25. Infralittoral rock and biogenic reef

Background

The infralittoral zone is found below the mean low water mark to a depth at which 1% light attenuation reaches the seafloor (approx. 20 -30 m, but in clear waters can be deeper). As the lower limit of the zone is dependent on the intensity of light reaching the seafloor, in areas of high turbidity the infralittoral zone can be very narrow. Infralittoral rock includes bedrock, boulders and cobbles and typically supports macroalgal communities. The upper limit of the infralittoral zone will typically be marked with dense kelp forest which will become sparser with depth (EUNIS, 2017b). Biogenic reef includes polychaete reefs and bivalve reefs (e.g., mussel beds), which may be found on a variety of sediment types, from exposed coasts to estuaries/marine inlets (EUNIS, 2017b).

Table A10.25.1. infralittoral rock ecological groups, and biogenic reef biotopes. Characterising species within those groups on which each group sensitivity assessment was based are listed (Maher et al. 2016). *Sabellaria* reef and *Mytilus edulis* bed biotope sensitivity scores were obtained from Tillin et al. (2023a, 2023b, 2023c).

Group number	Group description	Characterising species
Group 1	Macroalgae	*Laminaria hyperborea, Cladophora rupestris , Halidrys siliquosa, Palmaria palmata*
Group 2	Non-predatory mobile species	*Echinus esculentus*
Group 3	Mobile predators and scavengers	*Asterias rubens, Cancer pagurus, Nucella lapillus*
Group 4	Bivalves and brachiopods	*Pholas dactylus, Mytilus edulis*
Group 5	Tube-dwelling fauna	*Lanice conchilega, Sabella pavonina*
Group 6(a)	Attached soft-bodied species	*Alcyonium digitatum,Clavelina lepadiformis, Dysidea fragilis*
Group 6(b)	Attached encrusting species	*Cliona celata, Electra pilosa*
Group 6(c)	Attached erect species	*Axinella dissimilis, Eunicella verrucosa, Flustra foliacea*

Group 6(d)	Attached robust fauna	*Balanus crenatus, Spirobranchus triqueter*
Biogenic reef biotopes		
Sabellaria spinulosa on stable circalittoral mixed sediment		
Circalittoral *Sabellaria* reefs (on rock)		
Mytilus edulis beds on sublittoral sediment		

Rationale for spatial protection in the Celtic Sea

Infralittoral rock and biogenic reef is included in the features list as it is a Marine Strategy Framework Directive (MSFD) priority habitat and is a broadly distributed feature of ecological importance within the Celtic Sea. This habitat hosts a wide range of species, contributing to the biodiversity of Irish waters. Broadscale habitats do not have existing protection or management, but Ireland has a legal obligation under the MSFD to protect them and they are amenable to spatial protection.

