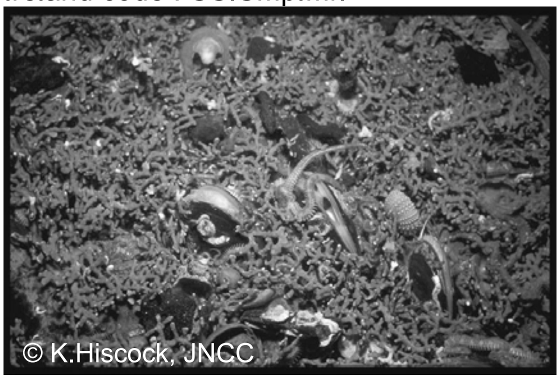
Nomination

Maerl beds
EUNIS Code: A5.51
National Marine Habitat Classification for UK & Ireland code : SS.SMp.Mrl



Definition for habitat mapping

"Maerl" is a collective term for several species of calcified red seaweed (e.g. *Phymatolithon calcareum*, *Lithothamnion glaciale*, *Lithothamnion corallioides* and *Lithophyllum fasciculatum*) which live unattached on sediments. In favourable conditions, these species can form extensive beds, typically 30% cover or more, mostly in coarse clean sediments of gravels and clean sands or muddy mixed sediments, which occur either on the open coast or in tide-swept channels of marine inlets, where it grows as unattached nodules or 'rhodoliths'. Maerl beds have been recorded from a variety of depths, ranging from the lower shore to 30m depth. As maerl requires light to photosynthesize, depth is determined by water turbidity. In fully marine conditions the dominant species is typically *P. calcareum*, whilst under variable salinity conditions such as sealochs, beds of *L. glaciale* may develop. Maerl beds have been recorded off the southern and western coasts of the British Isles, north to Shetland, in France and other western European waters.

Geographical extent

OSPAR Regions; Entire OSPAR Area
Biogeographic zones 4,6-9,11
Region & Biogeographic zones specified for decline and/or threat: Region III.

In the OSPAR area, maerl is common on Atlantic coasts from Norway and Denmark in the north, to Portugal in the south. In Spain maerl deposits are confined mainly to the Ria de Vigo and Ria de Arosa. In Ireland, maerl is widely distributed in the south and south-west, and in the UK it occurs off the southern and western coasts and north to Shetland. It is particularly abundant in Brittany but absent from large areas of Europe, such as most of the North Sea, the Baltic, the Irish Sea and eastern English Channel (Birkett *et al.,* 1998).

Live maerl has been found at depths up to 40m (and up to 100m near Corsica and Malta) but beds are typically much shallower, usually above 20m and can extend onto the lower shore.

Application of the Texel-Faial criteria

Nomination of maerl beds to be placed on the OSPAR list cited sensitivity, ecological significance and decline. Information was also provided on threat.

Decline

A number of studies indicate that maerl beds have declined in both extent and quality in the OSPAR Area. Hall-Spencer & Moore (2000), recorded declines on a maerl bed off the west coast of Scotland, related to the expansion of the scallop fishing industry there. Similar evidence exists off the Irish coast, where the situation was complicated as species came and went on maerl beds according to seasonal influences. Extraction of both living and fossil deposits have depleted beds in the Fal estuary in England and at least four maerl beds in Brittany have been completely destroyed by extraction (Hily & Le Foll,1990; Hall-Spencer,1995).

Most Breton maerl beds are affected by human activities and the only pristine grounds remaining are small compared to the extensive maerl beds that covered several square kilometres in the 1960s (Grall & Hall-Spencer, 2003). For example, one of the largest maerl beds in Brittany (Glenan) was covered in living maerl until maerl extraction started 35 years ago. When surveyed in 1999 live maerl was very rare over most the bank and no macrofauna were observed in grab and core samples in the extraction zone (Grall & Hall-Spencer, 2003). Some of Breton's extensive maerl beds have disappeared, not only because of extraction but also because of sewage discharge (Grall & Glémarec, 1997).

A review of historical data and the current situation at a maerl bed on the west coast of Scotland (Firth of Clyde) has revealed extensive changes over the last 100 years. A living maerl bed with abundant large thalli and nests of the gaping file shell *Limaria hians* has become a bed of predominantly dead maerl with few, small, live thalli and no *L.hians* (Hall-Spencer & Moore, 2003).

Sensitivity

The three commonest species of maerl are very sensitive to substrata loss, smothering, increase in suspended sediment, abrasion and physical disturbance which can prevent light reaching the living maerl and therefore halt photosynthesis (Jones *et al.,* 2000).

The impacts of any damage to maerl beds are long lasting because the key habitat structuring species has a very poor regenerative ability (Hall-Spencer & Moore, 2003). Extremely slow growth rates for maerl have been recorded in data from Ireland, England, France, Norway, Scotland and Spain. These are of the order of tenths of millimetres to one millimetre per year (Bosence & Wilson, 2003).

