

Maerl Forum Output Report & Cornwall Maerl Conservation Action Plan

October 2025



Foreword

David Slater

Regional Director for the Southwest, Natural England



When I first saw the beautiful images of Maerl off the coast of Cornwall it was love at first sight for me. As someone who's largely stayed on dry land in my conservation career this was a new and magical looking habitat. Not only is it beautiful, it is also incredibly important as a habitat for other species, a storer of carbon, and a component of a broader ecosystem that supports the livelihoods of coastal communities. For my terrestrial colleagues, think ancient woodland, limestone pavement and blanket bog. Or – 'once they are gone, they are gone habitats.'

We need to understand its extent and ecological characteristics, but also its value as natural capital; we need to have more persuasive evidence about how Maerl underpins broader ecosystem health and human communities. This evidence must be in an accessible form, to connect with local communities and decision makers alike. There are many routes to marine nature recovery, but the one that is likely to endure is the one that is in tune with both those that make their living from the seas as well as those that regulate and fund the management of our coastal waters.

The Maerl Forum was a great start on this journey, and the energy and expertise in the room from all the stakeholders should give us optimism for the future of Maerl. I am looking forward to seeing what comes next and how this links to Cornwall and Isles of Scilly Nature Recovery Strategy and Marine Nature Recovery Framework.

Foreword

Philippa Hoskin

Nature Recovery Manager, Cornwall Council



Growing up in Cornwall, on and in the sea, shaped me and kickstarted my career in conversation. I have seen first-hand the journey that Maerl has gone on over the past three decades and how it's story reflects the wider environmental movement from one of destruction to a slow path to recovery, plus reflecting the change in public understanding.

I was privileged to support the first ever UK Maerl Forum in 2025, held on the banks of the Fal Estuary, which supports an incredible Maerl bed thought to be at least 4000 years old. Given that Cornwall is home to the majority of England's known Maerl beds, it is a natural leader in developing effective conservation measures that protect this irreplaceable habitat.

I am delighted that Cornwall Council has been able to lead on the creation of the first of its kind Marine Nature Recovery Framework for our region, with Maerl recognised as a locally agreed priority for action. It is fantastic to see the Framework already being translated into partnership action with Cornwall proud to host the first UK Maerl Forum.

A lot has changed since the 1990s and there have been improvements, however we cannot be complacent, and more is still needed to be done. 2025 presents an opportunity to better conserve Cornwall's Maerl beds. By combining stronger protection, improved water management, innovative research, and broad community engagement, Cornwall can lead the UK in conserving this irreplaceable habitat.

As with marine nature recovery as a whole, the responsibility for delivering the actions laid out in this important Report and Action Plan is shared amongst us all. We need immediate and coordinated collaborative action to ensure that Maerl beds flourish and continue to support biodiversity, fisheries, and climate resilience for generations to come.

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Executive summary

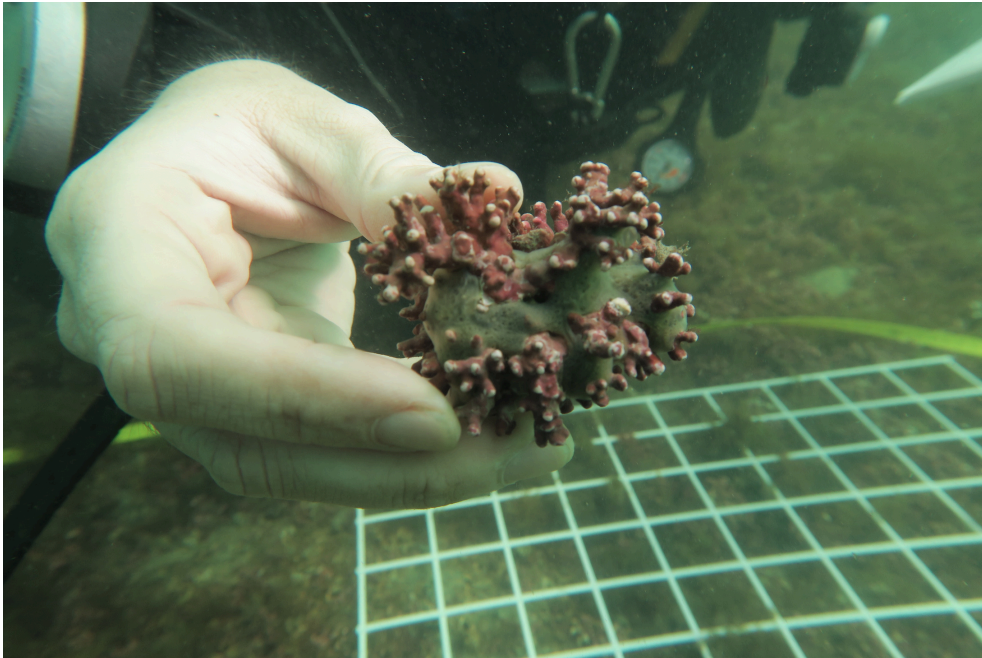
Maerl refers to free-living red coralline algae, commonly known as rhodoliths, which form complex three-dimensional habitats, that support diverse marine life. In England, the majority of known Maerl occurs off Cornwall's south coast, with particularly dense beds found on the St Mawes Bank in the Fal Estuary. Acting as ecosystem engineers, Maerl beds provide vital spawning and nursery grounds for commercial species, contribute to carbon sequestration as recognised blue carbon habitats, and represent an important part of Cornwall's natural capital. However, these fragile habitats remain highly vulnerable to human pressures, including unregulated bottom-towed gear, anchoring, invasive species, and poor water quality.

The Maerl Forum 2025 brought together researchers, conservation practitioners, policymakers, and community stakeholders from across the UK and beyond to explore the latest science, policy, and innovation surrounding Maerl conservation. Presentations provided insight into the latest science on Maerl mapping and monitoring, policy and legal tools for habitat protection, and the creative approaches to raise awareness and engage the public with Maerl. To consolidate the knowledge gained throughout the forum, a facilitated workshop was held, focusing on four key questions related to knowledge gaps and conservation opportunities. Responses were synthesised, refined, and shared with delegates within a post-forum feedback form to identify priority conservation actions. Information from these responses, together with consultation from the Maerl Forum Steering Group, informed the development of the **Cornwall Maerl Conservation Action Plan (2025-2030)**.

The Cornwall Maerl Conservation Action Plan was created in response to Cornwall Council's **Cornwall and the Isles of Scilly Marine Nature Recovery Framework** (MNRF), which highlights Maerl as a key habitat in need of improved identification, mapping, and protection. The Cornwall Maerl Conservation Action Plan provides a framework of practical and flexible actions to guide coordinated Maerl conservation efforts across Cornwall. It sets out a series of potential conservation actions that could be adopted by relevant organisations wanting to explore and implement Maerl conservation initiatives. The Plan is structured around six thematic areas that enable organisations to identify suitable points for exploration, collaboration, and delivery. These include Monitoring, Mapping, and Innovation; Water Quality and Pollution Management; Sustainable Fishing and Activity Regulation; Legal Protection and Policy Reform; Habitat Restoration, Recovery and Climate Change Research; and Public Awareness, Education and Community Engagement. This provides a framework for Maerl conservation priorities, the potential actions within the Plan will require further development, consultation, and resources to be implemented by relevant organisations.

What next?

Next steps will focus on maintaining the momentum initiated by the Maerl forum through the continued efforts of the Maerl Forum Steering Group as a coordinating body. Regular meetings, knowledge exchange, and shared reporting will help keep knowledge and understanding up to date, while aligning organisation initiatives with the identified conservation priorities. It is hoped that this Report and the Cornwall Maerl Conservation Action Plan will serve as key reference points for future Maerl conservation projects, and guide practical efforts that are collaborative, coordinated, and strategic. Building on the foundations established by the Maerl Forum 2025, Cornwall can lead the way in protecting and restoring one of England's most ecologically valuable marine habitats, Maerl.



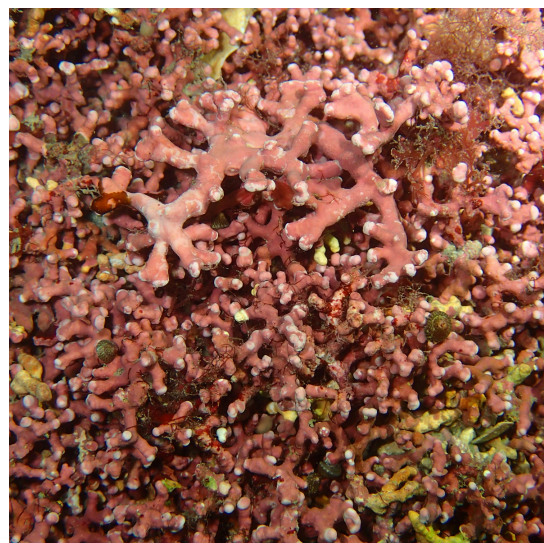
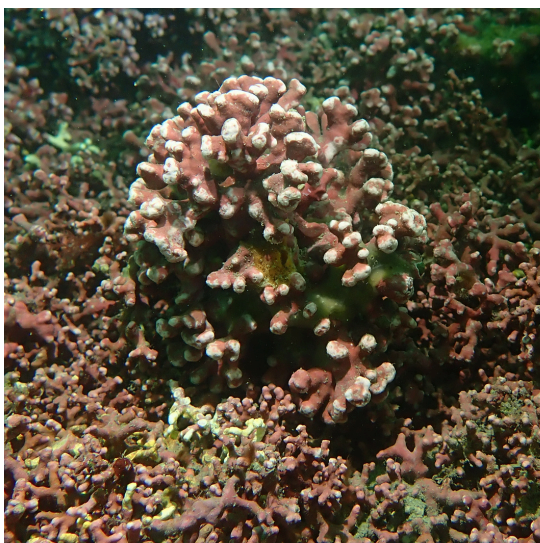
Maerl nodule found on a diving survey. Photo credit: Angie Gall.

About Maerl

What is Maerl?

Maerl is a collective term describing multiple species of red coralline algae that live unattached as free-living nodules, commonly known as rhodoliths (Hall-Spencer, Kelly, & Maggs, 2010). Conservation regulations in the UK list three species of Maerl; *Lithothamnion corallioides*, *Phymatolithon calcareum*, and *Boreolithothamnion glaciale* making it an important region for Maerl bed conservation (Hall-Spencer, Kelly, & Maggs, 2010). Owing to its photosynthetic requirements, Maerl is found at depths typically ranging between 1 and 30 meters allowing for sufficient light penetration, although some rhodoliths have been found much deeper (Birkett, Maggs & Dring, 1998). When conditions are optimal, Maerl nodules intertwine to form dense and extensive living 'beds' along shallow sheltered coastlines, on a variety of substrata such as sand, gravel, and mud (OSPAR, 2008).

As Maerl beds grow, live Maerl builds up on the surface layers of dead Maerl. These beds take millennia to form as the algae have an extremely slow growth rate of just <1mm yr⁻¹ (Bosence & Wilson, 2003). Some beds around the UK are estimated to be ~8000 years old, making them both ancient and highly sensitive to change (Birkett, Maggs & Dring, 1998). Estimates suggest that globally rhodolith habitat may cover ~4 million km², with the largest distributions in temperate North Atlantic regions, and in the waters off South America (Fragkopoulou et al., 2021; Corrigan et al., 2025). The historic distribution of Maerl beds around the UK remains unclear, however advances in marine mapping technologies have aided the identification of Maerl off the west coast of Scotland, Ireland, Wales, and Southwest England (Blake et al., 2007; Hall-Spencer, Kelly, & Maggs, 2010; Birkett, Maggs & Dring, 1998). In England, the majority of known Maerl is found on Cornwall's south coast in shallow inlets and bays. Extensive beds can be found on St Mawes bank in the Fal estuary, and at recently discovered sites off the southern Cornish coast including St Austell Bay (Gall, 2012; Allen et al., 2014; ENVISION MARINE LTD, 2023 and 2024).



Maerl bed photographed in the Fal estuary. Photo credit: Matt Slater.

Why is Maerl important?

In dense formation's Maerl acts as ecosystem engineer, creating structurally complex 3-D habitats that support rich and biodiverse communities of marine fauna and flora (Bulleri et al., 2025). The spaces between the branching Maerl nodules facilitate the settlement of sessile organisms which in turn attract mobile and consumer species, contributing to the formation of a dynamic benthic food web (Grall et al., 2006; Grall & Hall-Spencer., 2025). This web is strengthened by Maerl's role as a heterotrophic system, contributing to primary production through nutrient recycling, and by facilitating the growth of photosynthetic and epiphytic algae (Martin et al., 2007).

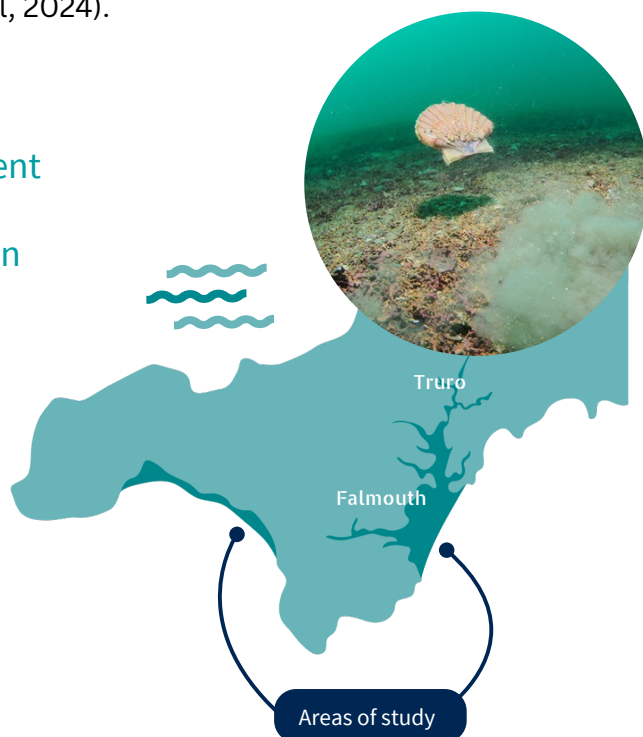
The species richness of Maerl beds varies over time and with location but estimates consistently demonstrate high biodiversity. In the North-East Atlantic, Peña et al., (2014) recorded 349 macroalgal species growing on Maerl, comprising 30% of the seaweed species native to the region. In the central Mediterranean Sciberras et al., (2009) recorded over 330 invertebrate and algae species associated with Maerl. In the UK, surveys conducted by Birkett, Maggs & Dring, (1998) recorded over 500 faunal species, and 150 algal species associated with Maerl habitats. Recently, in 2023, volunteers from the citizen science project Seasearch recorded 95 species during dive surveys on Maerl beds in Cornwall's Fal and Helford Special Area of Conservation, whilst diver-led surveys carried out by Natural England identified over 350 species in the Falmouth Bay to St Austell Bay Special Protected Area. This evidence of Maerl beds supporting rich marine communities reinforces the importance of protecting these habitats to promote and support biodiversity on local and international scales (Cornwall Wildlife Trust, 2024; Appendix II poster- ["Maerl In Falmouth Bay to St Austell Bay SPA"](#)).

