Do alien species capture the Wadden Sea?

Christian Buschbaum
Increasing ship traffic and aquaculture activities enhance the number of exotic species in native coastal waters
Transport of containers in 2007 (millions)

Most exotics originate from Pacific waters
Increasing temperatures promote the establishment of exotic species

Mean summer temperatures in the northern Wadden Sea

Increasing temperatures:

- may facilitate non-native species because many originate from warmer regions
- may cause an awakening of already introduced „ecological sleepers“

**Australian barnacle (Austrominius modestus) since the 1950s**

![Australian barnacle](image)

The combination of species introductions and global warming facilitates successful establishment of exotic species

[Graph showing the increase in density of Austrominius modestus over time](chart)
Alien species occur from the dunes down to the subtidal zone. Many of them are epibenthic ecosystem engineers.

- **Rosa rugosa**
- **Crepidula fornicata**
- **Ensis americanus**
- **Crassostrea gigas**
- **Sargassum muticum**
- **Spartina anglica**
Alien ecosystem engineers create novel habitats

New habitats with distinct communities and species interactions
Prominent alien species are suspension feeders

only little is known about the effects on the pelagic system

only little is known about the consequences on native organisms
Aliens seldom arrive alone!

*Mytilicola orientalis*

Photo: N. Elsner
Many aliens disperse from southwest to northeast along the Wadden Sea coast.
Summary

Intensive shipping and global warming cause increasing numbers of species invasions.

Yes, alien species capture the Wadden Sea and this...

...shows that carrying capacity of the Wadden Sea was not achieved because exotics are additions to the system without substantial loss of native species.

...causes a revolutionary change of the Wadden Sea ecosystem including its habitats, species communities and food webs.

...requires specific research on the flood of invasive species.
Main trilateral research targets on neobiota

1. To investigate neobiota in different phases of dispersal and establishment (e.g. identify pathways of establishment)

2. To study the increasing role of suspension feeders (e.g. food limitation)

3. To examine the function of alien ecosystem engineers (e.g. increasing habitat complexity and altered species interactions)
Despite increasing numbers of aliens a first attempt for a coordinated and comprehensive concept for neobiota assessment was performed in the Dutch and German Wadden Sea only in 2009.

**Dutch Wadden Sea:**
- 29 non-native or cryptogenic species
- 11 new records
(Gittenberger et al. 2010)

**German Wadden Sea:**
- 32 non-native or cryptogenic species
- 5 new records
(Lackschewitz et al. 2010)

approximately 60 species in total
Invasional meltdown in the Wadden Sea

Pacific oyster *Crassostrea gigas*

Japanese seeweed *Sargassum muticum*

Skeleton shrimp *Caprella mutica*

New habitats with distinct communities and species interactions