

Title

Biological habitat amelioration: *Mytilus*-stock supported by dense *Crassostrea*-reefs

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Abstract

The comprehensive invasion of intertidal blue mussel beds (*Mytilus edulis*) by the non-indigenous, reef-forming Pacific oyster *Crassostrea gigas* in all regions of the Wadden Sea is still considered to be a threat for native mussel populations. Live oyster stock in the Central Wadden Sea (National Park of Lower Saxony) is balancing since 2009 and biomass fluctuations around 160.000 tons are attributed to total mussel bed/reef area in the region which areal extension increases slightly. Interestingly, mussel biomass shows an oyster-synchronous development and stock size increased from 9.000 tons in 2005 to more than 40.000 tons up to date. Where is this mussel biomass to be found?

Data of 6 sites between 2008 and 2012, of which 12 surface samples per site were taken annually, was analysed. We introduce reef density, defined as shell mass of live and dead oysters, as a factor for habitat matrix and classified three reef types: Reef carpet [0 to < 30 kg/m²], Dense reef [30 to < 60 kg/m²] and Compact reef [≥ 60 kg/m²]. The total of 360 stations was sorted by reef type and we analysed mussel biomass and abundance of mussels in relation to reef types.

The distribution of mussel biomass in the study area between 2008 and 2012 is not site specific or related to mean reef density of the sites. Sites with high oyster impact have low or high mussel biomass. Within the extension of one site, reef density may vary between some kg/m² and areas may be compacted with over 60 up to 100 kg/m². In general, compacted reefs are uncommon areas while the majority are reef carpets. Between 2008 and 2012, the proportion of dense reefs is slightly increasing. Long-term analysis detected that dense reefs are populated by higher abundances of older mussels than reef carpets or compact reefs what subsequently increases biomass values in dense reefs. Mussel recruitment was more successful in reef carpets while survival is safeguarded within dense reefs.

The results of this study document a positive feedback for mussels in the Central Wadden Sea by the formation of dense oyster reefs. We expect progressively sustained mussel populations, supported by increasing proportions of dense reefs. The alien Pacific oyster is hereby providing an important service from one ecosystem engineer for another even though mussels are not available for mussel fishery.