In addition to providing complex habitat, Maerl beds hold significant natural capital, serving as essential spawning grounds for epipelagic fish such as Atlantic herring (*Clupea harengus*) , and nursery grounds for benthic species, including commercially important queen scallop (*Aequipecten opercularis*) and juvenile cod (*Gadus morhua*) (Morrison, Gamble and Shand, 1990; Hall-Spencer et al., 2003; Kamenos et al., 2004; Appendix II poster- ["Herring Spawning on Maerl"](#)). Often under-recognised for their commercial significance, these habitats may contribute to sustaining and enhancing populations of economically valuable species, therefore have the potential to support local fisheries and coastal economies (Kamenos et al., 2004).

The importance of Maerl is further demonstrated by its role in the oceanic carbon cycle, with the capacity to uptake, sequester, and store carbon (Burrows et al., 2017; Schubert et al., 2024; Appendix II poster- ["Maerl beds, associated wildlife and carbon sequestration around Wester Ross, NW Scotland"](#)). The calcium carbonate exterior of Maerl, fixes carbon for longer periods of time compared to other fleshier marine algae and plant habitats including kelp forests and seagrass meadows which decompose quickly (Mao et al., 2020). In the UK, research estimates suggest that some Maerl beds, covering just 7km², store upwards of ~440,500 tonnes of carbon (Burrows et al., 2014). Recognised as blue carbon habitats, maerl beds are increasingly acknowledged for their potential role in regulating carbon levels under future climate change scenarios (Cornwall Wildlife Trust, 2024).

Building on this understanding, in 2024, Cornwall Council completed the Blue Natural Capital Project, an ambitious initiative aiming to assess the natural capital of some of Cornwall's blue carbon habitats. Crucially, this included Maerl beds, which are often underrepresented in blue carbon estimates. Research commissioned on Cornwall's south coast revealed that Maerl beds, both within and outside the Fal and Helford SAC, stored between 31.4–90.2 milligrams of carbon per hectare (Mg C ha^{-1}), highlighting their significant yet overlooked contribution to carbon storage and their role as a potential asset in climate regulation (Cornwall Council, 2024).

Cornwall Council's Blue Natural Capital Project, funded by the Natural Environment Investment Readiness Fund (NEIRF) has expanded previously limited knowledge in Cornwall to provide a clearer understanding of blue carbon habitat extent and health. They have created a baseline of evidence to inform options to unlock future private funding for natural capital in the county and beyond.



One hectare is equal to one rugby pitch!

The Fal and Helford supports an astounding **Over 1,000 hectares of Maerl** making it a key UK site for this irreplaceable blue carbon habitat.

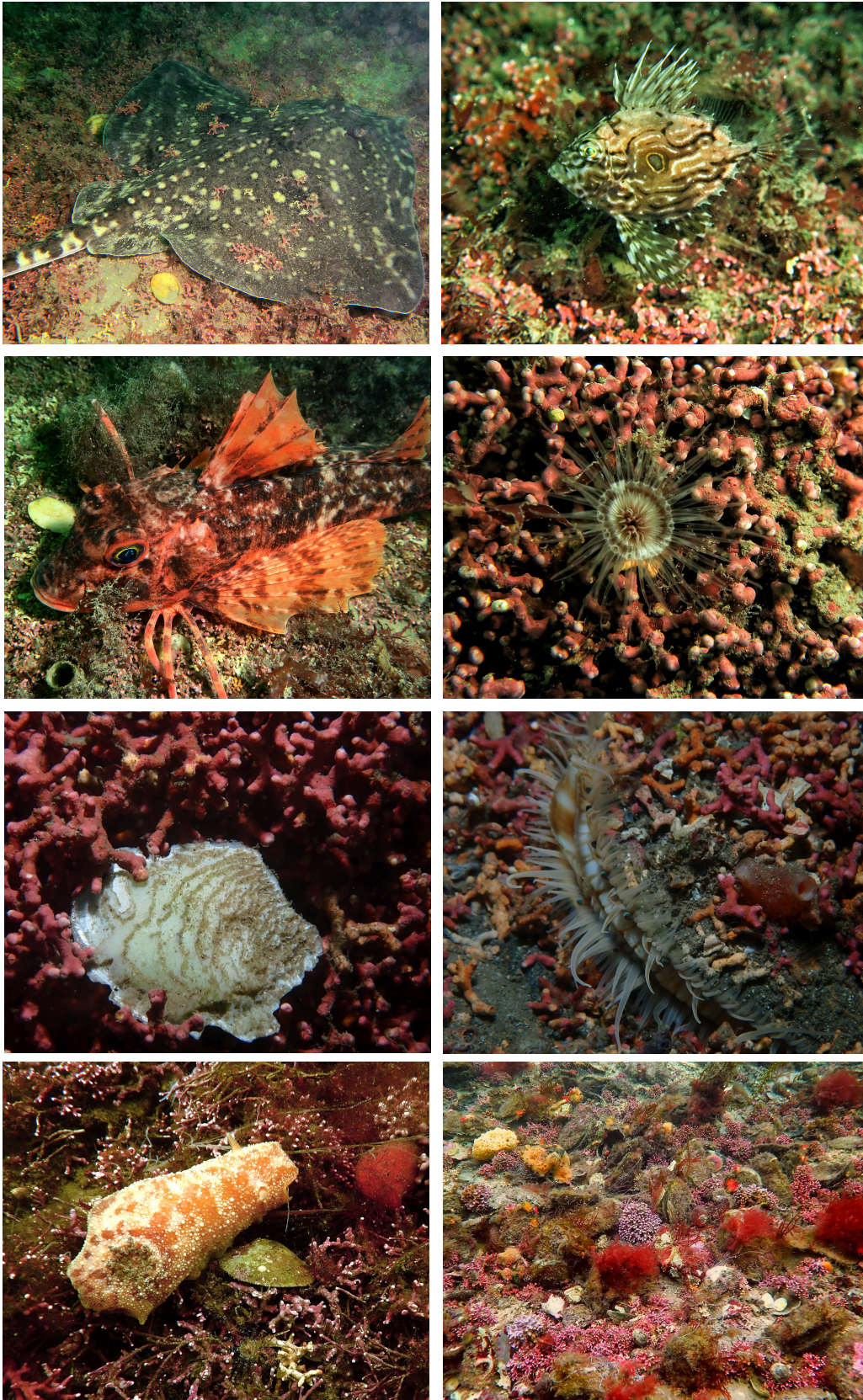
The live maerl in the Fal Estuary was also rich in organic carbon, supporting the theory that live maerl beds can potentially store large quantities of blue carbon for thousands of years.

The live Maerl habitats across the Fal & Helford Estuaries SAC absorb an estimated **841 tonnes of CO₂** each year - equal to about 3.7million petrol car miles.



This has a present value of **£7,58 million over 50 years.**

Due to the hectareage/broad coverage/amount of maerl, **the uptake of carbon is higher overall for this habitat** compared to the other blue carbon habitats studied, even seagrass.



Species found on Maerl beds, left to right descending; Thornback ray (*Raja clavata*), juvenile John Dory (*Zeus faber*), Red gurnard (*Chelidonichthys cuculus*), Burrowing anemone (*Cerianthus lloydii*), Oyster (*Ostrea edulis*), Scallop (*Pecten maximus*), Sea lemon (*Doris pseudoargus*), and Epiphytic algae and sponge. Photo credits: Trudy Russel, Angie Gall, and Jose Farinas-Franco.

Threats to Maerl

Although Maerl is increasingly recognised as a slow-growing and ecologically important habitat, it remains highly vulnerable to anthropogenic pressures that threaten its survival (Birkett, Maggs & Dring, 1998; Grall & Hall-Spencer, 2025). These mounting pressures are causing declines in the global coverage of Maerl beds, thus understanding the factors contributing to this decline is of critical importance (EU, 2016).

Most well documented are the impacts of marine activities such as commercial extraction, vessel anchoring, bottom trawling, mariculture, and the introduction of invasive species. (Grall & Hall-Spencer, 2003; Bernard et al., 2019; Tauran et al., 2020; Hall-Spencer et al., 2006; Legrand et al., 2024; Barbera et al., 2003; Grall and Hall-Spencer, 2025). These activities often result in physical degradation to Maerl habitats and the loss of their structural integrity, by breaking up nodules and fragmenting beds. The commercial extraction of Maerl is now less common due to EU regulations surrounding its protection. Greater concern focuses on the destructive impacts of anchoring and the use of bottom-towed gear, which can cause long-term and potentially irreversible damage to Maerl, as regrowth takes multiple decades (Tauran et al., 2020; Hall-Spencer, Kelly, & Maggs, 2008). Estimates suggest that fishing with bottom towed gear may take place within 629,000 km² of North Atlantic Maerl beds, highlighting the scale of the potential impacts on these fragile ecosystems (Fragkopoulou et al., 2021).

In addition to physical disturbance, concerns have arisen over the impacts of poor water quality on Maerl beds, particularly from terrestrial runoff and wastewater discharge. These inputs raise levels of suspended sediment in the surrounding water column, and may contain nutrients such as nitrogen and phosphorus which encourage the growth of epiphytic macroalgae. The epiphytic algae compete with Maerl for light, smothering it and reducing its photosynthetic capacity, which can lead to anoxic conditions resulting from eutrophication (Wilson et al., 2004; Grall and Hall-Spencer, 2003: 2025). The secondary impacts of poor water quality can alter Maerl habitat composition by supporting the proliferation of invasive species which are less sensitive to environmental change. In the Bay of Brest, France, agricultural runoff contributed to the spread of invasive macroalgae and molluscs such as *Crepidula fornicata*. This species formed dense carpets on a once biodiverse Maerl bed, outcompeting the commercially valuable great scallop (*Pecten maximus*), and threatening bivalve fisheries in the region (Ragueneau et al., 2018).



Algal growth on a Cornish Maerl bed. Photo credit: Matt Slater.

Climate change poses an additional and increasingly significant threat to Maerl habitats, intensifying the impacts of physical disturbance and poor water quality, and potentially altering the conditions required for Maerl calcification and growth through higher temperatures and increased acidification (Melbourne et al., 2023). Research suggests that the impacts of temperature and acidification on maerl growth and calcification are species-specific and partially mediated by nutrient availability. *P. calcareum* and *L. corallioides*, two species found in UK waters, may be moderately resilient to such changes (Qui-Minet et al., 2019). Conversely, evidence shows that the cellular structure and chemical composition of maerl varies with species, time, and location. Over the last 130 years, Maerl beds in southerly UK waters have demonstrated weaker structural growth as ocean temperatures have increased, suggesting the possibility of degraded southern beds and a potential range expansion of southern species into northern waters (Melbourne et al., 2023).

Conservation status and management

In recognition of its high ecological value, declining abundance, and the increasing environmental pressures it faces, Maerl has been identified as a habitat requiring protection on an international scale. It is classified as “vulnerable” on the European Red List of Habitats and described as “threatened and/ or declining” by the OSPAR commission (EU, 2016; OSPAR, 2008). To support Maerl’s conservation two key species *Lithothamnion corallioides* and *Phymatolithon calcareum*, are listed under Annex I and V of the EU’s habitat directive. These listings place legal obligations on member states to implement effective conservation measures. *L. corallioides*, listed under Annex I, requires designation within Special Areas of Conservation (SACs) to ensure it is maintained or restored to favourable condition. Meanwhile, *P. calcareum*, listed under Annex V, must be protected from unsustainable exploitation in the wild, with management strategies in place to prevent further decline (Hall-Spencer, Kelly, & Maggs, 2010).

Regionally, in Cornwall, Maerl is protected within the Fal and Helford Special Area of Conservation (SAC), designated under the UK Conservation of Habitats and Species Regulations 2017 (as amended), forming part of the “subtidal sandbanks” feature. Conservation objectives include maintaining the baseline extent and distribution of Maerl beds and supporting the associated ecological community (Natural England 2012). These conservation objectives are partially met through Cornwall Inshore Fisheries and Conservation Authority (CIFCA) bylaws, which prohibit the use of bottom-towed fishing gear, including scallop dredges and demersal trawls, within the entirety of the SAC (CIFCA, 2003; 2008). Recently discovered Maerl beds within St Austell Bay and other bays on Cornwall’s south coast, are protected as a supporting habitat within St Austell Bay Special Protected Area (SPA), designated to protect key bird species in the area. Evidence suggests that the Maerl beds, alongside a mosaic of other benthic habitats play a key role in sustaining populations of the protected bird species’ prey (Appendix II poster - “The Maerl Connection”).

Part 1

Maerl Forum Output Report

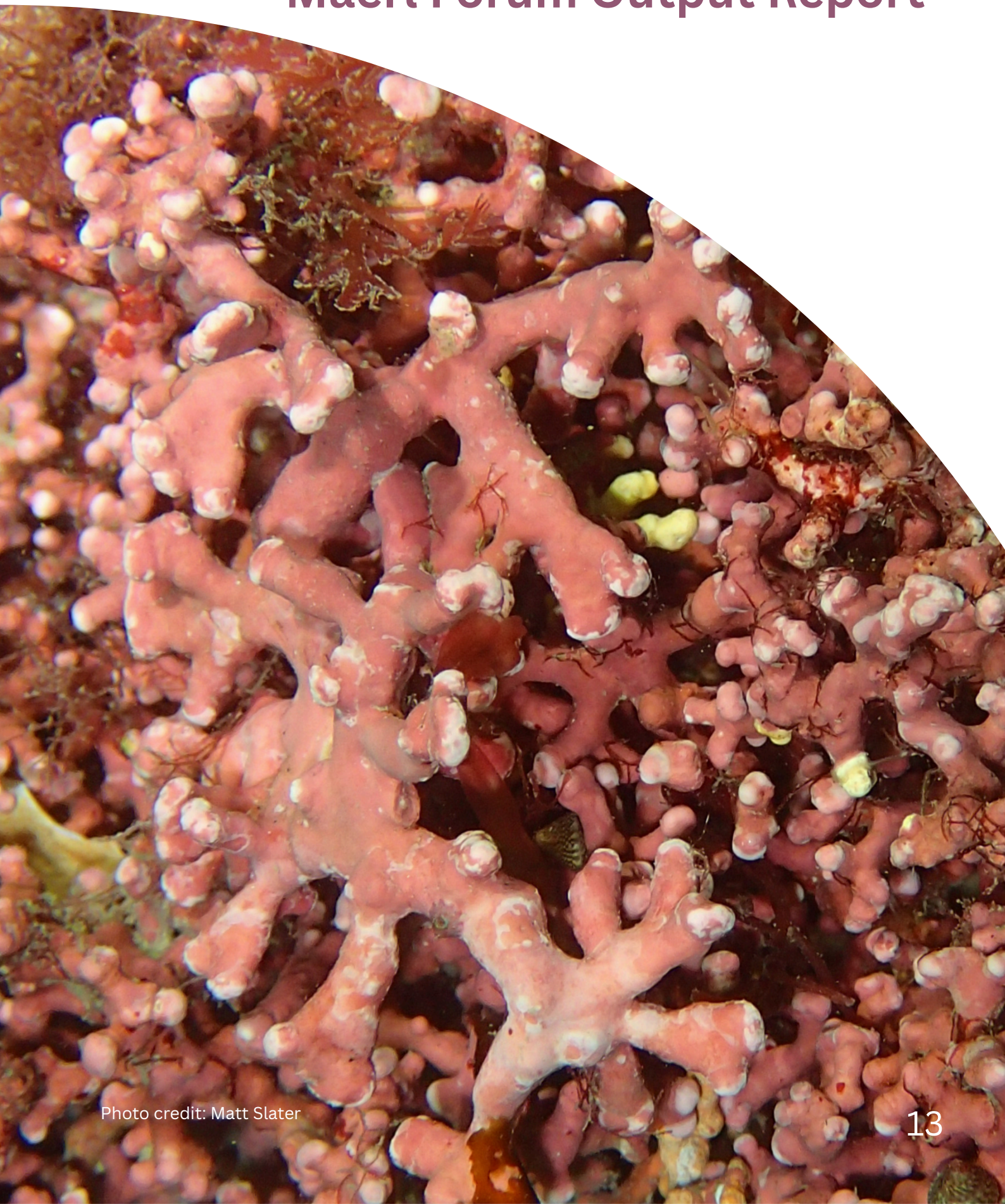


Photo credit: Matt Slater

Introduction from the Maerl Forum Steering Group

The Maerl Forum was convened in Cornwall in April 2025 to bring together researchers, conservation practitioners, policymakers, and community stakeholders around one of the UK's most ecologically valuable but underappreciated marine habitats, Maerl.

