A natural history of the Wadden Sea

Why a Wadden Sea?
Contingency in natural history
Increased blending of natural with human history
Two examples:
   Oysters in the Wadden Sea
   Seagrass mapping for European water quality
Conclusions

Karsten Reise AWI-Sylt
Thousands of years before today

Meter below present sea level

Post-glacial sea level rise

1 m/Cent.

15 cm/Cent.

Phase 1

1 m/Cent.

Phase 2

2050  2100

The Wadden Sea emerged when sea level rise and sediment supply became about equal

1 m/Cent.
The role of **contingency** in the natural history of the Wadden Sea

*Cause-and-effects chains almost never suffice to explain real patterns because coinciding chance events distort abstract patterns: E is observed because the sequence A+B+C+D preceded E (i.e., **contingency** in geology, evolution and ecology).*

*To understand natural patterns, knowledge on the laws of nature and on its history should be combined.*
Hunting and fishing

Gray whale

Pelican

Rays

Sturgeon

“Störe sieht man zuweilen über die Wasserfläche des Wattenmeeres springen” (Möbius 1893)
Number of Counted Harbour Seals in the Wadden Sea since 1975

CWSS 2012
Natural history and human history increasingly blend into each other in the modern Wadden Sea.

Natural patterns are best understood by combining knowledge on the laws of nature and the contingencies of natural history.

Human affairs are best understood by combining knowledge on ideas and the history of coincidences.

Human history has been influenced by natural events and the distribution of natural resources.

Natural history is increasingly altered by human impacts and management.
Oyster bed biocoenosis destroyed by overfishing a hundred years ago and never made it back
Introduced Pacific oysters farmed at Sylt since 1986 as an economic substitute for native oysters

Reproduction $>18^\circ C$
Recent warming facilitated the oyster invasion.
Oyster larvae settled on mussel beds since 1991 and took over around Sylt since 2002.
The Pacific oyster introduction irreversibly altered the food web, habitat structure and species composition in the Wadden Sea.
Biota of the Wadden Sea as a product of mixed natural and human history since the beginning.

The natural balance is a ghost of the past!
The Northern Wadden Sea is home of extensive seagrass beds often rooted in drowned marshes.

Seagrasses provide food and habitat and are sensitive to:
- turbidity
- strong hydrodynamics
- eutrophication.
Seagrass is monitored as indicator for the European Water Framework Directive.

Reise and Kohlus 2008

Years with seagrass cover in 1994 - 2006

- 1 - 4
- 5 - 8
- 9 - 13

High shorelines: dikes, dunes, cliffs
Low shorelines: salt marshes, high sand bars
Intertidal zone
Subtidal zone

Tidal flat cover of Northfrisian seagrass beds (%)

Nitrogen load of the Rhine 1840s – 2000s

J. van Beusekom, pers. com.

Airborne mapping

J. van Beusekom, pers. com.
Analysis of old aerial photographs

*Dolch et al. 2012*

Combination of historical and monitoring data suggest a recovery since the 1990s.
Elbe estuary separates genetically distinct seagrass populations
A. Zipperle 2012

Seed transfer for restoration?
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Mind the contingencies.

Humans altered the Wadden Sea ecosystem right from the beginning and their interferences increased in scale and pace.

Forget the myths of natural balance and pristine nature!

Mine the treasure of the natural / human history of the Wadden Sea to maintain the World Heritage.

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