

# PRIORITY MARINE FEATURE (PMF) - FISHERIES MANAGEMENT REVIEW

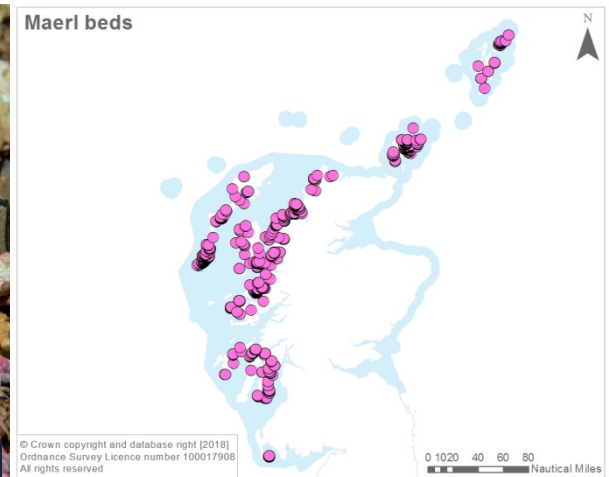
## Feature

### MAERL BEDS

#### Image



#### Map



#### Description

**Characteristics** - Maerl beds are formed by unusual red seaweeds with hard chalky skeletons that grow as small, rounded nodules or short, branched twig-like shapes (sometimes termed 'thalli' or 'rhodoliths'). At high abundance, these nodules and twigs form loosely interlocking carpets through which seawater is able to circulate. This creates perfect conditions for the development of diverse communities of plants and animals on, between and under the pieces of maerl. Other seaweeds, sea firs (hydroids), sea urchins, brittle stars, starfish, sea anemones and scallops may colonise the surface of the bed. Small crabs, queen scallops and juvenile fish can hide inside the bed, while burrowing crabs, worms and bivalves live in the sediment below. Maerl needs light to grow, so living maerl beds are restricted to water generally shallower than 25 m, though in exceptionally clear waters they can extend down to 38 m depth. Living maerl is restricted to the surface layer of the beds, overlying the chalky skeletons of dead maerl.

At least three maerl species exist in the British Isles and the relative composition of these within a bed, and the proportion of living / dead maerl within and between beds, varies with factors such as salinity and wave exposure. Maerls are extremely slow growing and extensive beds may be 1000s of years old. Most of the maerl beds in the UK lie along the fjordic coastline of western Scotland which has more records than any other European country (Hall-Spencer *et al.*, 2010).

**Definition** - Maerl beds are defined by the presence of a complex 3D structure, created by accumulations of maerl pieces. Depending on environmental conditions, beds can form as continuous carpets, patches of dense maerl on other sediments, or have a linear appearance, following the troughs or ridges of sediment waves on the seabed.

Accumulations of maerl are considered a bed where there is at least 20% coverage of dead or live maerl thalli. The 20% cover of maerl substrates has to extend over an area of at least 5 m x 5 m (whether continuous or in discrete patches / rows). Areas of the seabed where the substrate is made up of broken maerl gravel may also be considered maerl beds, albeit degraded ones, when there is at least 5% cover of live maerl material >1 cm in size.

**Environmental preferences** - Maerl beds develop on coarse clean sands and gravels either at the open coast or in tide-swept channels to a depth of about 25 m. Occasional records from muddier sediments e.g. Loch Torridon and in deeper waters e.g. Shetland.

## Distribution

**Scottish distribution** - Maerl beds are widespread on the west coast, ranging from Luce Bay, Arran and the Clyde, Jura, along west coast from Mull northwards, around the Small Isles and Skye, the Outer Hebrides, Loch Eriboll, Orkney and Shetland. There are no known examples on the east coast although sparse maerl thalli have been recorded at locations off the NE coast (e.g. in the outer Moray Firth off Buckie - see Moore, 2017).

**Estimated known Scottish extent** - Maerl beds vary considerably in size and the extent to which they are connected. Some beds are isolated and distinct, such as the small 0.1 ha bed at North Strome in Loch Carron (Moore *et al.*, 2018). Other locations support numerous maerl beds extending over many square kilometres e.g. in nearshore waters around Orkney.

**Wider distribution** - Recorded from SW England, Wales, Ireland and Northern Ireland, NW Iceland, NW France, NW Spain and the Canary Islands. Also known to occur in Sweden and Norway.