Maerl beds are remarkable. A single living Maerl thallus may be over a century old, and the Maerl beds in the Fal Estuary are estimated to be as much as 4,000 years in the making. These habitats are fragile, slow-growing, and globally declining. Yet in Cornwall, we have some of the most extensive and well-developed Maerl beds in England, stretching from the Manacles Reefs to St Austell Bay.

Maerl beds in the Fal and Helford estuaries are well studied, and were designated 20 years ago. But, with recent investment by Natural England and other partners in mapping and condition surveys, and through strong partnerships with local authorities, universities, NGOs, and citizen scientists, we now have a much better understanding of the extent, structure, and condition of these habitats across much of Cornwall's south coast. This growing evidence base created the momentum for us to bring people together for the first dedicated Maerl Forum.

Cornwall was the natural location for this event; it is not only home to England's most important Maerl habitats but is also leading the way in marine nature recovery. Two landmark initiatives have recently been developed by Cornwall Council:

- The **Cornwall and Isles of Scilly Nature Recovery Strategy**, a statutory strategy which sets out nature recovery priorities down to the mean low water mark
- And the **Cornwall and Isles of Scilly Marine Nature Recovery Framework**, a highly collaborative voluntary strategy for restoring marine ecosystems beyond low water, which includes a dedicated chapter on Maerl, identifying it as a shared local priority for conservation.

Our first face to face event was generously hosted by the University of Exeter and funded by Natural England (via the Marine Natural Capital and Ecosystem Assessment Programme) and Cornwall Council (through its Local Investment in Nature and SAC Management Programmes).

We brought together participants from across the UK and the wider region. Speakers shared the latest science on Maerl mapping and monitoring, policy and legal tools for protection, and creative approaches to raising public awareness. We were especially struck by stories of collaboration, how people are working with local stakeholders, respecting cultural values, and using creative approaches to communicate why Maerl matters. We explored the policy and legal frameworks available to support Maerl recovery, and learned about new science and technologies for mapping and monitoring, tools that are essential for tracking the health of these unique habitats.

Case studies from Cornwall, Wales, Ireland, Brittany, and Jersey highlighted both the risks to Maerl from damaging activities, and the progress being made through community-led and collaborative conservation.

One of our main aims was to stimulate collaboration. The workshops were a highlight of the day, generating a wide range of ideas and priorities that have been used, along with post-event feedback, to create the action plan within this report. This 5-year plan sets out our collective ambitions for future action to protect and recover Maerl in Cornwall, and aligns with the Maerl chapter of the Cornwall and Isles of Scilly Marine Nature Recovery Framework. We look forward to working with you all to deliver it.



Maerl diving survey. Photo credit: Angie Gall.

Maerl Forum 2025

25th April, Penryn, UK

The Maerl Forum 2025 provided an opportunity to hear from leading Maerl scientists, marine managers and stakeholders, to discuss and learn about Maerl, its ecology, value, threats and conservation management.

Venue

The University of Exeter, Tremough Campus, Penryn, Cornwall.



Maerl Forum 2025 attendees. Photo credit: Lewis Jefferies.

Session 1 - The Value of Maerl

Overview, Why Maerl?

Jason M. Hall-Spencer – Professor of Marine Biology at the Universities of Plymouth (UK) and Tsukuba (Japan).



Profile

Jason is Professor of Marine Biology at the Universities of Plymouth (UK) and Tsukuba (Japan). He did his PhD on the biology of coralline algae and moved a Royal Society University Research Fellowship from Glasgow to Plymouth in 2003 where he is now one of the most highly cited professors at the University of Plymouth. He has published extensively on Maerl bed habitats around Europe and Japan investigating a range of human impacts such as the effects of rising CO₂, scallop dredging and fish farming, most recently this year with Jacques Grall his partner in Maerl crime for 30 years.

Abstract

Maerl beds have ecological importance on a global scale, provide a wealth of ecosystem functions and services including biodiversity provision, but remain disproportionately understudied, compared to other coastal habitats (e.g. tropical coral reefs, kelp forests, mangroves, seagrasses). Although Maerl beds have gained some recognition as important and sensitive habitats at national/regional levels over the last decade, there is still a notable lack of knowledge about the value of these habitats, as a large proportion of their fauna is burrowing and hidden, hindering the development of effective conservation measures. The surfaces of UK Maerl beds provide nursery areas for cod, provide breeding grounds for scallop and crab stocks and are important for herring spawning.

A lack of Maerl bed protection in England is becoming a pressing issue, considering the severe pressures and threats these habitats are exposed to. Research shows that the two main Maerl-forming species in England (*Phymatolithon calcareum* and *Lithothamnion corallioides*) are not threatened by ocean acidification and warming at this latitude. Increased storminess is a potential concern, but nowhere near as large a concern as the highly damaging effects of 1) bottom contact fishing gear (e.g. scallop dredges, hydraulic dredges, and trawls), and 2) pollution (from sewage, aquaculture, and nutrient run-off from farm use of fertilisers). There is strong scientific evidence that both bottom-towed fishing gear and pollution cause severe damage to these, the oldest and slowest-growing biogenic habitats in UK coastal waters.

By synthesizing current knowledge, we will be able to provide arguments to highlight the importance and urgency of levelling-up Maerl bed conservation efforts as an important part of coastal ecosystems. The talk will finish with some uplifting news about the Blue Hope Alliance, a volunteer organisation carrying out citizen science monitoring and outreach to ensure that the status of Maerl improves in the Wester Ross marine protected area, the world's largest MPA for Maerl.

Supplementary Information

Publications

Hall-Spencer, J.M., Grall, J., Moore, P.G. and Atkinson, R.J.A., (2003). Bivalve fishing and Maerl-bed conservation in France and the UK—retrospect and prospect. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 13(S1), pp.S33-S41.

Hall-Spencer, J., White, N., Gillespie, E., Gillham, K. & Foggo, A. (2006) Impact of fish farms on Maerl beds in strongly tidal areas. *Marine Ecology Progress Series*, 326, pp.1–9.

Hall-Spencer, J.M., Kelly, J. and Maggs, C.A., (2008). Assessment of Maerl beds in the OSPAR area and the development of a monitoring program. Department of the Environment HaLGD, Ireland (ed), 34.

Hall-Spencer, J., Kelly, J. & Maggs, C. (2010) Background document for Maerl. Available at: <https://pearl.plymouth.ac.uk/bms-research/809>

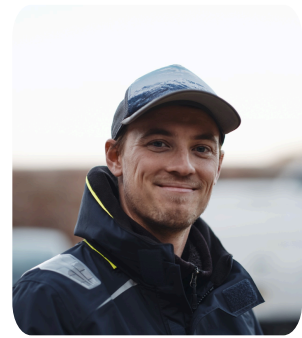
Hall-Spencer, J.M. and Rasmusson, L.M., (2024). The importance of public engagement for Maerl conservation: Insights from Scotland. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 34(5), p.e4162.



**UNIVERSITY OF
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A Valuation of Jerseys Marine Habitats in Providing Ecosystem Services

Freddie Watson – Channel Island Project Manager at Blue Marine Foundation.



Profile

Freddie has been working on Blue Marine's project in Jersey for the last four years. Having grown up on the Island, Freddie has a particular interest to see its waters under protection. The last four years of his work has mainly focussed on a campaign for large scale MPAs, which has involved research, advocacy, and education.

Abstract

With an area 20 times that of the island itself, Jersey's marine environment is a vital resource. Incredibly diverse, with over 3,000 known animal and plant species, its range of habitats provide essential services to the Island including food, climate regulation, nutrient cycling, coastline protection, recreation, and wellbeing.

In 2022, the Government of Jersey committed to developing Jersey's first Marine Spatial Plan (MSP) with the aim of balancing the different uses of the marine environment. At the time of development, the MSP included a commitment to extend Jersey's Marine Protected Area (MPA) to 27% of territorial waters. However, the economic value of safeguarding habitats was yet to be quantified. To strengthen proposals for MPAs, Blue Marine Foundation worked with New Economics Foundation (NEF) to establish the ecosystem services (ES) provided by an MPA covering 27% to the Island.

Before displacement of fishing activity, the gross ecosystem services benefits in the proposed protected area are estimated at £17.5 million within the first five years, £54.0 million over a 10-year period and £132.0 million over twenty years. When factoring the lost fishing value from these time periods, the cumulative net benefit of the marine park proposal over five, ten and twenty years is estimated as ~£1.6 million, ~£9.6 million and ~£27.8 million, respectively.

This study provided key economic data, contributing to an already strong MPA evidence base. One of the key habitats included in this analysis is Maerl. However, after consultation on the 27% MPA network, much of this habitat was removed.

This talk will dive deeper into the economic value of protecting this specific habitat and the techniques used by Blue Marine when undertaking public and political advocacy for its reintroduction back into the proposed MPA network.

Supplementary Information

Website:

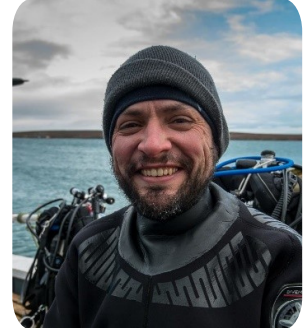
<https://www.blumarinefoundation.com/projects/jersey/>



Session 2 - Monitoring Maerl

A Unique Mosaic of Marine Life: Reciprocal Facilitation Between Maerl and Native Oyster Beds, Drive Habitat Complexity and Biodiversity

Jose M. Fariñas-Franco – Lecturer at Atlantic Technological University Galway City, and Head of The Biogenic Habitats Lab at The Marine and Freshwater Research Centre.



Profile

Dr Jose Fariñas-Franco is a Lecturer in Aquatic Biology at ATU Galway, Ireland, and head of the biogenic habitats lab in the Marine and Freshwater Research Centre. A marine ecologist and avid scientific diver, Jose's research primarily focuses on the functioning of shellfish reefs, seagrass beds, Maerl and other biogenic habitats, their conservation value as biodiversity hotspots and their ecological restoration.

Abstract

Kilkieran and Bertraghboy bays are two sheltered bays in the Connemara region, in the west coast of Ireland, an area with high cultural and natural conservation importance. The geomorphological complexity of these shallow bays, with many islands and peninsulas, channels and sounds with high tidal flows, results in a rich mosaic of habitats of high conservation value, including seagrass, native oyster, and Maerl beds. The Maerl beds in Kilkieran Bay, known locally as 'coral,' are extensive and varied in the number of species and structure, making it one of the few known localities where, in addition to *Phymatolithon calcareum* and *Lithothamnion corallioides*, the most recorded Maerl species, *Lithophyllum dentatum* and *Lithothamnion fasciculatum* co-occur.

Habitat mapping surveys conducted in both bays as part of the Oisre Conamara project, have revealed the presence of a rich epibiotic assemblage associated with native oysters (*Ostrea edulis*) as the habitat forming species, criteria consistent with the definition of the OSPAR 'Ostrea edulis beds' biotope. The presence of red filamentous and foliose seaweeds is a common feature of this rich and unique biotope, as is the widespread presence of encrusting Maerl species *Lithophyllum incrustans* and the reef building tubeworm *Serpula vermicularis* attached to live and dead oysters, creating a three-dimensional matrix typical of biogenic reefs, that provide refuge for juveniles of many Invertebrates and fish.

The conspicuous presence of extensive Maerl beds, created by both *P. calcareum* and *L. coralloides* associated with the native oyster clumps is noticeable in most areas where fishing hasn't occurred in recent years. The combination of Maerl and native oysters, along with seagrass in some areas, as the keystone, habitat forming species, support a strikingly rich and colourful epifaunal assemblage where the variegated scallop (*Mimachlamys varia*) and queen scallop (*Aequipecten opercularis*) –cloisin in Irish- also thrive. The diverse array of sponges *Cliona celata*, *Suberites ficus* and *S. carnosus*, *Amphilectus fucorum*, and *Mycale macilenta* (in association with queen scallops), coexist with solitary and colonial tunicates (e.g. *Botryllus schlosseri*), nudibranchs *Archidoris pseudoargus*, and holothurians *Neopentadactyla mixta*. There is a wide array of rare anemone species found, and many species of fish including; gobies, flatfish, nursehounds, lesser spotted catsharks and skates, which use these Maerl and native oyster habitats as nursing grounds.

While some stakeholders worry Maerl may be detrimental to the native oyster beds, co-occurrence of both habitats suggests co-facilitation, from sediment stabilisation and enhanced recruitment and survival to water quality, and cumulative effects on biodiversity. The range of Maerl deposits, including banks of dead Maerl debris, live Maerl and mixtures of Maerl, gravel and mud, supports biodiversity and the establishment of self-sustaining oyster beds. These positive feedback loops between habitat forming species, should be considered in a seascape strategy for MPA management, to best inform ecosystem-based approaches to resource management in coexistence with local fisheries. This presentation will provide photographic and video evidence of these 'hidden ecosystems' formed by Maerl and native oysters gathered during the Oisre Conamara project to highlight the urgent need for a paradigm shift in the management of biogenic habitats.

Supplementary Information

Native Oyster Restoration Alliance

<https://nora.europa.eu/ireland-oisre-conamara-oyster-information-and-scientific-restoration-of-ecosystems-of-conamara/>

Marine and Freshwater Research Centre

<https://mfrc-atu.ie/meet-the-team/dr-jose-maria-farinas-franco/>

Publication

https://www.researchgate.net/profile/Jose-Farinas-Franco?ev=hdr_xprf



Ollscoil
Teicneolaíochta
an Atlantaigh

Atlantic
Technological
University

Maerl as a Blue Carbon Habitat?

Chris Laing – Researcher and Senior Lecturer in Marine Biology at The University of Exeter, Cornwall Campus.



Profile

Chris is a lecturer and researcher at the University of Exeter on the Cornwall campus, with a background in biogeochemistry who has worked on a series of projects with Cornwall Council to estimate the carbon budgets of coastal marine habitats in the Fal and Helford SAC, including Maerl. Along with local organisations, he is advocating their protection and restoration to support the range of ecosystem services they offer.

Abstract

In recent years, interest in coastal marine habitats as carbon stocks has grown substantially. This has been catalysed by the recognition that nature-based solutions will play an important role in meeting global emissions targets and the commitments made by businesses at COP26 to investment in Environmental, Social and Governance (ESG) factors. Scientific investigation is at the forefront of this endeavour to provide data for a framework to facilitate this investment but there remains considerable uncertainty around the specifics of carbon cycling within and between these habitats. Coralline algae such as Maerl are noted for having particularly high productivity globally containing both organic and inorganic carbon in their structure but are not currently considered as a blue carbon habitat.

