

Impacts, their trends and effects in the marine environment

Artificial reefs clearly have socio-economic benefits. They provide additional substrate for the commercial culture of a variety of shellfish species, serve to protect fish stocks from illegal fishing activities and provide educational and recreational opportunities (see case studies in Appendix A). However, some of the perceived environmental benefits are more contentious. For example, there are differing opinions as to whether reefs actually increase the productivity of fish species, with the opposing view being that they just serve to concentrate them and in fact, make them easier to catch. Similarly, not everyone supports the contention that placing a reef on a sandy plain increases biodiversity. What it does is to facilitate the replacement of the biodiversity associated with a sandy substrate with that of a rocky reef, and if placed in an area which is important for sandy-bottom species, may actually have a negative impact.

Moreover, reefs may also have directly negative impacts, both during the construction phase and once the reef has been established. These include changes in wave action, current velocities and direction, and patterns of sediment distribution (leading to erosion in some areas and smothering in others); sediment chemistry; displacement of and changes to the biological communities of the area, including the introduction and establishment of potentially invasive alien species; and exposure to chemical contaminants as a result of leaching from the reef structures. Where reefs are not sufficiently robust, they may fragment, contributing to the problem of marine debris. Material may be displaced into adjacent areas of high conservation or productive value causing damage to these ecosystems.

For the most part, the negative impacts of artificial reefs can be mitigated by careful planning and appropriate selection of sites, design and construction materials based both on the purpose of the reef and the oceanographic conditions at the proposed site. The OSPAR Guidelines cover each of these aspects, although perhaps not in sufficient depth, as well as making recommendations on administrative requirements, monitoring, ownership and liability.

The OSPAR Guidelines recommend the use of inert materials not susceptible to leaching, physical or chemical weathering, or biological activity, for construction of reefs. The majority of the reefs constructed in the OSPAR Maritime Area are, in fact, constructed of concrete or a concrete mix, many with polyethylene pipes or deterrent arms radiating from a central core of concrete (see Figures 4.1 and 4.2, and case studies in Appendix A). Other materials used include natural rock and decommissioned vessels. In some cases the materials have been specifically tested for robustness and chemical inertness prior to deployment – for example, in the case of the Loch Linnhe reef constructed on the West coast of Scotland. Vessels which have been placed more recently have been thoroughly cleaned prior to being sunk, in accordance with relevant guidelines under the London Convention.

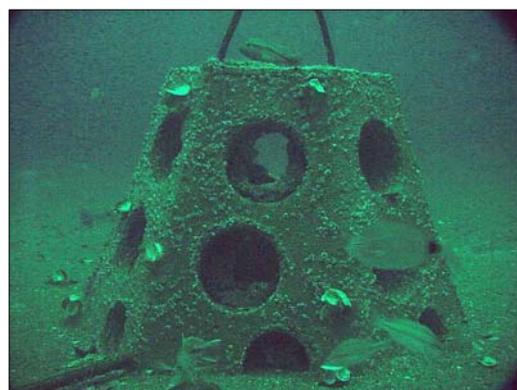
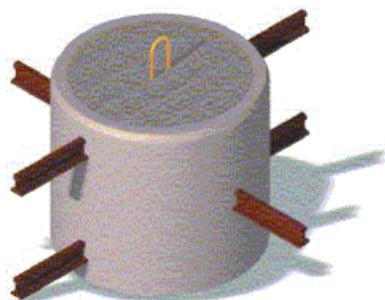


Figure 4.1. Artificial reef module designs for a protection reef (left - with deterrent arms); and a reef intended to provide habitat for marine organisms (right). Source: General Secretariat of Marine Fisheries: Spain

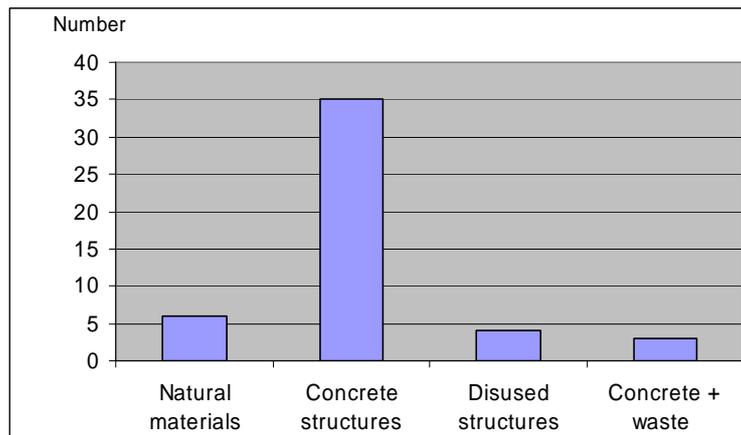


Figure 4.2. Materials used for artificial reef construction in the OSPAR Maritime Area.

Research and monitoring programmes have, to date, reported only relatively minor, localised environmental impacts. For example, reduced current flows at the reef edges of the Lock Linnhe reef resulted in an accumulation of detritus with consequential decreases in sediment oxygen levels and associated changes in the biological community. Similarly, low oxygen conditions were detected in some parts of the Gothenburg reefs.

In light of the localised nature of the environmental impacts demonstrated to date, it seems that unless there is a massive increase in the number of reefs – and especially in the more vulnerable ecosystems such as coastal bays and fjords – and provided that the relevant guidelines are followed, the artificial reef development in the OSPAR area will not have major negative environmental effects. Nevertheless, given the potential for cumulative impacts, it is recommended that OSPAR continues to monitor this activity.

→ [Go to full QSR assessment report on construction or placement of artificial reefs \(publication number 438/2009\)](#)