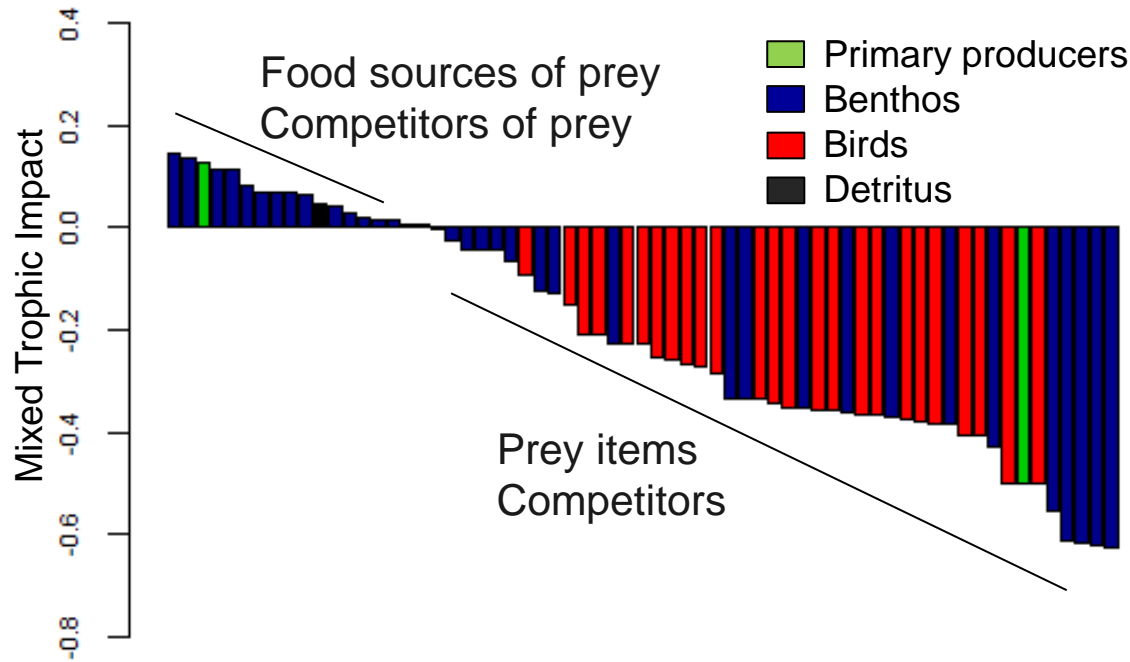
- All systems can be described as sustainable
- The systems differ in their features and attributes
- Habitat heterogeneity is an important trait for the functioning of the entire ecosystem
 - Each habitat has a distinct role
 - Habitats used differently by foraging birds

How do birds influence the intertidal food web?

Influence of birds

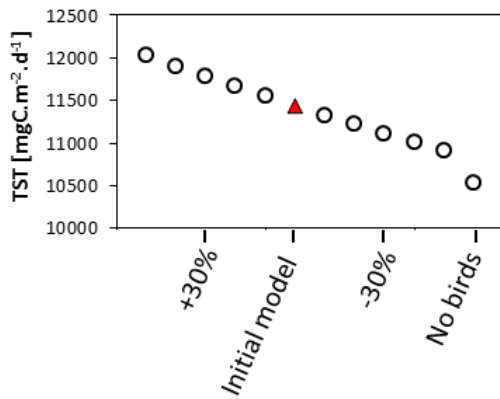


Impact analysis

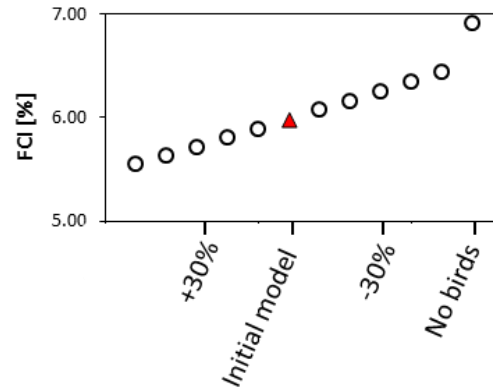


Bird sensitivity analysis

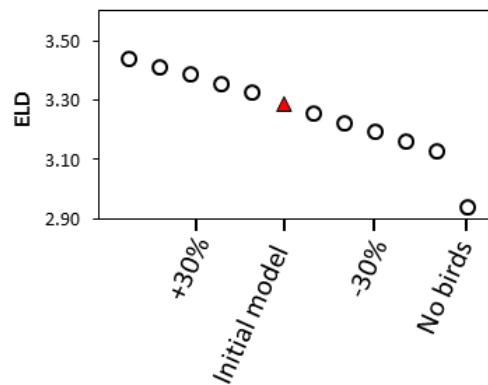
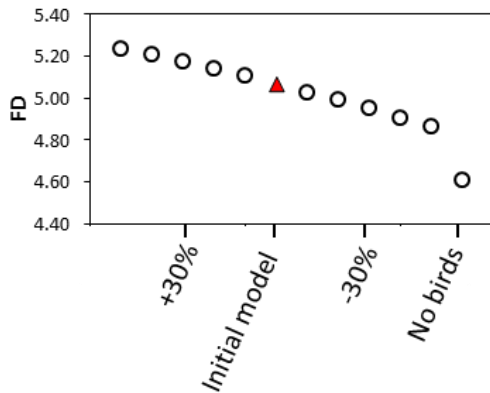
Size and activity