We investigated the extents and carbon content of *Phymatolithon calcareum* and *Lithothamnion corallioides* Maerl beds in the Fal and Helford SAC in 2022 that are nationally significant sites and report on these values here. We estimated extents with varying amounts of living Maerl of around 1000 hectares and found that organic carbon-rich sediment was trapped beneath a relatively thin layer of living Maerl at sites around St Mawes. Carbon estimation values of the sediment were almost double that of seagrass sediment collected locally and, combined with productivity estimates, this suggests Maerl habitats should be considered as valuable blue carbon habitats. Local threats to the continued functioning of these important habitats are discussed.

Supplementary Information

Publication

<https://letstalk.cornwall.gov.uk/bluecarbon>



University
of Exeter

Mapping and Monitoring Maerl Using Georeferenced 3D Photogrammetry – “Providing Underwater Clarity”

Jonathan Sayer-Mitchell – Commercial Director at Tritonia Scientific



Profile

Jonathan Sayer-Mitchell is the Commercial Director at Tritonia Scientific Ltd. Since joining Tritonia in 2019, he has played a key role in expanding the use of georeferenced 3D photogrammetry as a powerful tool for underwater mapping and monitoring. Now leading the company’s commercial strategy, he works with clients across more than ten sectors—including aquaculture, offshore energy, conservation, and marine infrastructure—to drive innovation, improve decision-making, and support sustainable marine management.

Abstract

Maerl beds are ecologically valuable yet fragile marine habitats that play a crucial role in biodiversity support, carbon sequestration, and fisheries sustainability. However, these habitats face increasing pressures from climate change, human activity, and coastal development. Effective monitoring requires high-resolution, non-destructive, and repeatable surveying methods to assess changes over time. Tritonia Scientific Ltd. is at the forefront of using georeferenced 3D photogrammetry (G3DP) to map and monitor Maerl with exceptional accuracy, providing a powerful tool for conservation, marine management, and public engagement.

Initially, Tritonia relied on diver-based photogrammetry but has since transitioned to ROV-based surveying, incorporating semi-autonomous navigation to significantly increase data collection efficiency. This innovation has allowed Tritonia to map up to 3,600m² per day in fully georeferenced 3 dimensions, making it one of the most scalable and precise techniques available. At fine scales, G3DP enables the analysis of digital terrain models, elevation mapping, and rugosity, offering detailed insights into Maerl bed structure and complexity. On a larger scale, it provides accurate assessments of Maerl coverage and spatial distribution, critical for long-term monitoring and marine spatial planning.

Tritonia’s research, supported by funding from the Sustainable Aquaculture Innovation Centre (SAIC), has explored diver-based versus ROV-based data collection, assessing their strengths and limitations.

Separately, funding from the Seafood Innovation Fund (SIF) has been instrumental in developing semi-autonomous flight patterns to increase the efficiency and repeatability of ROV-based surveys. These advancements ensure that G3DP delivers high-resolution, transparent, and scientifically robust data for stakeholders across conservation, offshore energy, aquaculture, and marine policy sectors.

We believe that G3DP is the future of accurate and transparent Maerl mapping and monitoring, providing a data-driven approach for rapid decision-making. This technology enhances not only environmental assessments but also public engagement, with interactive 3D visualisations that effectively "make the water disappear," bringing underwater ecosystems to life in a way that was previously impossible.

At Tritonia Scientific, our mission is simple: Providing Underwater Clarity—delivering the tools and insights needed to safeguard our marine environments for the future.

Supplementary Information

Publication

www.doi.org/10.1002/aqc.70007

Visualisation platform

www.hydrophis.co.uk

Website

www.tritonia.scot

Maerl Surveys and Mapping Falmouth Bay to St Austell Bay SPA

Alison Benson – Principal Consultant at Envision Marine LTD.



Profile

Alison Benson has previously worked in protected area management support, public outreach development, and socioeconomic monitoring network coordination for conservation organisations. Since starting work with Envision Marine Ltd. in 2006, Alison has provided project management and support on a wide variety of projects, from marine survey and habitat mapping work to GIS and modelling projects. Alison has undertaken benthic and intertidal surveys around the UK and overseas and has a particular interest in the analysis of underwater imagery for assessment of benthic habitats and to support marine management objectives. Alison has contributed to OSPAR and national guidelines and is an active member of the Big Picture Group, providing inputs on survey and analysis techniques.

Abstract

Envision Marine Ltd (ENVISION) has mapped Maerl habitats including areas of the Fal since the early 90s, and around various locations in Scotland. Recently, ENVISION was commissioned by Natural England, in collaboration with the Cornwall Wildlife Trust and with funding from mNCEA programme, to undertake two studies within the Falmouth Bay to St Austell Bay Special Protection Area (FBSAB SPA). This research aimed to assess the distribution and condition of subtidal Maerl communities, as a potential supporting habitat for the birds designated as features of the SPA.

Sidescan sonar and underwater imagery surveys were carried out by the Cornwall Inshore Fisheries and Conservation Authority (CIFCA) and ENVISION. ENVISION analysed the video and still imagery to quantify live and dead Maerl cover, classify habitats, and assess conservation features.

Habitats encountered during analysis included sandy habitats, seagrass beds, Annex I reef comprising kelp and macroalgal communities on rock, coarse and mixed substrate, and multiple occurrences of Maerl, which appeared in a diverse range of conditions with varying densities of live and dead Maerl.

The study applied the Maerl classification system to describe these habitats, however not all records of Maerl could be categorised satisfactorily using this system.

Data interpretation processes which combine geophysical data with the biological sample information to produce predictive maps of benthic habitat distribution and the implications of this technique for monitoring are explored. The benthic habitat distribution maps produced by the study are presented, along with discussion of recommendations for refining the Maerl classification system, assessment of Maerl biotopes, and future habitat mapping. Findings contributed to the conservation and management of marine habitats within the FBSAB SPA.

Supplementary Information

Publications

[NECR589 Falmouth Bay to St Austell Bay SPA Drop Down Video and Acoustic Survey Maerl Mapping - St Austell Bay 2023, PDF, 7.7 MB](#)

[NERR123 Edition 1 A categorisation system for Maerl bed habitats in England, PDF, 1.2 MB](#)

[Fal and Helford Special Area of Conservation Drop Down Video Maerl Habitat Survey 2022 - Survey report](#)

[Fal and Helford Special Area of Conservation Drop Down Video Maerl Habitat Survey 2022 - Field report](#)

Session 3 - Awareness and Community Action

Engaging Communities and Citizen Science

Matt Slater – Marine Conservation Officer at Cornwall Wildlife Trust



Profile

Matt Slater is a Marine Conservation Officer at Cornwall Wildlife Trust. He has spent many hours underwater exploring Cornwall's marine habitats, including our amazing Maerl beds, and is the Cornwall coordinator for Seasearch. He has a great deal of experience working with community groups and volunteers and as well as leading Seasearch in Cornwall he also delivers the Shoresearch project, and leads on Cornwall Good Seafood Guide and Cornwall Wildlife Trusts Seagrass restoration work.

Abstract

People won't protect what they don't know about! Over the past 12 years the Cornwall Wildlife Trust Marine team have been working hard to encourage people to better appreciate the incredible world beneath the surface of Cornwall's seas. The Your Shore Network of local marine conservation groups was established and supported by Cornwall Wildlife Trust Your Shore project and now includes 18 groups all run by highly motivated local volunteers who passionately care about the marine environment. Volunteers are motivated to make a difference and many of them also take part in marine citizen science projects such as Shoresearch, Seasearch, Seaquest and the Marine Strandings network.

The National Seasearch project; a collaborative citizen science project administered by The Marine Conservation Society, has done a brilliant job at increasing our understanding of rare marine habitats such as Maerl. The data collected, as well as images and videos collected by trained volunteers are vital in raising awareness and highlighting challenges faced by our marine habitats. Seasearch has also played a central role in exploration of our coastal seas including the discovery of Maerl in the Helford Estuary and St Austell Bay. Recent drop-down surveys of Maerl beds carried out in Fal bay and St Austell Bay have been ground-truthed by Seasearch divers who are often able to get far better appreciation and understanding of the topography and biodiversity of an area than you would using drop down cameras or side scan surveys.

The awareness of the public in Cornwall is improving but there are still many who haven't heard of a Maerl bed and who don't understand the benefits of protecting our Maerl making it vitally important that this work is continued and expanded. Snorkelling is rising in popularity and in recent years Seasearch Cornwall has reached a point where 50% of their records are coming from snorkellers and freedivers – In future years we hope to continue to expand our work and to get far more people to see Maerl beds first hand!

Supplementary Information

Websites

<https://www.cornwallwildlifetrust.org.uk/>

[Cornwall Good Seafood Guide](#)

[Tor to Shore | Cornwall Wildlife Trust](#)

Articles

[Cornwall's Coral Beds Facing Threat from Pollution | Cornwall Wildlife Trust](#)



Cornwall
Wildlife Trust

Maerl – A Creative Engagement Project to Raise Awareness of Threatened Maerl Habitats

Julia Barton – Visual Artist and Activist

Profile



Julia Barton is a visual artist and activist living on the north west coast of Scotland, passionate about coastal ecology and sustainability, inspired by seaweed and fascinated by Maerl. She designed, curated, and managed Scotland's First Seaweed Festival on Isle Martin in 2021, engaging over 250 people in seaweed community awareness events, using an art science mix. Julia is convinced that art can make a difference.

Abstract

Artist Julia Barton is passionate about seaweed and marine sustainability. She shares her connection with the little-known coralline algae Maerl, and her fascination with how this hard twiglet-like seaweed forms essential complex seafloor habitats 'Maerl beds.' Her sadness and anger at the numerous threats to the Maerl beds close to her studio in Scotland, led her to test out how interactive creative visual storytelling can engage audiences in the issue.

To test this hypothesis, Julia Barton undertook art science research & development in 2024 in conversation with Professor of Marine Biology Jason Hall-Spencer, with an award from the National Lottery through Creative Scotland. A performance story was devised exploring the life of a Maerl bed, combining a colourful sculptural set, underwater video, and sound recordings with three live performers who embodied the Maerl bed inhabitants - crab, octopus, and sea-cucumber. At a test performance in Glasgow, the performers entertained the audience and encouraged interaction with the Maerl bed set.

Feedback documented from the audience/participants to the performance was very positive: "It was a great fun introduction to Maerl, finding out about how it provides protection to such a variety of marine life and how it's under threat from the impacts of seabed dredging."

This affirmative response to the immersive performance test suggests that entertaining creative experiences make a tangible difference to the public awareness of Maerl beds, and inspires an interest and understanding of sustainability issues in our marine environment. In working to protect our Maerl beds: 'I am searching for science and arts collaborators to partner me in creating a series of creative events and to find funding. Please do get in touch.' JB

Supplementary Information

Publications

<https://littoralartproject.com/>

<https://littoralartproject.com/guide-to-beach-litter/>

Session 4 - Threats, Policy, and Management

Factors Affecting a Maerl Bed in Milford Haven 2005 – 2023

Tom Mercer – Marine Ecologist and Director at Aquatic Survey and Monitoring LTD.



Profile

A Jack-of-all-trades Marine Ecologist, initially having worked for the FSC, NCC, OPRU, NRA, IRTU and then for the last 30 years, Tom has run Aquatic Environments & worked in the co-operative ASML with Francis Bunker, Christine Howson and Jon Moore. Working mainly on marine nature conservation monitoring projects along with pre- and post- littoral and sublittoral impact assessments using a multitude of accepted techniques.

Abstract

Milford Haven is home to Wales' only Maerl bed. This bed is relatively small and also vulnerable, as it lies in this busy industrial port, beneath the off-loading jetty to an LNG terminal. When the Jetty was renovated for the LNG terminal (2005 – 2009), Natural Resources Wales put in place a twin stranded monitoring programme of 1. An in-situ diver monitoring survey and 2. a broadscale drop-down video surveillance programme. The diving surveys were carried out in 2005, 2010, 2016, and 2023. The drop-down video surveys in 2005, 2016 and 2023.

In the 2023 diving survey, the abundance (assessed as % cover) of live Maerl at the 6 study sites had declined by almost 90% from the 2005 levels. No further decline was detected between 2016 and 2023. The abundance of live Maerl in the Milford Haven Maerl bed is low compared to other Maerl beds in the UK.

There was an increase in slipper limpet (*Crepidula fornicata*) abundance noted between 2005 and 2010, they declined between 2016 and 2023 at the diving study sites.

The epibiota community composition was distinct between all years with the exception of 2005 and 2010. The differences were driven by changes in abundance of species including *Lithothamnium corallioides*, *Crepidula fornicata*, *Ascidella aspersa* and *Spirobranchus lamarkii*. Trajectories indicate directional change in community composition.

The number of epibiota taxa recorded in situ varied between sites and years with no distinct overall pattern emerging, except that the number of taxa recorded in 2023 was higher at all sites apart from at site 410. It is postulated that the increase in recorded taxa (chiefly epifauna) is due to an increase in dead shell material caused by the decline in *C. fornicata* since 2016.

Five epifloral species endemic or closely associated with Maerl declined between 2010 and 2016 but increased in abundance between 2016 and 2023.

In 2023 a drop-down video survey was performed focussing on the Milford Haven Maerl bed in the vicinity of the South Hook LNG Jetty. The method was similar to surveys carried out in 2005 and 2016. The light drop-down video system obtained footage from 656 locations and screen shot quadrats were taken and analysed. The number of stations recording live Maerl remained fairly constant at approximately 20% throughout the time window. However, the average percentage cover of the live Maerl records over the years had fallen from 5.7% to 1.3%, whilst the percentage of stations recording dead Maerl had increased by 50%.

The shells of the 'Slipper limpet' (*Crepidula fornicata*) a non-native, invasive species were found to be present at approximately 30% of stations in both 2016 and 2023, with an average cover of 3% across the survey area. Live *Crepidula fornicata* were recorded separately in 2023 for the first time and were present at 6% of sites.

Voronoi metrics have been calculated for the area of Maerl bed, with 2005 as the baseline and following the 2023 analysis they highlight a fall of 71% in the area of live Maerl and an increase of 55% in the area of live and dead Maerl combined. This latter statistic being suggested as a measure of 'suitable habitat'

Supplementary Information

Publications

Mercer, T.S. (2000). Taxonomic and community analysis of the macrobenthic community inhabiting the Maerl deposits found in the Loch Blashvael rapids, Loch Maddy, North Uist. Report to Scottish Natural Heritage. 17pp.

Howson, C.M., Mercer, T.S. & Bunker, F.S.P.D. (2003). Fal and Helford Sublittoral Monitoring. Report to English Nature.

Bunker, F.StP. D., 2011. Continued studies of the Milford Haven Maerl bed in 2010 using diving. A report to the Countryside Council for Wales by MarineSeen, Pembrokeshire

Bunker, F.StP. D., (2013). Fal and Helford SAC kelp forest condition assessment and Maerl studies in August 2012. A report to Natural England by MarineSeen, Pembrokeshire 59pp + xi.