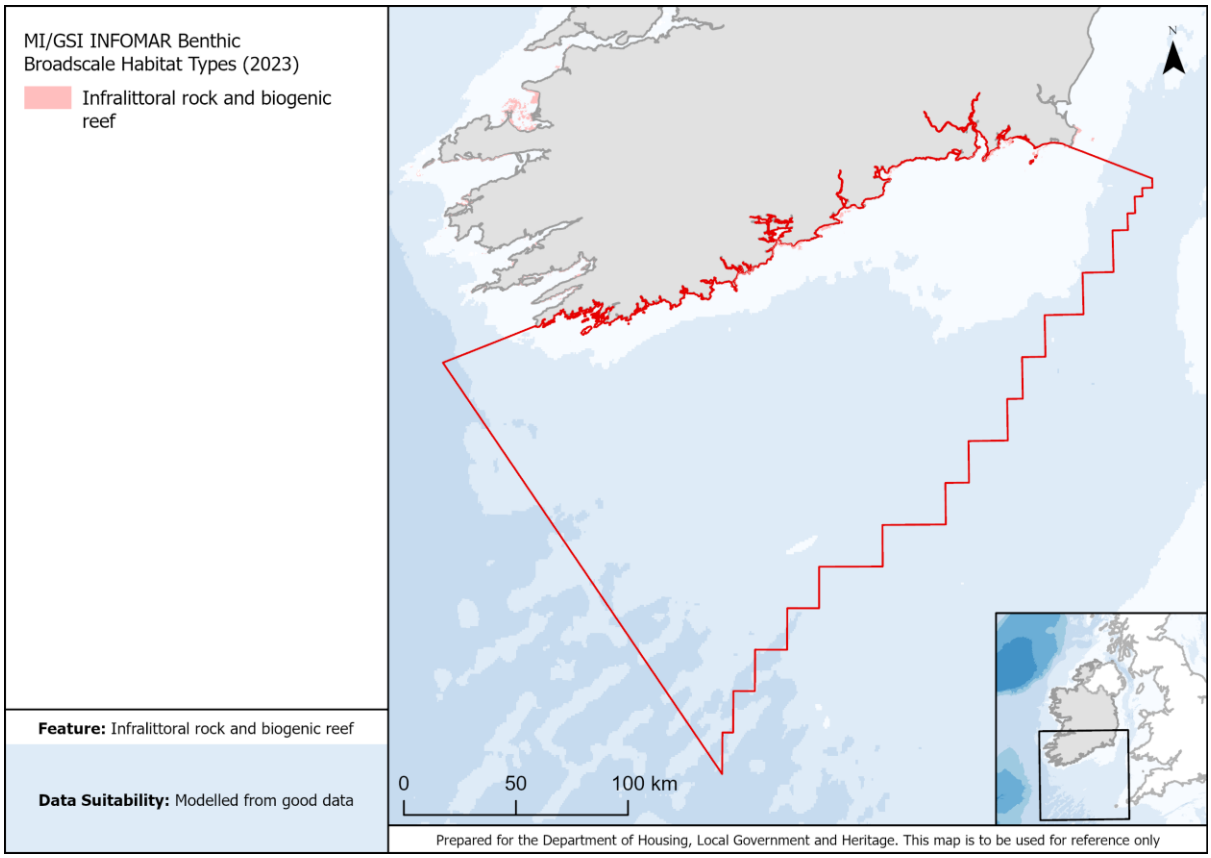

Figure A10.25.1. Data available for infralittoral rock and biogenic reef in the Celtic Sea.

Sensitivity Assessment

Infralittoral rock and biogenic reef is highly sensitive to pressures associated with the construction and operation of offshore wind farms. All marine habitats and benthic species are considered to be

highly sensitive to the pressure 'physical loss (to land or freshwater habitat)', with a resistance of None and no resilience. Circalittoral rock and biogenic reef is highly sensitive to change to another seabed type. A permanent change from rock to sediment or vice versa would change the habitat classification, meaning a resistance and resilience of None. Ecological group 6(c), an attached erect species, is highly sensitive to heavy smothering and siltation changes. As permanently attached species that generally are less than 25 cm in height, a deposition of 30 cm would totally smother the group and cover suitable substratum for resettlement (Maher et al., 2016).

Infralittoral rock and biogenic reef is highly sensitive to pressures associated with the fishing sector. Ecological group 4, bivalves and brachiopods, and *Mytilus edulis* beds are highly sensitive to the pressure 'introduction or spread of invasive non-indigenous species'. Invasive species known to impact *Mytilus edulis* beds include the tunicate *Didemnum vexillum,* the slipper limpet *Crepidula fornicata*, and the Pacific oyster *Magallana gigas* (Mainwaring et al., 2014). Impacts include out competing, smothering and alteration of waterflow. Slipper limpets attach to living mussel shells, causing increased drag on the mussel. This could cause the mussels to expend more energy in producing stronger byssus threads to stay anchored, which would explain the reduced growth rates and higher mortality rates reported for slipper limpet encrusted mussels (Thieltges, 2005). Circalittoral rock and biogenic reef is also highly sensitive to chemical pressures which are detailed below with regards to shipping.

Infralittoral rock and biogenic reef is highly sensitive to pressures associated with shipping. Ecological group 6(c), attached erect species, and *Mytilus edulis* beds on sublittoral sediment are highly sensitive to the pressure 'hydrocarbon & PAH contamination'. No direct effects have been reported for the characterising species in group 6(c), but they have been reported for gorgonian corals (e.g., *Eunicella verrucosa)*. Exposure is most likely through the ingestion of contaminated plankton and organic material, and can result in damage to up to 50% of a coral population (Etnoyer et al., 2016). Sporadic recruitment and slow growth rates mean resilience was assessed as Low. Exposure to petroleum hydrocarbons (oils) can cause 25-75% mortality in *Mytilus edulis*, depending on hydrocarbon concentration (Widdows et al., 1982). Ecological group 3, mobile predators and scavengers, and *Mytilus edulis* are highly sensitive to the pressure 'transition elements & organo-metal contamination'. Tributyltin (TBT) used in antifouling paint can kill and reduce the reproductive capacity of both *Asterias rubens* and *Nucella lapillus*, which leads to population decline through natural mortality and poor recruitment (Maher et al., 2016). Copper, cadmium, and mercury can be lethal to *Mytilus edulis* (Tyler-Walters et al., 2022). Ecological group 3, predators and scavengers, and *Mytilus edulis* are also highly sensitive to synthetic compound contamination. Comprising predators and scavengers, ecological group 3 is susceptible to bioaccumulation of contaminants.

Polychlorinated biphenyls (PCBs) can accumulate in *A. rubens,* resulting in reduced survival rates of larvae (den Besten et al., 1989). *Mytilus edulis* larvae are more sensitive than adults to synthetic compounds (Tillin et al., 2023b), which can affect recruitment and persistence. All the chemical pressures listed above also apply to ORE, as well as fishing.

Data sources available

See Figure A10.25.1 for data available for this broadscale habitat type in the Celtic Sea. This layer was used in prioritization analyses.

Further research needs

As with other MSFD broadscale habitats, better evidence is needed as to which species particularly characterise this habitat in the Celtic Sea. There is a lack of knowledge on the prevalence and distribution of biogenic reefs in the Celtic Sea, hindering the ability to place them under appropriate protection. Genetic data on characterising species could help identify populations with high genetic variability or distinctness, and provide information on connectivity among populations. An integrated approach where genetic data are used in combination with sensitivity and conservation prioritization analyses could provide more comprehensive spatial protection.

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