Recycling



Flow structure



TST: Total System Throughput

FD: Flow Diversity

ELD: Effective Link-Density

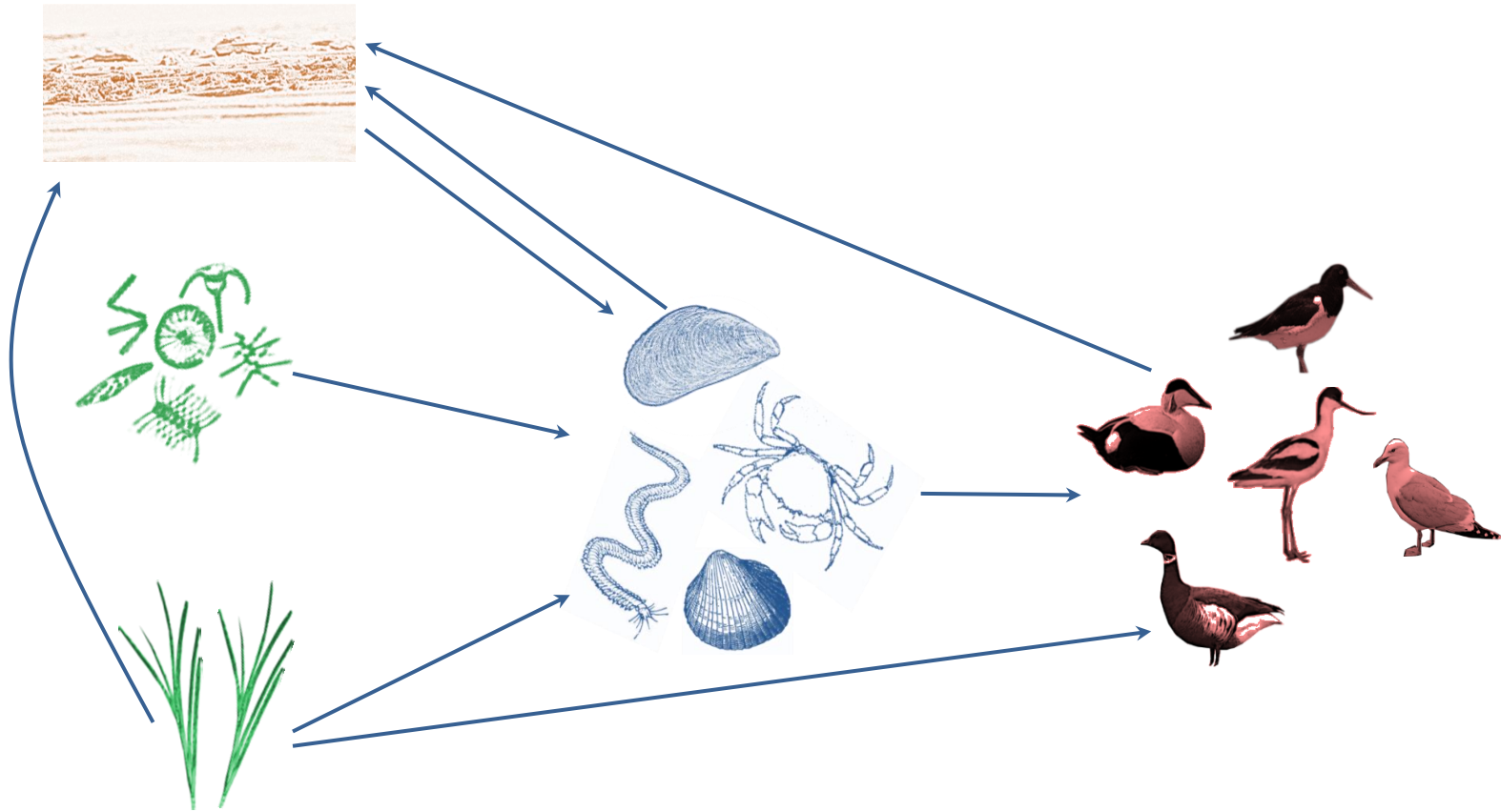
FCI: Finn Cycling Index

Decrease in bird biomass = Decrease in stability and resistance

Conclusion

- Habitats differ in their structure and functioning
 - Differ also in their importance for birds
- Birds are important predators in intertidal food webs
 - Included in direct and indirect pathways
 - Changes in the bird population induce alterations in the food web structure

Application of results



Better implementation of mangement strategies by taking into account relationships in ecosystem



Thank you!

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