Mercer, T.S., Kamphausen, L., Moore, J., Bunker, F., Archer Thompson, J., Howson, C. (2015). South Arran MPA Maerl and seagrass bed diver surveys 2014. Scottish Natural Heritage Commissioned Report No. 882

Mercer, T.S., Kamphausen, L., Bunker, F. and Howson, C.M. (2016). Sound of Barra macrobenthic infaunal grab survey and Eriskay Causeway sediment survey - 2015. Scottish Natural Heritage Commissioned Report (internal).

Bunker, F. St P. D., Mercer, T.S., Howson, C.M., Moore, J.M., Diaz, P. and Maggs, C.A. (2016). Site condition monitoring of Maerl beds and seagrass beds in the Sound of Barra SAC 2015 – diving survey. Scottish Natural Heritage Commissioned Report No. 924.

Moore, J. and Mercer, T. (2017). Milford Haven Maerl bed survey, Spring 2017. NRW Report Series Report No:??, 25pp, in press.

Mercer, T., Bunker, F., Moore, J., Ratcliffe, F. & Camplin M., 2025. Milford Haven Maerl bed survey, 2023. NRW Report Series Report No:??, 42pp, in press.

Further work on the South Hook Maerl bed exists in the form of reports produced for RPS consultants and lodged with Natural Resources Wales. This work took place as part of the environmental impact assessment for the construction of the South Hook LNG Jetty, between 2005 -2009 and was carried out by ASML.



Maerl Beds Biodiversity: From Observation to Conservation

Jacques Grall- Researcher at Institut Universitaire Européen de la Mer, Université de Bretagne Occidentale.



Profile

Jacques is a researcher at the European Institute of Marine Studies (Brest university- Brittany), responsible for long-term monitoring of benthic habitats, including Maerl beds. His research focuses on the biodiversity of coastal habitats, from the Bay of Biscay to the Arctic (Greenland), particularly the biodiversity, dynamics, functions, and threats to Maerl habitats and their associated species. Jacques is also involved in the conservation efforts aimed at preserving Maerl ecosystems.

Abstract

Maerl beds are among the most species-rich and functionally diverse coastal habitats in the Northeast Atlantic, surpassing all others in ecological value. Despite their importance, most ecoregions still lack sufficient data on their distribution and ecological status. Long-term observation of Maerl habitats in Brittany –often combined with experimental studies–has revealed their vital role in coastal ecosystems, from providing structural support for biodiversity to fulfilling key ecosystem functions. Such observational data shed light on the spatial and temporal dynamics of the associated biodiversity, as well as the impacts of disturbances—both direct, such as extraction, and indirect, including eutrophication and aquaculture.

Although European bans on direct Maerl extraction have led to some environmental improvements, serious threats persist, including clam dredging, eutrophication, and mussel farming. These activities continue to severely degrade these fragile habitats, as existing conservation measures are often inadequate. Since Maerl beds take millennia to form, they require stronger, more effective protection strategies that should be co-designed with local stakeholders. This synthesis underscores not only the urgent need for improved conservation, but also the wider benefits of preserving healthy Maerl beds for coastal socio-ecosystems at multiple levels.

Supplementary Information

Publications

Grall, J. & Hall-Spencer, J.M. (2003) Problems facing Maerl conservation in Brittany. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 13(S1), pp.S55–S64.

Grall, J., Le Loc'h, F., Guyonnet, B. & Riera, P. (2006) Community structure and food web based on stable isotopes ($\delta^{15}\text{N}$ and $\delta^{13}\text{C}$) analysis of a north-eastern Atlantic Maerl bed. *Journal of Experimental Marine Biology and Ecology*, 338(1), pp.1–15.

Grall, J. & Hall-Spencer, J.M. (2025) Maerl bed conservation: successes and failures. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 35(2), p.e70058.

Optimizing Maerl Protection in England

Trudy Russel – Conservation Advice Project Manager and Diving Officer at Natural England.



Profile

Trudy has worked for Natural England for over 10 years and is currently working on the marine protected areas target and as diving officer. Prior to that she was a specialist focusing on reef, Maerl and monitoring. Before that she was in the Cornwall marine team helping with advice to Defra for marine conservation zone designation. Trudy started out as a citizen scientist; she has been Sea searching in Cornwall for 18 years.

Abstract

In my talk I will take you on a brief journey through the role and work of Natural England with Maerl. Starting with providing scientific advice to Defra when they designate marine protected areas, the conservation advice we write for each site and feature designated. The advice we provide for managers including Local Authorities, the Marine Management Organisation (MMO) and Inshore Fisheries and Conservation Authorities (IFCAs) when they have decisions to make potentially affecting those sites and features. I will review the impact this has had on Maerl within protected areas in Cornwall and what the different designations mean for protecting the Maerl within them. I will explain our role in reporting progress in meeting the targets set for marine protected areas and how we undertake monitoring and condition assessments to support this work. I will look briefly at our recent work monitoring the Maerl in Cornwall as part of the marine Natural Capital and Ecosystem Assessment (mNCEA) Programme.

Then I will look at what tools we have for Maerl outside of protected sites; Maerl is a Priority UK BAP Habitat and listed as an OSPAR threatened and declining habitat. Different species of Maerl found within the beds are themselves listed as being of “principal importance for the purpose of the conservation of biodiversity” under the NERC Act (2006). Maerl has also been reviewed as part of Natural England’s recent work drafting a definition for marine irreplaceable habitats, its scores more highly than almost all other shallow water habitats including seagrass beds (Tillin et al, 2022).

Supplementary Information

Website

<https://designatedsites.naturalengland.org.uk/ConservationAdvice/SupplementaryAdvice.aspx?SiteCode=UK0013112&SiteName=fal&SiteNameDisplay=Fal+and+Helford+SAC&countyCode=&responsiblePerson=&SeaArea=&IFCAAarea=&NumMarineSeasonality=0>

The Law of Maerl Protected Areas

Tom Appleby – Head of Governance and Legal Affairs at Blue Marine Foundation and Associate Professor at The University of West England.



Profile

Tom Appleby is a lawyer at the university of the west of England specialising in marine conservation law, he was a trustee of a commercial port, helped set up Community of Arran Seabed Trust and was a trustee and is latterly employed by Blue Marine since its inception. Tom has published widely on UK and EU marine conservation law.

Abstract

This talk explores the two means of public control of Maerl habitats – ownership and regulation. The seabed in territorial waters (usually 12 nautical miles) generally forms part of the Crown Estate, the bed of some estuarine waters is privately owned, but often by public or quasi-public bodies (such as the Duchy of Cornwall). All plant and animal life attached to the seabed is owned by the seabed owner. Maerl is freestanding, but the consent of the seabed owner would normally be required for any activity (other than perhaps fishing) which disturbs the Maerl.

In terms of regulation, Maerl beds are not directly protected under the Wildlife and Countryside Act (unlike pink sea fans), so it is not a criminal offence to directly disturb them. But Maerl is protected under the Habitats Regulations and can also be afforded area protection under the Marine and Coastal Access Act. Maerl is part of the UK Biodiversity and Strategic Action Plan, meaning that marine licence decisions need to consider the impacts of any marine developments on Maerl. Both Habitats Regulations and UK Action Plan status also requires onward monitoring. This feeds into governance around Water Framework and Marine Strategy Framework. So, in theory we have the mechanisms to protect it– they just need to work.

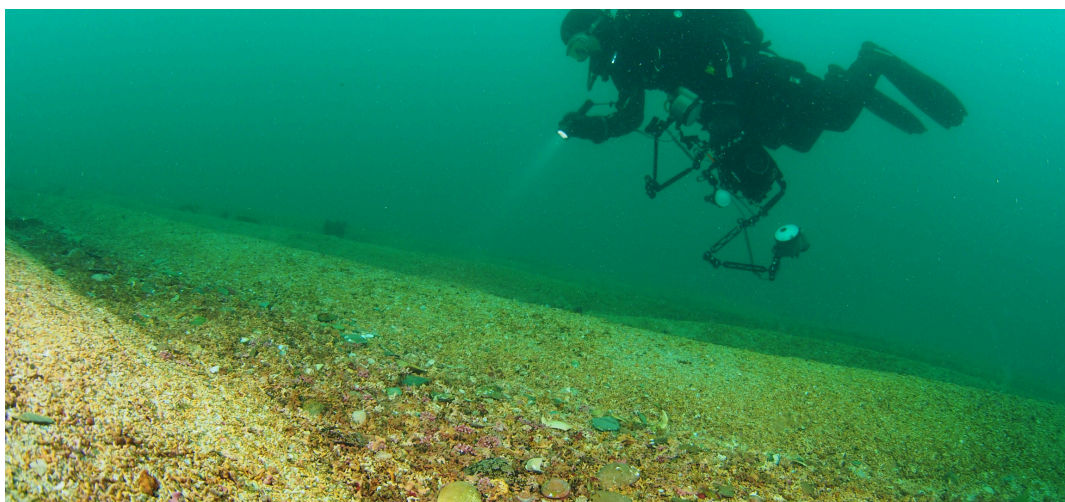
Workshop Discussion & Feedback Results

To understand the current knowledge on Maerl, and inform strategic conservation action, a workshop brainstorming four key questions was organised by the Maerl Forum Steering Group (for full results see [Appendix III](#)). Post-conference, the results from the workshop were synthesised, entered into a feedback form and sent to delegates where they were asked to select 5 top priority actions for each workshop question (for full results see [Appendix IIII](#)).

Forum Workshop Discussion Points

Question 1. What do we still not know about Maerl?

Despite growing awareness of the ecological importance of Maerl beds, significant knowledge gaps remain that hinder effective conservation and management. Scientifically, we lack a comprehensive understanding of Maerl's biological and ecological dynamics, including its distribution, mobility, seasonality, and the extent and condition of live versus dead Maerl both, locally and globally. Poorly understood are the complex interactions within Maerl-associated food webs, its role in larval settlement, and the environmental drivers that influence Maerl condition, such as sediment dynamics, nutrient levels, and oceanographic factors. The natural capital value of Maerl, including its role in carbon storage, nutrient cycling, and fisheries productivity, also requires detailed quantification. Pressures from unsustainable fishing, pollution, historic industrial and mining waste, invasive species, and climate change pose threats, yet their impacts and effective management responses remain unclear. Questions persist around the feasibility of restoration, protection within MPAs, and Maerl's potential for recovery or cultivation. Furthermore, effective policy development is constrained by uncertainties around seabed ownership, stakeholder responsibility, and the lack of clear legal protection frameworks. Lastly, public awareness of Maerl appears low, raising questions about its cultural significance, particularly in Cornwall, and the potential for broader engagement through educational tools and the media.



Waves of Maerl in St Austell bay. Photo Credit: Matt Slater

Question 2. What has worked well for Maerl so far?

Progress in Maerl conservation has been marked by key successes across research, policy, and public engagement. Advances in mapping using innovative technology, has led to greater discovery, and improved understanding of Maerl distribution. Scientific research has informed and justified conservation efforts, particularly with growing recognition of Maerl's rarity and ecological importance. The introduction of policy and byelaws to reduce pressures from fishing and anchoring, have been highly effective at protecting vulnerable habitats such as Maerl within designated Marine Protected Areas (MPAs). Evidence-based advocacy is at the forefront of this action, particularly before-and-after studies of dredging impacts, which have proved highly influential in raising awareness. Public and stakeholder engagement through creative and educational outreach, such as performance art, media stories, and community group projects, are successfully strengthening awareness. Open dialogue with marine-user groups such as fishers, has also been beneficial, building support for conservation by highlighting Maerl's role in supporting commercially valuable species such as scallops. Legally, Maerl has benefited from protection as a designated feature within marine protected areas, alongside regulations and byelaws preventing harmful practices such as bottom towed fishing and commercial extraction. Collaborative lobbying and clear conservation objectives have further strengthened policy responses, with some positive initiatives emerging from within the fishing industry and water companies, demonstrating the benefits of cross-sector cooperation.

Question 3. What do you think are the top actions for protecting Maerl moving forward?

Effective protection of Maerl beds requires a multifaceted approach that integrates scientific research, policy, public and stakeholder engagement, and sufficient funding. Key priorities should include greater surveillance and research of Maerl beds and their associated food webs, to identify examples of healthy ecosystems, establish baseline condition indicators, and better understand Maerl's tolerance to anthropogenic impacts. Addressing threats such as poor water quality, sedimentation, and destructive fishing practices, requires strengthened policy, targeted management, and catchment-to-coast pollution control strategies. Clear definitions of Maerl and high-quality documentation including imagery and videography, will support increased recognition and communication efforts. Public and stakeholder engagement needs strengthening through education campaigns that highlight Maerl's ecological and economic value, such as its role in carbon storage and fish nurseries, alongside user-friendly mapping tools to help groups avoid disturbing beds. Conservation efforts should focus on formally recognizing Maerl as an irreplaceable habitat, integrating it into MPA designations and MPA network reviews, and quantifying its value across sectors.

Policy tools, including enforcement measures against illegal damage, use of seabed leasing for protection, and the development of private stewardship, could reinforce current legal protection. Additionally, funding mechanisms should support transition in fisheries methodology and gear, incentivize low-impact methods, and sustain ongoing research and community-driven conservation initiatives.

Question 4. Taking those top actions, do you have any inspiring ideas of delivering them?

Delivering effective Maerl protection calls for creative, inclusive, and forward-thinking strategies that engage diverse audiences and drive practical outcomes. Managing key threats, such as poor water quality, pollution, and physical disturbance, requires innovative catchment-to-coast approaches, alongside strengthened policy, enforcement, and novel tools to monitor and discourage damage. Inspiring ideas for engagement include, inviting policymakers and stakeholders to collaborative forums on Maerl's value and protection, launching initiatives such as "Maerl Month" or "World Maerl Day," and harnessing storytelling, media, art, and interactive exhibitions to connect wider audiences to this unique habitat. Public involvement may be deepened through rebranding, and campaigns like "own a square of Maerl," and through citizen science projects, tourism, and community marine-groups, supported by virtual reality, films, and drop-down video tours. Universities and local conservation projects offer valuable partnerships for research, mapping, and restoration trials. Policy efforts could be amplified through actions such as writing to elected IFCA representatives, introducing fines linked to Maerl education courses, and exploring seabed leasing or private stewardship models. Formalising a Maerl conservation network, connecting it with well-known habitats like seagrass, and embracing emerging technologies will help integrate efforts and unlock new pathways for long-term protection.

**AI was used to synthesise and refine these discussion point summaries.*



Maerl bed themed engagement performance in Glasgow. Photo credit: Julia Barton.

Forum Feedback Results

Question 1. What do we still not know about Maerl?

