

Artificial hard substrata as ecosystems – a case-study of the Belgian coast

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Natural, intertidal hard substrata (rocky shores) are characterized by a high density, and especially a very high diversity of marine organisms (e.g. algae, epilithic invertebrates, fishes and birds). The very high diversity of the complex rocky shore ecosystem results from biological (predation, competition, grazing,...) and non-biological interactions (tides, waves, coast topography,...). The majority of the organisms living on rocky shores is only found in unique species associations. Hence, the ecology of rocky shores differs drastically from the surrounding soft-bottom substrata (e.g. sandy beaches).

In contrast to the northern French coast (Cap Gris Nez and the surroundings), natural hard substrata are not found along the Belgian coast. However, within the framework of coastal defence, lots of artificial hard substrata, like groins, dykes and harbour walls, were built. These artificial hard substrata, on which the typical floristic and faunistic associations of rocky shores can develop, act as a substitute for the natural hard substrata in an originally soft-bottom area. The hard substrata of the Belgian coast thus contribute to an increase of the coastal biological diversity. The ecological importance of the Belgian hard substrata is also demonstrated by the high numbers of Purple Sandpipers (*Calidris maritima*) and Turnstones (*Arenaria interpres*). Nevertheless, the biology of the Belgian artificial hard substrata is hardly known. The few data available are dealing with algae and associated fauna from hard substrata (Coppejans, 1998; Daro, 1969, 1970; De Vos, 1980).

To increase the knowledge of this unique ecosystem, an interdisciplinary research project was set up to investigate (1) the biodiversity of the Belgian artificial hard substrata, focussing on macro-algae, macrofauna and avifauna, (2) their seasonal variation and (3) their biological interactions.

First of all the different types of Belgian artificial hard substrata were classified, according to the situation of hard substrate (e.g. dyke or groin) and the composing material (e.g. concrete or natural stone). Each type was sampled for its macro-fauna and -algae by means of approximately 20 samples, using a quadrant (50x50cm) in which the occurrence of all macrofauna and -algae was quantitatively examined. A subsample (10x10cm) was taken to retrieve a semi-quantitative estimation of the free-living species (e.g. isopods and amphipods). Additional photographic surveys were used as a control. Next to these data, environmental variables, such as height, exposure, and orientation, were recorded. The distribution of the avifauna was investigated by intensive counts along the whole Belgian coast. In a next phase of the project, this sampling method will be repeated seasonally during one year to study the seasonal variation within the macrofauna, macro-algae and avifauna. Finally, the research project will deal with the ecological interactions between the macro-algae, macrofauna and avifauna. Preliminary results for the macrofauna (6 of the 15 types of hard substrata investigated) will be presented.