## Status

Maerl beds have a globally restricted distribution. Scottish waters support approximately 30% of the maerl beds in north-west Europe and most of the beds in the UK. The habitat is listed as threatened and / or declining under OSPAR (OSPAR, 2008), with evidence of decline in both extent and quality across the Celtic Seas, OSPAR Region III (Hall-Spencer *et al.*, 2010).

Evidence of deterioration in the condition of maerl beds in the Wester Ross MPA and South Arran MPA led to a 'recover' conservation objective being set for the feature at both sites.

## Sensitivity (including recovery)

[Key sources: [FEAST](#); [Fisheries Management Guidance](#)]

Maerl beds are highly sensitive to physical disturbance, particularly in the form of abrasion and habitat removal / change, organic enrichment, siltation and changes in water flow (Hall-Spencer & Moore, 2000; Perry & Tyler-Walters, 2018). Activities associated with these pressures include bottom-contacting fishing, aquaculture (Hall-Spencer *et al.*, 2006) and coastal development (Mazik *et al.*, 2015). Maerl beds may also be vulnerable to future climate impacts, experiencing shifts in distribution as a result of intolerance to altered seawater temperature and chemistry, with likely knock-on effects on community composition and function (Birchenough *et al.*, 2013; Martin & Hall-Spencer, 2017).

Heavy, bottom-contacting towed gears have the potential for significant negative impacts on maerl beds with up to 70% of the maerl present being crushed and buried (up to 8 cm depth) by one pass of a scallop dredge (Hall-Spencer & Moore, 2000). The impacts from smothering have also been demonstrated experimentally (Wilson *et al.*, 2004). Similar impacts on the structure and integrity of maerl have been recorded in relation to hydraulic dredging (Hauton *et al.*, 2003). A review of historical data on the west coast of Scotland (Firth of Clyde) revealed extensive damage over the last 100 years (Hall-Spencer *et al.*, 2010).

Current evidence suggests that if maerl is removed, fragmented or killed then it has almost no ability to recover (Perry & Tyler-Walters, 2018). There is limited sexual reproduction in maerl in Scottish waters, hence very poor dispersal, and minimal potential for beds to establish *ab initio*. Where live maerl does remain post impact, recoverability is severely limited by the slow growth rates of the species (e.g. 0.1-1 mm/yr - Lancaster *et al.*, 2014; Mazik *et al.*, 2015). If the maerl is killed but dead maerl substrates remain then the associated benthic community may partially recover within 2-10 years (Perry & Tyler-Walters, 2018). Where maerl is fragmented, species richness is likely to decrease. The large, long-lived bivalve component of the habitat may take 20-50 years to recover to former levels (Hall-Spencer, 2009).

## Connectivity

**Between maerl beds** - There is limited sexual reproduction with dispersive life stages amongst maerl beds in Scotland, so connectivity between beds is considered to be low and restricted to transport of maerl rhodoliths by currents. Some maerl beds may be reliant on being “fed” live maerl in this way and would not be able to persist if the connection / source bed was lost. Further research is required to understand more about connectivity between maerl beds (and links to the *maerl or coarse shell gravel with burrowing sea cucumbers* PMF).

**With other PMFs** - Maerl beds can exhibit a range of functional links and associations with other PMFs (Lancaster *et al.*, 2014). Nests of the flame shell (*Limaria hians*) can be found in conjunction with maerl (Hall-Spencer *et al.*, 2003; Moore *et al.*, 2018). The byssal threads of flame shells bind the maerl together helping to stabilise the bed (Birkett *et al.*, 1998). The *maerl or coarse shell gravel with burrowing sea cucumbers* PMF is often closely associated with maerl beds, occurring around bed margins where maerl substrates grade into coarse, non-maerl gravels. *Seagrass beds* have been found rooted within maerl beds e.g. in Wyre, Rousay and Gairsay Sounds in Orkney (Thomson *et al.*, 2014) and Loch Sween (Moore *et al.*, 2013). Maerl beds are also believed to serve as important nursery areas for *native oysters* (*Ostrea edulis*) (Hall-Spencer *et al.*, 2003) and can form habitat mosaics with *horse mussel beds* (Birkett *et al.*, 1998; Moore *et al.*, 2018).

Maerl beds can also co-exist or form mosaics with *kelp and seaweed communities on sublittoral sediment*. This habitat can overlie and mask the presence of maerl, particularly during the summer months when foliose algal cover can be high.