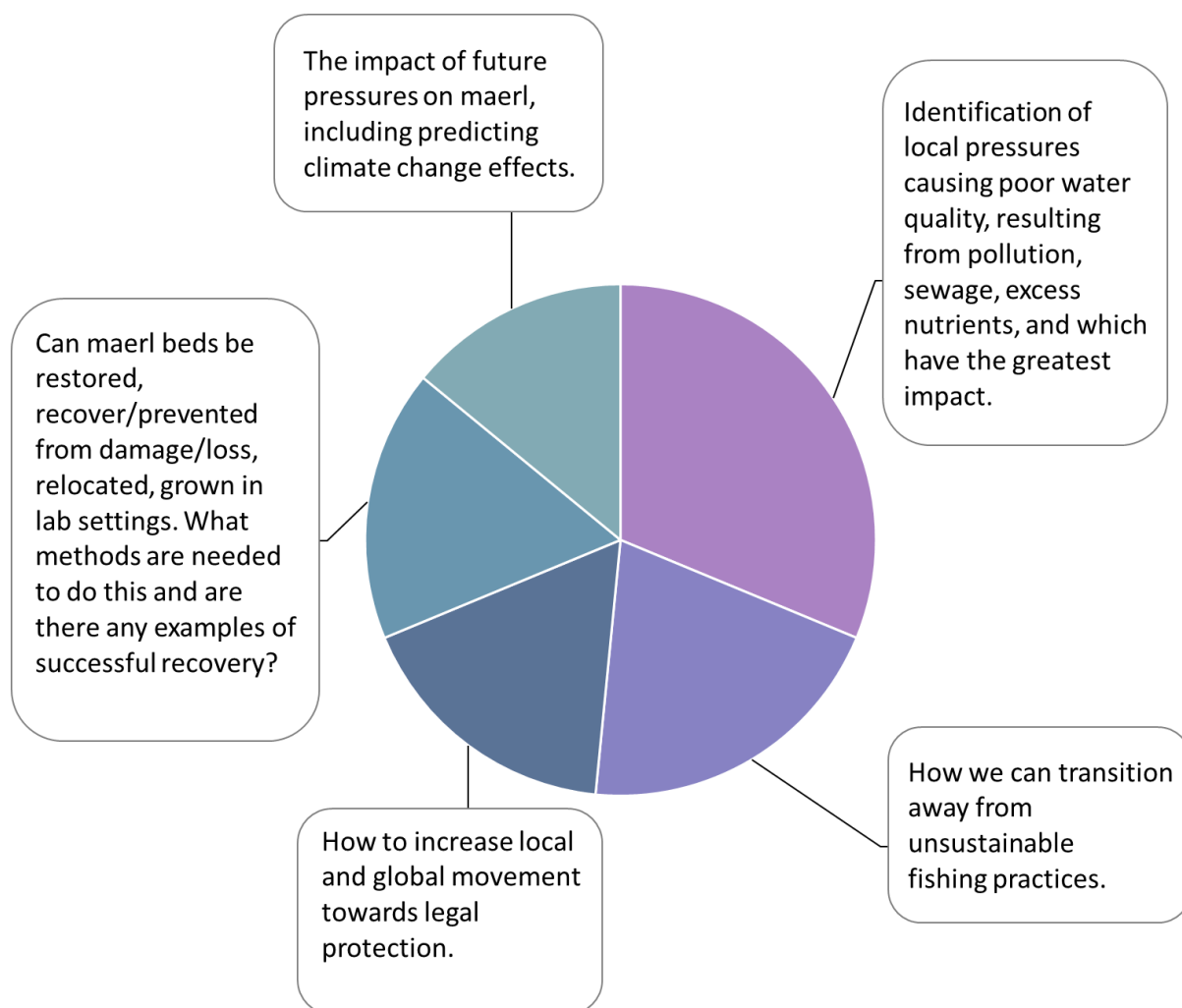


Figure 1. Top 5 most voted points answering “What do we still not know about Maerl?”. Identification of local pressures causing poor water quality, resulting from pollution, sewage, excess nutrients, and which have the greatest impact (20 votes). How we can transition away from unsustainable fishing practices (13 votes). How to increase local and global movement towards legal protection (11 votes). Can Maerl beds be restored, recover/prevented from damage/loss, relocated, grown in lab settings. What methods are needed to do this and are there any examples of successful recovery? (11 votes). The impact of future pressures on Maerl, including predicting climate change effects (9 votes).

Question 2. What has worked well for Maerl so far?

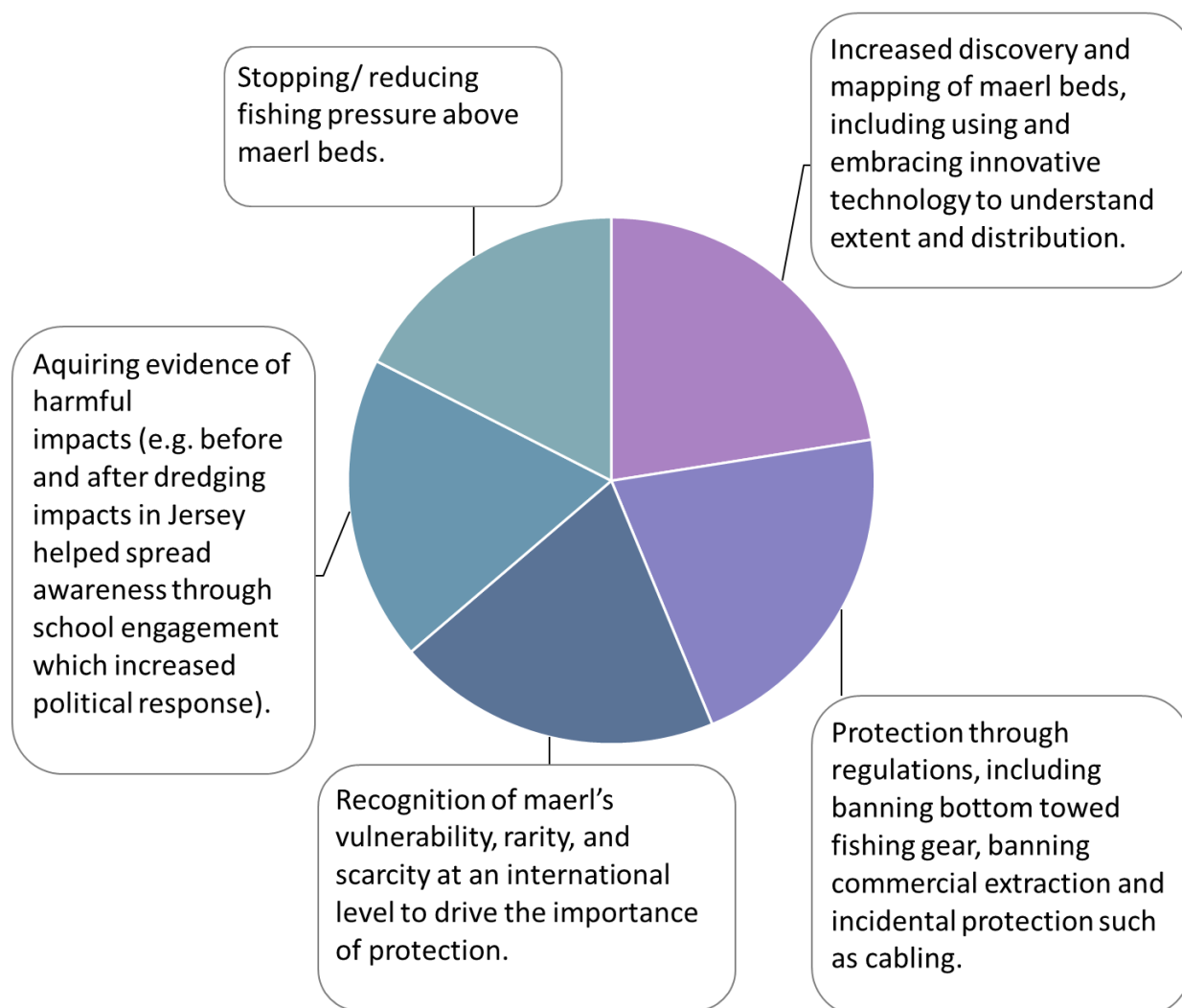


Figure 2- Top 5 most voted points answering “What has worked well for Maerl so far?”. Increased discovery and mapping of Maerl beds, including using and embracing innovative technology to understand extent and distribution (18 votes). Protection through regulations, including banning bottom towed fishing gear, banning commercial extraction and incidental protection such as cabling (17 votes). Recognition of Maerl’s vulnerability, rarity, and scarcity at an international level to drive the importance of protection (16 votes). Acquiring evidence of harmful impacts (e.g. before and after dredging impacts in Jersey helped spread awareness through school engagement which increased political response) (15 votes). Stopping/ reducing fishing pressure above Maerl beds (14 votes).

Question 3. What do you think are the top actions for protecting Maerl moving forward?

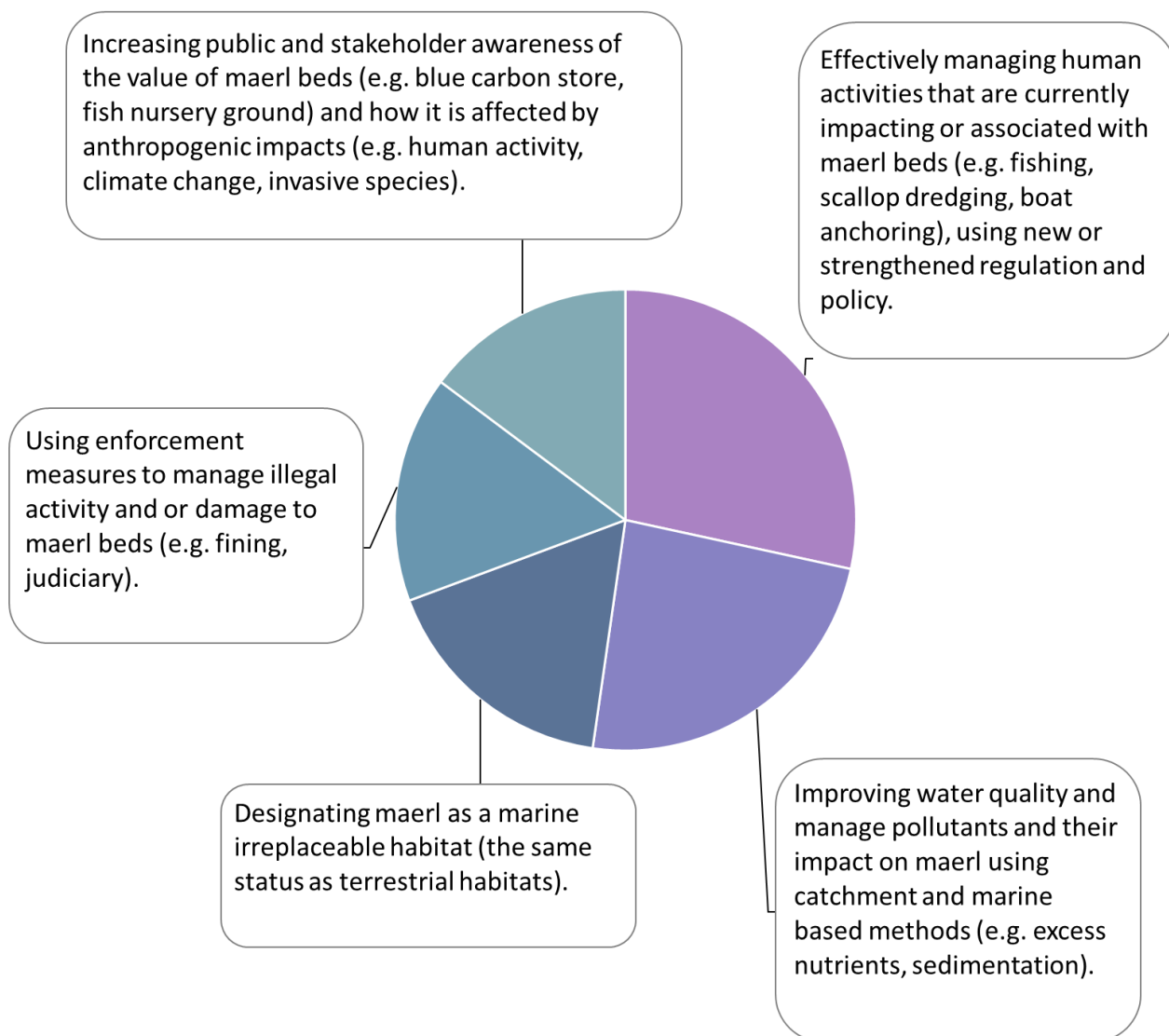


Figure 3- Top 5 most voted points answering “What do you think are the top actions for protecting Maerl moving forward?”. Effectively managing human activities that are currently impacting or associated with Maerl beds (e.g. fishing, scallop dredging, boat anchoring), using new or strengthened regulation and policy (25 votes). Improving water quality and manage pollutants and their impact on Maerl using catchment and marine based methods (e.g. excess nutrients, sedimentation) (21 votes). Designating Maerl as a marine irreplaceable habitat (the same status as terrestrial habitats) (15 votes). Using enforcement measures to manage illegal activity and or damage to Maerl beds (e.g. fining, judiciary) (14 votes). Increasing public and stakeholder awareness of the value of Maerl beds (e.g. blue carbon store, fish nursery ground) and how it is affected by anthropogenic impacts (e.g. human activity, climate change, invasive species). Using the media, educational programmes, interpretation tools, and community group activities (13 votes).

Question 4. Taking those top actions, have some inspiring ideas of delivering them?

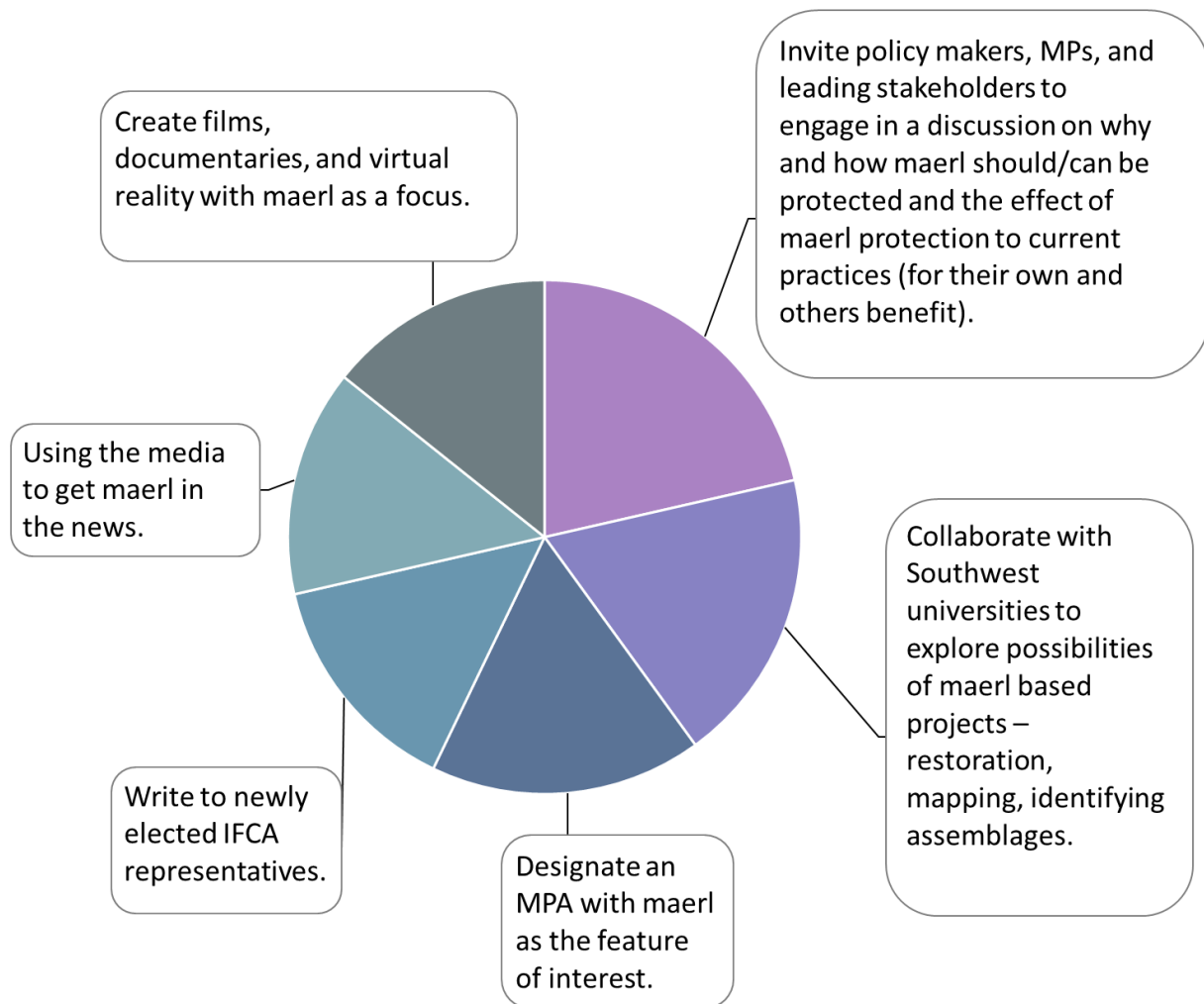


Figure 3- Top 5 most voted points answering “Taking those top actions, do you have some inspiring ideas of delivering them?”. Invite policy makers, MPs, and leading stakeholders to engage in a discussion on why and how Maerl should/can be protected and the effect of Maerl protection to current practices (for their own and others benefit) (15 votes). Collaborate with Southwest universities to explore possibilities of Maerl based projects – restoration, mapping, identifying assemblages (13 votes) . Designate an MPA with Maerl as the feature of interest (12 votes). Write to newly elected IFCA representatives (10 votes). Using the media to get Maerl in the news (10 votes) . Create films, documentaries, and virtual reality with Maerl as a focus (10 votes).