Maerl beds in the Sound of Iona are recorded as containing dead nodules up to 4,000 years old (Farrow, 1983, cited in Maggs *et al*., 1998). Adey (1970) estimates the life-span of individual plants of *L.glaciale* to be from 10-50 years and little is known about the reproductive mechanisms of this species. Spores can potentially disperse long distances although if dispersal is dependent on vegetative propagation, then distances will be extremely limited.

Ecological significance

Maerl beds are an important habitat for a wide variety of marine animals and plants which live amongst or are attached to the nodules, or which burrow in the coarse gravel or fossil maerl beneath the top living layer (Grall & Gélmarec, 1997). The beds studied to date have been found to harbour a disproportionately high diversity and abundance of associated species in comparison with surrounding habitats, and some of these species are confined to the maerl habitat or rarely found elsewhere. Dead maerl also has an ecological importance, supporting diverse communities, although these have been reported to be less rich than those which in live maerl beds (Keegan, 1974). Both dead and living maerl deposits are also considered to be an important source of subtidal and beach-forming calcareous sediments (Farrow *et al.,* 1978).

Maerl beds may also be important nursery areas for commercially valuable molluscs and crustaceans. This aspect has not been well studied but there is good evidence that they are nurseries for at least a few species e.g. the black sea urchin *Paracentrotus lividus* in maerl deposits in Ireland and scallops on maerl beds in France and the west of Scotland (Thouzeau, 1991; Keegan, 1974; Birkett *et al*., 1998). They also provide structurally complex feeding areas for juvenile fish such as Atlantic cod, and reserves of commercial brood stock for species such as *Pecten maximus, Venus verrucosa* and *Ensis* spp. (Hall-Spencer *et al*., 2003).

Threat

In Europe, maerl has been dredged from both living beds and fossilised deposits for use as an agricultural soil conditioner as well as use in animal food additives and water filtration systems. Although quantities were initially small, by the 1970s a peak of around 600,000 tonnes were extracted per year in France (Briand, 1991). Due to the very slow rate of growth, maerl is considered to be a non-renewable resource and, even if the proportion of living maerl in commercially collected material is low, extraction has major effects on the wide range of species present in both live and dead maerl deposits (Hall-Spencer, 1998; Barbera *et al.,* 2003)

As well as the direct effect of the physical removal of the maerl during extraction, there are other direct and indirect impacts from muddy plumes and excessive sediment load, caused by the dredging activity, which later settle out and smother associated and surrounding communities.

Damage to the surface of beds is also caused by heavy demersal fishing gear, from pollution by finfish and shellfish aquaculture operations in inshore waters, and suction dredging for bivalves. Coastal construction and increases in agricultural and sewage discharges may also have some impact if they increase sediment loads or result in the excessive growth of ephemeral species of macroalgae around maerl beds (Birkett *et al.,* 1998; De Grave *et al.*, 2000).

Impacts have also been reported on benthic communities at and around extraction sites. In Brittany large scale maerl extraction over the last 30 years has removed and degraded the habitat. Other major impacts include the spread of the invasive gastropod *Crepidula fornicata*, industrial waste, sewage pollution, aquaculture and demersal fishing, all of which have increased sharply since the 1970s and are causing widespread damage to Breton beds (Grall & Hall-Spencer, 2003, BIOMAERL team, 2003). For example at Glenan in France there was a clear change from 1969 (before suction dredging started) to 1999 (Grall & Hall-Spencer 2003). Before intense dredging the community was diverse and typical of Breton maerl beds but it has since become an impoverished muddy sand community. In 1969 the habitat was described as a clean maerl gravel with low silt content supporting abundant suspension feeding bivalves. Now the habitat is of muddy sand dominated by deposit feeders and omnivores. Similar changes have also been recorded in Ireland (De Grave & Whittaker, 1999). Habitat complexity is also much reduced by bivalve dredging (Hall-Spencer *et al.,* 2003).

Relevant additional considerations

Sufficiency of data

There is a good body of information on the rich biodiversity of maerl beds from studies on the maerl itself, as well as associated flora, infauna and epifauna, and an extensive inventory of maerl-associated biota from sites throughout Europe. The functional diversity of maerl beds has been described as has the potential role as nursery grounds for commercial species of fish and shellfish. Work has also been carried out on the growth rate of different species of maerl using a variety of methods.

The principle threats to maerl beds from physical, chemical, and biological impacts have been described in general terms as well as being documented or confirmed in the OSPAR Area by experimental studies on maerl beds in the UK, Ireland, France and Spain while the recently concluded EC-funded BIOMAERL project was perhaps the largest single concerted research programme carried out to date on maerl and has drawn upon the experience of researchers from across Europe covering the wider range of maerl beds and associated impacts (Donnan & Moore, 2003).