## Ecosystem services

- |   |   |
|---|---|
| <ul style="list-style-type: none"><li>• Biomass production</li><li>• Larval/gamete supply (supporting connectivity)</li><li>• Nutrient cycling</li><li>• Formation of habitat for other species (supporting biodiversity)</li><li>• Formation of physical barrier</li></ul> | <ul style="list-style-type: none"><li>• Resilience to INNS &amp; disease</li><li>• Carbon storage &amp; climate regulation</li><li>• Fish and shellfish stocks</li><li>• Sediment stabilisation</li><li>• Socially valued places/seascapes</li><li>• Watching/studying nature</li></ul> |
|---|---|

## Existing Marine Protected Areas

Maerl beds are a protected feature of 11 MPAs: Loch Laxford; Loch nam Madadh; Sound of Arisaig; Luce Bay; Sound of Barra; Fetlar to Haroldswick; Wyre and Rousay Sounds; Loch Sween; Wester Ross; South Arran; and, Loch Carron.

## Existing and proposed fisheries measures providing PMF protection

Details of existing fisheries measures associated with 6 of the MPAs: Loch Laxford; Luce Bay; Wyre and Rousay Sounds; Loch Sween; Wester Ross; and, South Arran are provided on Marine Scotland’s web pages (<http://www.gov.scot/Topics/marine/marine-environment/mpanetwork/MPAMGT/protectedareasmgt>).

New fisheries management measures that will provide PMF protection in 4 other MPAs: Loch nam Madadh; Sound of Arisaig; Sound of Barra; and, Fetlar to Haroldswick will be consulted upon later in 2018 (see - <http://www.gov.scot/Topics/marine/marine-environment/mpanetwork/inshorempas/Management>).

Loch Carron was designated as an MPA on urgent basis in May 2017. An urgent Marine Conservation Order (MCO) came into force at the same time to manage fishing activity within the loch. This prohibits the deployment and use of any towed, bottom-contacting gear. A public consultation on the case for making the MPA and associated MCO permanent closed on 13 June 2018. Further details are available online (<http://www.gov.scot/Topics/marine/marine-environment/mpanetwork/developing/2017MPA>).

The Shetland Shellfish Management Organisation (SSMO - <https://www.ssmo.co.uk>) is the regulator for shellfish fisheries within Shetland's six mile limit. There is an expectation that measures to manage scallop dredging activity within relevant MPAs will be introduced by the SSMO to complement measures proposed by Marine Scotland and provide the necessary protection for designated habitats and species (including the PMFs covered by this review). The mapping presented in this paper assumes that measures will be implemented accordingly to afford protection to all maerl beds in the Fetlar to Haroldswick MPA (existing restrictions currently exclude 5 records) and that initial voluntary measures in the Mousa MPA will be formalised in due course (subject to new survey work as appropriate).

Maerl beds are afforded protection by virtue of fisheries measures associated with other designated features in a further 3 MPAs: Treshnish Isles; Loch Roag Lagoons; and, Mousa (see above).

Maerl beds are also afforded protection through the Loch Gairloch (CA58) and Loch Torridon and Northern Inner Sound (CA56) fisheries areas.

### **Examples of PMFs that have no or partial coverage by fisheries measures**

There are unprotected maerl beds along most of the Scottish west coast and islands and in waters around Orkney and Shetland.

- Inner Clyde - along the north-east of Arran and around the Isle of Bute.
- Islay and Jura.
- From the north-west of Mull to Arisaig, Loch Nevis and the Sound of Sleat.
- Around the Small Isles and Skye, with recent records in Lochs Eishort, Slapin and Scavaig (Moore, 2015 & 2017).
- Outer Hebrides - multiple unprotected records along south-west Lewis, Loch Seaforth, Scalpay, in the Sound of Harris, all along the Uists and off Barra. The beds are of high quality and represent a wide range of environmental conditions.
- North-west coast - from Loch Eriboll to Kinlochbervie and Kylesku. Only the records in Loch Laxford MPA are currently afforded protection.
- Orkney - possibly Scotland's most important area for maerl beds, both in quantity and quality. The vast majority of maerl bed records in Orkney lie outwith the MPA network.
- Shetland - outside the MPAs, a number of maerl bed records are afforded partial protection (with prohibitions in place for scallop dredging only) within SSMO statutory closed areas (at Lunning Sound, Wadbister and The Vadills - see - <https://www.ssmo.co.uk/maps>). The SSMO closed areas at Wadbister and Lunning Sound were informed by NAFC survey work undertaken in 2011 (Shelmerdine *et al.*, 2013). SNH-commissioned survey work in 2003 failed to relocate the maerl bed originally recorded in The Vadills MPA in 1993 (see ERT (Scotland) Ltd., 2006 for details). There is one historic maerl bed record in Wadbister Voe that has no existing measures in place. Situated outside the existing SSMO closed area, the location was not re-surveyed in 2011. Work undertaken in 2011 in relation to a development proposal to the north of Papa (Hjaltland Seafarms Ltd., 2011) also recorded maerl beds not currently covered by fisheries measures.