Part 2

Cornwall Maerl Conservation Action Plan

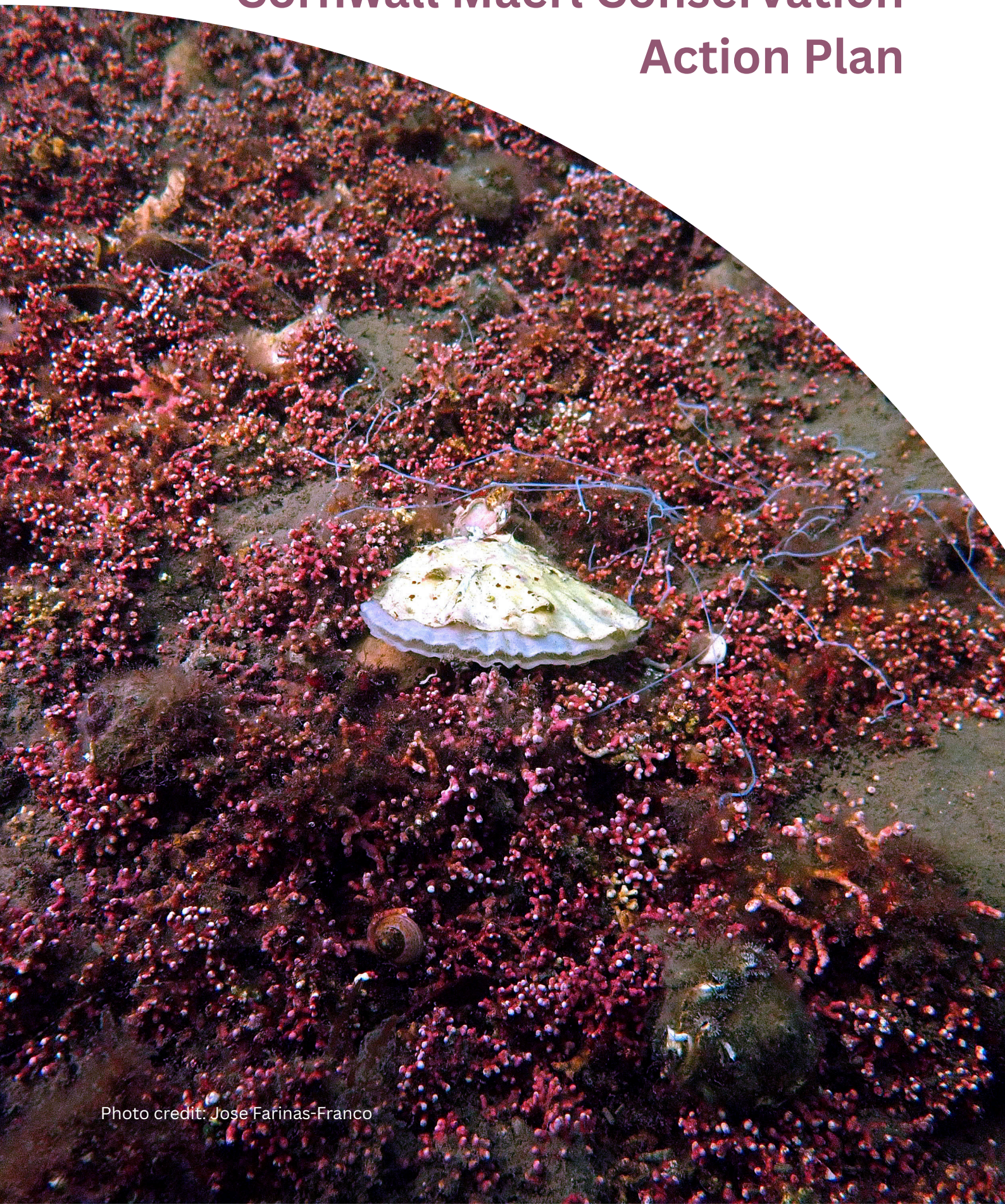


Photo credit: Jose Farinas-Franco

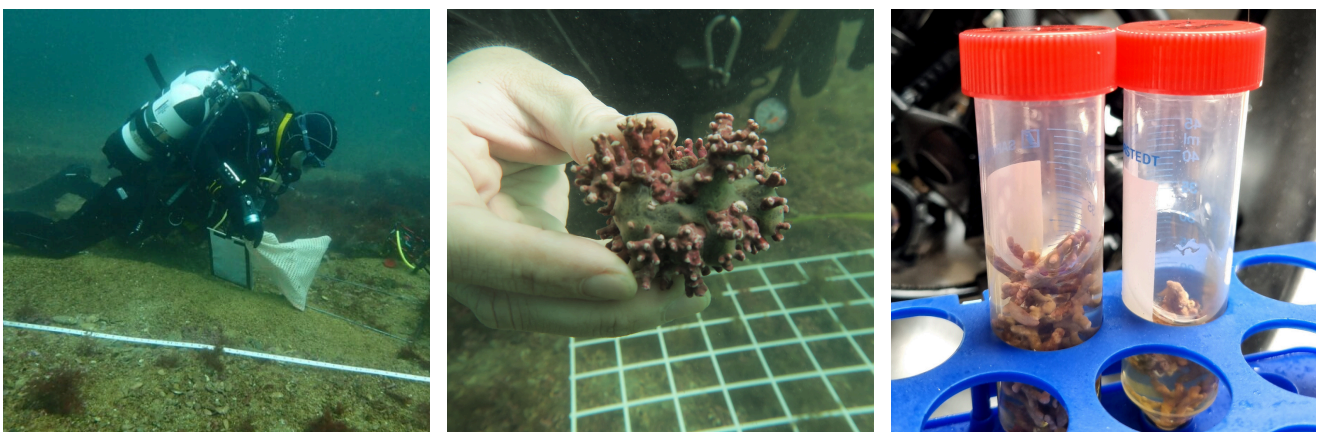
Cornwall Maerl Conservation Action Plan

Maerl beds are among the most precious, and least understood marine habitats both within Cornwall and nationally. These slow-growing, coralline algae form structurally-complex habitats that support exceptional biodiversity, provide nursery ground for commercially valuable species, contributing to local economies and blue carbon storage. Yet, Maerl beds are some of the most vulnerable ecosystems in our seas, threatened by pollution, unsustainable practices and future threats such as climate change.

The **Cornwall Maerl Conservation Action Plan** (2025-2030), sets out a shared framework for protecting these irreplaceable habitats. Developed by the Maerl Forum Steering Group through expert consultation, and informed through Maerl Forum delegate consultation, the plan draws on evidence and shared knowledge to highlight **suggested actions** for protecting Cornwall's Maerl beds. This Plan is structured around six thematic areas:

- **Monitoring, Mapping, and Innovation**
- **Water Quality and Pollution Management**
- **Sustainable Fishing and Activity Regulation**
- **Legal Protection and Policy Reform**
- **Habitat Restoration, Recovery, and Climate Change Research**
- **Public Awareness, Education, and Community Engagement**

These priorities are not finalised projects, but a set of **potential actions** that provide a framework for future action. They will require further development, consultation, and resources, and should be taken forward collaboratively by partners to ensure stakeholder wide engagement. This plan provides a foundation for protecting Maerl habitats, ensuring it continues to support biodiversity, fisheries, and the resilience of Cornwall's seas for generations to come.



Maerl surveying in Cornwall. Photo credit: Angie Gall.

Cornwall Maerl Conservation Action Plan

Monitoring, Mapping & Innovation		
Objective: Improve knowledge of Maerl extent, condition, and change over time using innovative technologies.		
Actions	Timescale	Suggested Ownership
Identify		
Expand existing knowledge about distribution and extent of Maerl beds in Cornwall, including their quality, composition and biological communities, using existing and new technology that can aid the mapping and monitoring of Maerl beds.	2025-2027	Natural England, IFCA, Universities, Consultancies, NGOs.
Identify gaps in maerl lifecycle knowledge, and the requirements needed for growth and habitat function. This includes the identification of conditions needed to grow when direct pressures are removed.	2025-2030	Universities.
Further investigate the natural capital value of Maerl locally including nursery habitat function and scallop larval support, carbon storage, biodiversity, fishing, ecotourism and cultural.	2025-2030	Natural England, Universities, NGOs.
Implement		
Standardise Maerl classification across Cornwall sites using the Maerl categorisation system. Classification may describe live vs dead Maerl, and or what defines a partial or existing “Maerl bed”.	2025-2027	Natural England, IFCA, Universities, Consultancies.
Partner with consultancies and universities to co-develop innovative tools.	2025-2030	Natural England, IFCA, Universities, Consultancies.
Publish high-resolution mapping to build an improved picture of Maerl beds.	2025-2028	Natural England, IFCA, Universities, Consultancies.
Establish a central Maerl data and resource hub for the South West region.	2025-2027	ERCISS
Conduct formal condition assessment within relevant SPAs and update Maerl condition assessment for relevant SACs.	2025-2026	Natural England.
Conduct marine natural capital assessment of Maerl in south Cornwall.	2028-2030	Consultancy, Universities.

Continue monitoring and recording invasive non-native species on and within maerl beds, using ongoing methods and schemes, this may aid future management requirements to actively remove invasive species from maerl beds.	2025-2030	NGO's.
Engage		
Use mapping and photogrammetry footage in engagement campaigns.	2025-2030	Local Authorities, Government Authorities, NGO's.

Water quality and pollution management		
Objective: Reduce nutrient enrichment, contaminants, and their impact in and around Maerl bed habitats.		
Actions	Timescale	Suggested Ownership
Identify		
Identify pollution sources (e.g. farm runoff, urban runoff, sewage, heavy metal, and hydrocarbon contamination), hotspots, and specific Maerl beds effected. Must include additional physical influences such as temperature, water flow rate, and tidal state, to understand combined impact.	2025-2030	Statutory Agencies, NGO's, Utility Companies, Local Authorities, Universities, Landowners, Citizen Scientists.
Identifying impacts of poor water quality on Maerl function and condition, including algal growth using collected samples and data.	2025-2030	Universities, Researchers, Natural England, Cornwall Wildlife Trust.
Implement		
Establish long-term water quality monitoring stations in priority areas, collaborate with the EA and South West Water to share data.	2025-2027	Utility Companies, Environment Agency, Port Health, Citizen Scientists, West County Rivers Trust, Cornwall Wildlife Trust, Universities, Surfers Against Sewage.

Implement		
Develop catchment-based projects around hotspots with landowners, partnerships, stakeholders, and communities to better understand sources of pollution (e.g. fertilisers etc) to implement catchment management solutions. Align actions with Nature Recovery Strategy, Water Framework Directive, River Basin Management Plans, and local nutrient neutrality targets. See Cornwall and Isles of Scilly Nature Recovery Strategy: https://letstalk.cornwall.gov.uk/cornwall-and-isles-of-scilly-nature-recovery-strategy .	2025-2030	Land managers, NGOs, Governing Bodies, Communities, Local Authorities.
Support and engage with the Rivers to Reef project which will transform the Fal catchment into a thriving biodiversity hotspot—where healthy freshwater systems sustain vibrant marine life, and where farm businesses prosper alongside nature.	2025-2028	Rivers to Reef Project Steering Group.
Engage		
Delivering an engagement campaign explaining pollution impact on Maerl which will raise the issue with the public and key stakeholders e.g. EA, South West Water, local divers. (film, art, posters, community days, press, conferences).	2025-2026	Maerl Festival Working Group, Silver Back film co, Cornwall Council, Cornwall Wildlife Trust, Local Marine Groups.
Citizen science projects (Recording algal sightings/blooms on Maerl beds).	2025-2030 Ongoing	Seasearch, West County Rivers Trust.

Sustainable fishing & activity management		
Objective: Minimise physical damage to Maerl from fishing, anchoring, and infrastructure.		
Actions	Timescale	Suggested Ownership
Identify		
Record events that could cause or have caused physical damage to Maerl beds, understand whether some areas are more affected than others. This will be achieved by establishing a monitoring programme with relevant stakeholders and partners.	2025-2030	Cornwall Wildlife Trust, Local Marine Groups, Universities, Falmouth Harbour, Cornwall IFCA, Natural England.
Map overlap between commercial fishing effort and gear (particularly bottom towed gear), commercial anchoring, and recreational boating activity and Maerl beds to prioritise interventions.	2025-2030	Universities, Cornwall IFCA
Gather evidence of impacts of both commercial fishery, anchoring, and infrastructural activity on Maerl bed condition and health.	2025-2030/ Ongoing	Cornwall IFCA, Natural England, research institutes and universities, citizen scientists, Harbour authorities, MMO.
Conduct a global review and feasibility study of commercial anchoring in ecologically sensitive sites, using case studies to inform potential solutions and alternative measures for Falmouth Bay.	2025-2030	MMO, Falmouth Harbour Commission, research institutes.
Implement		
Collaborate with local fishers to trial and encourage sustainable gear use and phase out harmful practices on Maerl beds (e.g. disco scallops), particularly in areas that are not subject to current Cornwall IFCA bottom-towed gear and scallop dredging byelaws.	2025-2030	Cornwall Wildlife Trust, IFCA, Local Fishers, Universities, NGOs

Work with Fal and Helford recreation mitigation officer to design and implement delivery methods to reduce recreational pressure on Maerl beds within the Special Area of Conservation, for example the implementation of an additional voluntary or statutory no-anchor zones in healthy Maerl bed areas, and or the deployment of Advanced Mooring Systems (AMS).	2025-2027	Cornwall Council, Harbour Authority, MMO.
Using the results of both global review and monitoring, facilitate workshop with stakeholders to consider potential solutions regarding commercial anchoring in Falmouth Bay.	2027-2030	Statutory Authorities, Harbour Authorities, Harbour User Group, SAC Management Committee, Cornwall Council.
Engage		
Engage with all IFCA committee members and Harbour User Groups with Maerl-specific priorities, including suggestions to expand bottom-towed gear bans and consider the implementation of Highly Protected Marine Area designations with leading statutory bodies.	2025-2030	Cornwall Council, NGOs, CIFCA.
Collaborate with local marine groups and NGOs to design engaging material aimed at marine recreation users to encourage the use of seabed safe practices (e.g. sensitive seabed buoys, interpretation boards, public events, VR, and imaging).	2025-2030 Ongoing	Local Marine Groups, Cornwall Council, NGOs.

