

# Benthic Habitats and Reefing Patterns



## POTENTIAL CONCERNS

The installation of marine renewable energy (MRE) devices may alter marine habitats through mechanisms that induce physical change, such as modifying or eliminating species in a localized area, providing opportunities for colonization by new species, altering patterns of species succession, and inducing behavioral responses in marine organisms. All MRE devices must be attached to the sea bottom, either with gravity foundations, piled into the seafloor, or by one of several anchoring methods.



Placement of devices on the seafloor, as well as movement of anchor lines, cables, and mechanical parts, can all affect the surrounding rocky or soft-bottom seabed and the benthic organisms these habitats support. Similarly, the presence of MRE devices on the seafloor or suspended in the water column may attract fish and benthic organisms, causing them to change their behavior and settling locations, and perhaps affecting population movement, structure, or success.

## STATUS OF KNOWLEDGE

Scientific peer-reviewed literature about the interactions of benthic organisms and habitats with offshore renewable energy devices is dominated by studies examining the potential effects of offshore wind turbine foundations. No offshore wind farm studies to date have shown the devices to have major deleterious effects on benthic communities or reefing fish. However, the time scales over which these devices have been monitored may not have been sufficient to enable us to see the changes or to ensure that the benthic communities or reefing fish are in balance with nearby populations. Increases in the number of species and total number of benthic organisms and fish have been noted in the vicinity of underwater structures, but it is unclear whether populations are actually larger or whether they represent movement away from other nearby communities.



Studies have been carried out on benthic communities around tidal turbines at two locations—the Marine Current Turbines’ SeaGen site in Strangford Lough, Northern Ireland, and OpenHydro’s open-center turbine at the European Marine Energy Centre (EMEC), Orkney, Scotland. Negative effects on benthic communities associated with the tidal turbines were seen only immediately under the turbine installations (at SeaGen). Observed changes in benthic communities appear to be largely driven by natural variability rather than by device interactions. In addition, the presence of the devices (especially at EMEC) attracted additional benthic organisms and fish.

The potential effects of only one wave installation (Lysekil wave test park on the west coast of Sweden) on benthic communities and reefing fish have been studied. Higher biomass, diversity, and species numbers of benthic organisms were found around the installation, and more fish were seen near the wave foundations. The natural variability of both benthic communities and fish populations made it difficult to attribute the additional organisms strictly to the presence of the wave devices.

## UNDERSTANDING OF THE PROBLEM

Benthic communities and populations of reefing fish have not been seen to be adversely affected by wave or tidal devices, with the exception of some loss of habitat immediately under the devices. Similarly, the effects of offshore wind farms on benthic habitats and reefing fish have not been documented. Changes associated with wave and tidal devices are not expected to be widespread nor are they expected to affect benthic habitats differently than other marine industries that place structures in the ocean. Modeling studies have provided insight into natural processes that may be affected by MRE devices, such as sedimentation patterns and hydrodynamics, which in turn can affect benthic habitats and communities. However, most of these models have not been validated with field data to ensure their accuracy or realism.

## FUTURE RECOMMENDATIONS

It is important to carry out baseline assessments to understand the condition of the benthic habitat and the presence of fish populations in areas destined for MRE development to ensure that healthy populations are present. In some cases, monitoring of the benthic communities and fish populations will be needed to determine that the operation of devices is not degrading the marine environment. However, under natural ocean conditions, benthic communities are always undergoing changes, making it difficult to determine effects from devices, and similarly, many species of fish are naturally attracted to structures of any size in the ocean.

## FOR MORE INFORMATION

Annex IV State of the Science full report and executive summary available at: <http://tethys.pnnl.gov/publications/state-of-the-science-2016>

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Go to <http://tethys.pnnl.gov> for a robust collection of papers, reports, archived presentations, and other media about MRE development.

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