The information available provides clear evidence of the threat and to damage to maerl beds from activities such as maerl extraction, scallop dredging and poor water quality.

Changes in relation to natural variability

The ecological niche of *L.corallioides* and *P,.calcareum* is relatively narrow and subject to many controlling environmental factors. The requirement of moderate current and wave action on the one hand, but moderate turbidity and sedimentation on the other, help to explain the limited spatial distribution of these species. Little is known about changes in maerl beds in relation to natural variability.

Expert judgement

Studies within the OSPAR Area have confirmed threat, impacts and decline of maerl beds associated with a range of human activities.

ICES evaluation

OSPAR (2001) considered this habitat to be threatened and/or declining over the whole OSPAR area. The Leiden Workshop concluded that evidence for the decline and threat of maerl beds was "strong" over the whole OSPAR area. ICES agreed that evidence for decline and threat of this habitat was sufficient, but only for the OSPAR Region III area. Results from the four-year EC funded BIOMAERL project have since been published (2003) and show that both the threat to maerl beds and their decline is more widespread. Maerl beds are therefore still nominated for the entire OSPAR area.

Threat and link to human activities

Cross-reference to checklist of human activities in OSPAR MPA Guidelines

Relevant human activity: Extraction of sand, stone and gravel, constructions, landbased activities, aquaculture/mariculture, traffic infrastructure (dredging), placement and operation of cables and pipelines, fishing, hunting, harvesting, tourism and recreational activities.

Category of effect of human activity: Physical – Substratum removal, substratum change, increased siltation, turbidity changes, water flow rate changes; Biological – physical damage to species, displacement of species, removal of non-target species, introduction of alien species, changes in population or community structure or dynamics.

There is no doubt that many human activities can and do damage to maerl beds. Commercial dredging of maerl deposits is particularly destructive since this removes the productive surface layer and dumps sediment on any plants which escape dredging, inhibiting habitat recovery (Hall-Spencer, 1994). Fishing activities can also cause damage with scallop dredging on French and UK maerl beds having significantly reduced the complexity, biodiversity and long-term viability of these habitats (Hall-Spencer *et al*., 2003; Hily *et al.,* 1993; MacDonald *et al.,* 1996). Video and direct observation of the effects of scallop dredging in the Upper Firth of Clyde (UK) have revealed dredge teeth penetrating 10cm into the maerl, crushing maerl fragments and killing them by burial. Four months later there were less than half as many live maerl thalli as in control undredged areas (Hall-Spencer, 1995, 1998). Scallop dredging activity has also been reported to result in severe disruption to the maerl bed and associated flora and fauna in France although where there are restrictions certain types of damage may be reduced so some areas have remained productive for commercial bivalves and deep-burrowing organisms can survive in large numbers (Hily & Le Fol, 1990; Hall-Spencer *et al.,* 2003).

Sewage pollution has also been directly linked to the loss of maerl beds. In the Bay of Brest, for example, two maerl beds studied 50 years ago have changed from dense deposits of living maerl on sandy mud mixed with dead maerl to heterogeneous mud with maerl fragments buried under several centimetres of fine sediment with species-poor communities dominated by opportunists (Grall & Glemarec, 1997; Grall & Hall-Spencer, 2003).

Management considerations

The main management measure which would assist the conservation of this habitat is protection from physical damage. This would require halting direct extraction from maerl beds and stopping fishing in maerl beds using gears that damage the structure of the beds and the associated species. A recently concluded four year EU project on maerl in Europe has recommended a presumption of protection of all maerl beds as they are effectively non-renewable resources. Other proposals from this work include the prohibition on the use of towed gear on maerl grounds, moratoria on the issue of further permits for the siting of aquaculture units above maerl grounds and measures to limit the impacts that might affect water quality above maerl beds (Barbera *et al.,* 2003)

Closed areas for particular types of fishing are used to protect certain habitats and species in the NE Atlantic and could also be applied to protect this habitat. This is a matter that falls within the remit of fisheries organisations rather than OSPAR, although OSPAR can communicate an opinion on its concern about this habitat to the relevant bodies and introduce any relevant supporting measures that fall within its own remit (such as Marine Protected Areas).

Two of the more common maerl forming species *L.corallioides* and *P.calcareum* are listed in Annex V of the EC Habitats Directive. In some locations it is also a key habitat within some of the Annex I habitats of the Directive and therefore given protection through the designation of Special Areas of Conservation. In the UK maerl is the subject of a habitat action plan under the UK Biodiversity Action Plan.

Further information

Nominated by:
UK
France

Contact persons:
David Connor, Joint Nature Conservation Committee, Monkstone House, City Road, Peterborough, PE1 1JY, UK

Jacques Grall, LEMAR, Institut Universitaire Européen de la Mer, F-29280 PLOUZANE. Jgrall@univ-brest.fr

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