

The ongoing hardening of the coasts, an ecosystem altering mechanism favouring non-indigenous species. The example of the Southern North Sea

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Coastal communities all over the world have witnessed major changes in the past decades, largely as a result of the rapid and ongoing hardening of the shore. This phenomenon is particularly well noticeable along the coast of the shallow Southern North Sea.

The number, diversity and size of various anthropogenic hard structures in marine environments, either moving (e.g. ships and rigs, floating buoys including aquaculture devices) or fixed (e.g. coastal defence and harbour works, windmill farms) is rapidly increasing. All of them are directly associated with different types of human activities such as maritime transport, coastal defence, aquaculture and energy production/transfer.

The increased availability of man-made hard substrata, together with the increased activities of vectors such as shipping, allows not only a much faster and more intense transport of certain species all over the globe but the migrants now find more suitable habitat to settle and to prosper in regions beyond their original distribution.

While some of the activities (like shipping, harbours and coastal defence) extend back in time for centuries and are already recognised as important vectors for species movement, offshore renewable energy production is a more recent activity with clear intensification during recent decades. Wind farms extend also further off shore and will in the future occupy large areas of the shallow waters of the North Sea. Some of the hard substrates such as wind farms create completely new habitats in the marine ecosystem. For instance, wind turbine foundations create three different zones for epifaunal organisms in the intertidal zone, each with a specific fauna part of it being non-indigenous. The number of non-indigenous species proved to be particularly high in the intertidal zone. This is important for the obligate intertidal hard substrata species, for which offshore habitat did not exist in the Southern North Sea until recently. Importantly, wind turbines are often found in sandy environments and these artificial hard structures may act as a stepping stones for non-indigenous biota.

The increased availability of man-made structures in the marine environment poses a current concern, but the decommissioning of many of these structures when becoming obsolete will pose future problems.

It has been argued that the newcomers may augment local biodiversity. However, it becomes more and more evident that these non-native species pose a burden to the native biodiversity: they alter local communities and there are many unwanted economic effects on activities such as shipping and aquaculture (clogging nets).

The issue of artificial substrates is not only relevant to introduced species, but also contributes to the overall change of marine biodiversity. The presence of a large number of non-native organisms – both spreading and introduced species – has already resulted in major changes in coastal habitats. Increased availability of artificial hard substrate hence promotes: 1) establishing of introduced species, 2) spreading of southern species, 3) strengthening of the strategic position of the populations and stepping stone effect.