### **Assessment against National Marine Plan General Policy 9:**

Development and use of the marine environment must not result in significant impact on the national status of Priority Marine Features.

**Maerl beds are functionally important, biodiverse, sensitive, slow to recover and if lost completely may not recover. They are an OSPAR T&D habitat, scarce in north-west Europe with evidence of decline in Scotland. Therefore any activities that lead to the loss of entire beds or damage beds to the extent that function or provision of ecosystem services cannot be maintained should be considered a significant impact on national status.**

**Existing licensing and consenting processes will continue to consider the potential for significant impacts on the national status of development proposals on maerl beds. The following assessment relates to fishing using towed bottom-contacting gear only but is consistent with the approach taken for assessing proposed developments. Please refer to the *consultation overview* for further details.**

**In a fisheries context**, additional measures to protect maerl beds from pressures associated with towed bottom-contacting gears are recommended in the following 13 areas: **Clyde; Islay and Jura; North-west Mull; Mallaig to Mull; Skye; Inner Sound; Uists; Lewis & Harris; Kylesku to Eriboll; Orkney** and 3 areas in **Shetland (Lunning Sound; Wadbister; and, Papa (North))**. The recommendations for maerl beds need to be considered alongside the recommendations for the other 10 PMFs considered as part of this review. The areas identified provide a starting point for discussions regarding future fisheries management. These discussions will be led by Marine Scotland.

Areas where additional fisheries management should be considered to avoid significant impact on the national status of this PMF are distributed to cover the full range of environmental conditions in which maerl beds occur and the different associated bed forms (exposure, depth, geographic range, substrate, rhodolith form etc.).

Areas have been designed around clusters of numerous records in preference to isolated observations, and around larger beds in preference to smaller ones (where known), except where smaller or fragmented beds are the only (remaining) examples in a geographic area. This is the case in the Clyde, where maerl habitats are generally severely degraded and all remaining beds require protection to support PMF recovery. Areas also encompass the habitat's inherent patchy nature, and the distribution of the associated *maerl or coarse shell gravel with burrowing sea cucumbers* PMF, with which it forms mosaic habitats.

A greater biological diversity of associated faunal and floral communities, a higher percentage of live maerl material and a greater thickness of maerl matrix are factors which increase the conservation importance of a bed. Information on these characteristics does not exist for all records in Scottish waters precluding their detailed application in this assessment. However, such information will be sought and used in development licensing and consenting processes.

The recommendations take account of the valuable contribution maerl beds make to ecosystem services e.g. providing nursery habitats for fish and shellfish, increasing local biodiversity and contributing to carbon capture and storage.

### **Knowledge gaps and other records**

**Other records** - Additional maerl beds are likely to be identified around the Scottish coastline. Future targeted surveys should be guided by species distribution / habitat suitability modelling studies as well as knowledge of historic presence. Opportunities for joint research to improve our understanding of the distribution of this OSPAR T&D habitat should be explored through the 2018-2022 EU INTERREG VA-funded MarPAMM Project.

### **Data confidence**

Available records span 1970 to 2017. Surveys vary in scope from Seasearch (carried out by volunteer divers) to dedicated PMF validation surveys (e.g. 2014 SNH South Skye sea lochs benthic camera survey). Records come primarily from diving and remote video surveys with a smaller number of records from infaunal grab samples.

