



Figure 1. Examples of artificial substrata with different rugosity, which will be inserted in The Netherlands (Oosterchelde estuary) and in Italy (Coast of Lecce): (a) limestone; (b) sandstone.

Biodiversity-substratum interactions on hard substrata

Are there consistent patterns in the Mediterranean and the North Sea? A first attempt at integration under the MARBEF network

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RELATIONSHIPS BETWEEN BIODIVERSITY and ecosystem function in coastal systems are still under debate and can be mediated by environmental features.

As an example, mineralogical composition and topographic complexity of the substratum can affect the abundance and diversity of assemblages through a variety of mechanisms (Cerrano *et al* 1998, García-Charton & Pérez-Ruzafa 1999, Bavestrello *et al* 2000, Guichard *et al* 2001, Cattaneo-Vietti *et al* 2002, Schiaparelli *et al* 2003, Faimali *et al* 2004) altering biotic interactions among organisms, from larval settlement and colonisation and changing environmental variables such as availability of food or number of refuges.

Structural complexity of habitats has relevant applications to the management of artificial coastal defence structures (Bacchiocchi & Airolidi 2003). The construction of human-made structures can introduce new substrata which differ from nearby natural shores, altering many aspects of the natural ecology of an area, as well as reducing its natural variability. Introduction of artificial substrata can also lead to habitat fragmentation and to the disappearance of species, as well as cause the introduction of allochthonous species.

There is scant information available on the material used to produce artificial substrata (concrete or sandstone) and, mostly, to the effects of introducing substrata of different mineralogical features on local biodiversity (Connell & Glasby 1999).

The Dutch and the Italian coasts are quite different habitats, the former being mainly characterised by sandy and muddy natural substrata and the latter being characterised by a high coastal heterogeneity. Nevertheless, both regions are largely exploited by human activities and, as a result, there are large areas characterised by artificial reefs and seawalls, potentially influencing local biodiversity. Such influence might change according to the geological features and complexity of the used material. Specifically in this project, we want to analyse:

- 1) the effects of different substrata (in terms of mineralogical composition and rugosity) on structure and distribution of populations and assemblages;
- 2) the consistency of the observed patterns on a large scale.

Each region will host tiles of an artificial substratum, tiles of a substratum naturally present along its coast and tiles of a substratum

naturally present in the other region (Fig 1).
We expect two different scenarios:

- differences between localities and regions due to ecological processes other than nature; and
- complexity of substrata or the opposite (differences driven by the features of substrata independently of the locality and of regions).

In addition, replicating experiments under drastically different conditions will provide a test of whether robust relationships between habitat heterogeneity and diversity exist, independent of background environmental and biotic characteristics. Results of this research programme will provide an important basis for possible future larger-scale comparisons of the effect of the introduction of artificial substrata on coastal environments. •

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