Maerl bed records in Shetland were cross-checked against the results of survey work undertaken by the North Atlantic Fisheries College (NAFC) Marine Centre UHI (Shelmerdine *et al.*, 2014). The maps provided in this paper include provisional new records of the PMF not currently held in the database. A process to incorporate relevant, confirmed PMF data, collated as part of the Shetland Islands Marine Spatial Plan (SIMSP) is in development. These records will be mobilised via future updates to the Marine Scotland MAPS NMPi (National Marine Plan interactive) online tool (<http://maps.marine.gov.scot/>).

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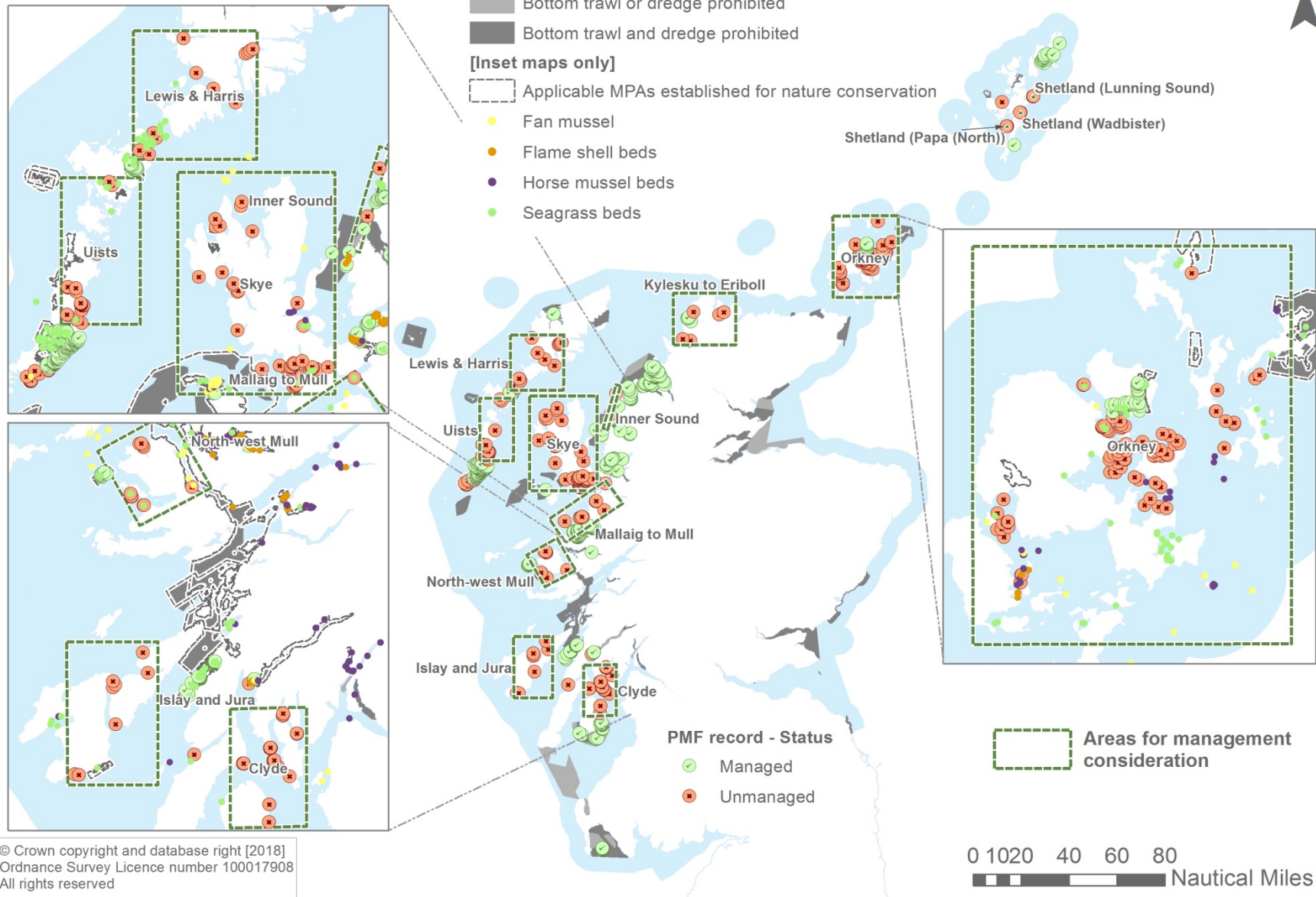
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**Areas where fisheries management should be considered to avoid a significant impact on the national status of the PMF**

**Maerl beds**



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