Legal Protection and Policy Reform		
Objective: Secure stronger, enforceable legal protection for Maerl at local and national levels.		
Actions	Timescale	Suggested Ownership
Identify		
Identify all current legal protection on local and national scales and input into an open document for accessible viewing.	2025-2027	Natural England.
Implement		
Designate Maerl sites outside of existing areas such as current SAC's. Focus should be initially in areas of Cornwall's south coast, outside of current SAC's. This will ensure that the full range of maerl beds, conditions and associated wildlife are represented in the protected sites network.	2025-2030	Government agencies.
Continue to submit additional evidence and data, including natural capital, to Defra showing value and the ongoing impacts on Maerl beds. This will feed into Defra's MPA Network Review and enable investigation into options of further designation and protection for Maerl in England.	2025-2028	All, Natural England.
Work with Fal and Helford recreation mitigation officer to design and implement delivery methods to reduce recreational pressure on Maerl beds within the Special Area of Conservation, for example the implementation of an additional voluntary or statutory no-anchor zones in healthy Maerl bed areas.	2025-2027	Cornwall Council, Harbour Authority, MMO.
Align any further Maerl protection with international frameworks.	2025-2030 Ongoing	Government.
Engage		
Lobby UK Government to progress the legal status of marine irreplaceable habitats.	2025-2030	NGOs, Public.
Deliver a workshop inviting MPs, statutory body officials and local authorities to a "Maerl Showcase" hosted by stakeholders and scientists, to present evidence for the requirement of strengthened protection and enforcement.	2025-2028	Cornwall Council, Statutory Bodies, Universities, NGOs.
Use sign-on letters or motions from local councils and stakeholders to gain widespread agreement of improved legal protection and enforcement.	2025-2030	Public, NGO's, Community groups.

Restoration, Recovery & Climate Change Research		
Objective: Investigate options for the natural recovery and restoration of Maerl from human impacts in light of climate change and gather baseline data of Maerl biology.		
Actions	Timescale	Suggested Ownership
Identify		
Identify locations in which Maerl beds that require recovery including those previously subjected to historic pressures such as commercial extraction.	2026-2028	Natural England.
Conduct a global review with case studies to understand Maerl restoration potential, e.g. Translocation.	2026-2028	Universities.
Scope possibilities for in situ restoration trials.	2027-2030	Universities, NGOs, Natural England.
Implement		
Conduct lab and field-based experiments on Maerl biological traits and recovery after human impact e.g. thermal tolerance, water chemistry, changes in Maerl coverage, biodiversity, growth rates, eDNA, acoustic monitoring .	2025-2030	Universities, Research Institutes, Natural England.
Increase understanding of Maerl as a blue carbon habitat and its role in climate resilience.	2025-2030	Universities, Research Institutes, Natural England.
Include Maerl vulnerability in national marine climate risk assessments.	2025-2030 Ongoing	Government.
Engage		
Use citizen science programmes to support monitoring of restoration/ recovery trials.	2025-2030	Cornwall Wildlife Trust, local marine groups.
Disseminate findings of research and trials to local stakeholders	2027-2030	Universities, NGOs, Local Authorities, Statutory Bodies, local marine groups.

Awareness, Education & Community Participation
Objective: Raise public and stakeholder awareness of Maerl's ecological value, threat and local importance.
Actions by 2030
Deliver a Maerl Festival to showcase Maerl in Cornwall.
Launch a public campaign for Maerl, improving its profile and recognition.
Develop interpretive signage at sites near Maerl beds.
Create immersive media (films, VR experiences, school kits) focused on Maerl ecology.
Host community events and citizen science days linked to Maerl conservation.
Use media coverage, press features, and nature documentaries to tell Maerl's story.
Run compelling social media series.
Engage local artists or filmmakers to create Maerl-inspired exhibitions or installations.
Use engaging materials to communicate Maerl's role in climate change as a blue carbon habitat and its vulnerability to change, to the public, climate and environmental NGO's and local authorities.

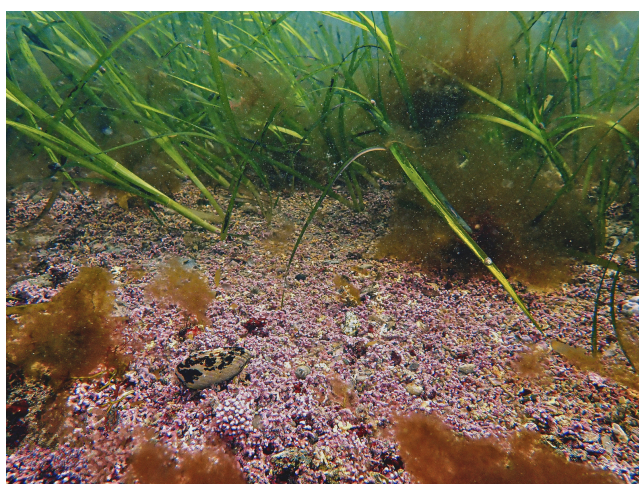
Conclusion

Following the success of the Maerl Steering Group in convening the Maerl Forum 2025 and developing the Cornwall Maerl Conservation Action Plan, it is strongly recommended that the group continues as a central mechanism for collaboration, coordination, and progress. The Steering Group has demonstrated the value of bringing together expertise from across sectors, and its continuation will be vital to maintain momentum.

While no single authority is mandated to implement the Action Plan, it is endorsed by local and national conservation organisations, statutory agencies, and marine industries involved in the Maerl Forum, who will champion actions that deliver the locally agreed priorities. Collaboration between the public, private, and voluntary sectors is key to achieving its goals, with the Cornwall and Isles of Scilly Marine and Coastal Partnership playing a crucial role in coordinating and delivering these efforts.

Future work should build on these foundations by maintaining regular meetings and ensuring representation from various stakeholders, including researchers, NGOs, statutory bodies, industry representatives, and local communities. This will ensure that the Steering Group's activities consider evolving statutory requirements, stakeholder needs, and the latest evidence from publications and research. In doing so, the steering group will act as a link between science, policy, and practice, ensuring knowledge is refreshed, understood, and applied. In practical terms, the Steering Group will provide a platform for hosting forums, delivering accessible webinars, and organising community engagement events that highlight Maerl's ecological importance and the urgent need for its conservation.

Furthermore, it is hoped that this report will serve as key reference point for organisations exploring Maerl conservation initiatives, guiding practical efforts and priorities. By sharing these clear objectives and the evidence required for action, this report can help drive and align projects with the highlighted conservation priorities across Cornwall and beyond. This will aid the coordinated and strategic approach required to carry out effective protection that aids the recovery of these valuable habitats long term.



Maerl and seagrass in the Fal Estuary
Photo credit: Daisy Laing.



Algal growth on a large Maerl nodule.
Photo credit: Matt Slater.

Report details

Report compiled by consultant Daisy Laing, on behalf of the Maerl Forum Steering Group.

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Partner organisations



**CORNWALL
COUNCIL**



**University
of Exeter**



Cornwall
Wildlife Trust



**UNIVERSITY OF
PLYMOUTH**



**BLUE MARINE
FOUNDATION**



Fal & Helford
Marine Protected Area

Funders

Natural England
Cornwall Council
University of Exeter
Fal and Helford SAC S106 Fund
Local Investment in Nature Cornwall

Citation

Maerl Forum Output Report & Cornwall Maerl Conservation Action Plan (2025)

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Appendices



Photo credit: Matt Slater

Appendix I – Forum Programme

Time	Speaker	Title
09:00	Arrival (tea and coffee available)	
09:30	Angie Gall, Natural England	Welcome to our Maerl Forum 2025
09:40	David Slater, Natural England	Marine Nature Recovery – Perspectives from the SW of England
	VALUE OF MAERL	CHAIR: Abigail Crosby, Cornwall Council
09:50	Jason Hall Spencer, University of Plymouth	Overview - Why maerl?
10:10	Freddie Watson, Blue Marine Foundation	A Valuation of Jersey's Marine Habitats in Providing Ecosystem Services
	MONITORING	CHAIR: Victoria Hobson, University of Exeter
10:25	Jose Farinas-Franco, Atlantic Technological University Galway City	A unique mosaic of marine life: Reciprocal facilitation between maerl and native oyster beds drive habitat complexity and biodiversity
10:40	Chris Laing, University of Exeter	Blue carbon assessment of maerl beds in the Fal and Helford Special Area of Conservation
10:55	Jonathan Sayer-Mitchell, Tritonia Scientific	Mapping and monitoring maerl using georeferenced 3D photogrammetry – “Providing underwater clarity”
11:10	Alison Benson, Envision Marine Ltd.	Maerl mapping
11:25	Panel Q&A	ALL
11:40	Break - Early lunch	
	AWARENESS AND COMMUNITY ACTION	CHAIR: Abigail Crosby, Cornwall Council
12:30	Matt Slater, Cornwall Wildlife Trust	Engaging communities & citizen science
12:45	Julia Barton, Artist	Maerl - a creative engagement project to raise awareness of threatened maerl habitats
	THREATS POLICY AND MANAGEMENT	CHAIR: Dr Jean-Luc Solandt, Blue Marine Foundation
13:00	Tom Mercer, Aquatic Survey & Monitoring Ltd.	Factors affecting a maerl bed in Milford Haven 2005 - 2023
13:15	Jacques Grall, Université de Bretagne	Maerl Beds biodiversity: from observation to conservation
13:35	Trudy Russell, Natural England	Using policy to protect maerl in England
13:50	Tom Appleby, Blue Marine Foundation	Can the law let us do what is needed?
14:05	Panel Q&A	ALL
14:20	Break - Cake	
15:00	Workshops	ALL - In person and online
16:00	Reconvene - Summary of workshops	Workshop facilitators
	KEY SPEAKER	CHAIR: Abigail Crosby, Cornwall Council
16:30	Lucy Kay, Community of Arran Seabed Trust (COAST)	Maerl at the heart of community action
16:55	Pip Hoskin, Cornwall Council	Conclusions and thank you
17:00	FINISH	

Appendix II – Forum Posters

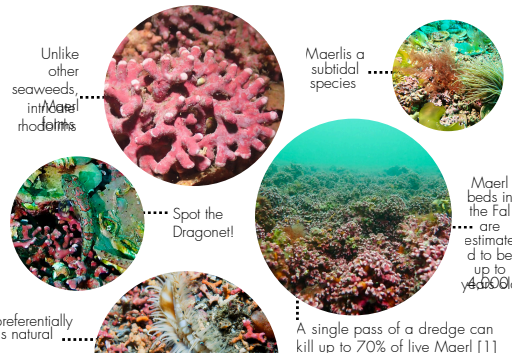
Natural England - Maerl in Falmouth Bay to St Austell Bay SPA

MAERL IN FALMOUTH BAY TO ST AUSTELL BAY SPA



CONTEXT

Maerl are free-living calcified red seaweeds, forming pink twig-like structures known as rhodoliths. These grow into intricate three-dimensional habitats on the seabed, supporting high biodiversity and acting as a nursery for young fish. Maerl is incredibly slow-growing and fragile - In recent work, Natural England classified Maerl beds as one of the UK's most irreplaceable marine habitats [4]. As a Priority Habitat under the NERC Act, public authorities have a duty to consider its conservation in England [8]. **Falmouth Bay to St Austell Bay Special Protection Area (SPA)** has recently been a focus for understanding these valuable habitats. Over the last two years, Natural England has been working in partnership with a range of key local stakeholders to obtain more evidence and better understand the distribution and condition of Maerl within the SPA, because despite their ecological importance, high natural capital value, and irreplaceability, Maerl within this SPA remains largely unprotected.



Maerl first charted in St Austell Bay by the Hydrographic Office in 1808 and appeared on charts again in 1851. Forgotten for decades and absent from recent maps [7]

Seasearch volunteer divers rediscovered and recorded extensive Maerl in St Austell Bay, the first time in over 150 years of records

2024

2023

Seasearch played a vital role in raising awareness of Maerl. This included the Maerl Community Evening, and the launch night for the St Austell Bay Blue Carbon Mapping Report

Fish surveys to understand the role of different habitats, including Maerl beds, in supporting fish at various life stages, carried out by Natural England and partners including Cornwall IFCA

A literature review undertaken to looking into the connections between the bird features of the SPA and the Maerl beds

The first Maerl Forum held, bringing together stakeholders and developing a conversation around recovery of Cornwall's Maerl

MAPPING SURVEYS (2023 & 2024)

WHAT?

Maerl habitat mapping was carried out in 2023 and 2024 across the bays of the SPA from St Austell Bay to the mouth of the Fal. This was led by Natural England, in partnership with Cornwall Wildlife Trust, with Envision Marine Ltd key to data analysis and reporting, and CIFCA central to data collection [2,5].

WHY?

To improve understanding the **extent, distribution and condition** of subtidal Maerl communities within the Falmouth Bay to St Austell Bay SPA.

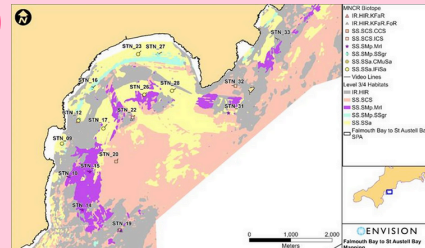
HOW?

- **Side scan sonar** surveys were conducted to map the seabed.
- **Drop-down video and still imagery** provided ground-truthed data for habitat assessment.
- **Imagery analysis** allowed for the quantification of live and dead Maerl cover.

- **Habitat classification** using The Marine Habitat Classification (MHC) for Britain and Ireland, and the application of Axelsson's 2023 Maerl categorisation system [3].

- **Predictive habitat modelling** integrated geophysical data with imagery analysis to produce detailed maps of Maerl distribution.

KEY FINDINGS



Predicted Maerl in Gerrans Bay [2]

- **Previously unrecorded** Maerl habitats were discovered and mapped, with the extent of Maerl exceeding initial expectations. Maerl was recorded in all four target areas— Old Wall to The Bizzies, Gerrans Bay, Verran Bay, and Mewagissey Bay—typically occurring in patchy distributions in sheltered locations near rocky habitats.

- The largest extents of Maerl were predicted in the southwest sections of Gerrans Bay and Verran Bay.

- The proportion of live Maerl was typically higher in the bays further west than in St Austell Bay [2,5].

News + Cornwall News + Environment

Mysterious 'Barbieland' found on British shores is teeming with rare underwater life

Discovered off the southern coast of Cornwall this fascinating 'underwater forest' is a sight to behold

'Woodlands of the sea' found off Cornwall

Maerl habitats, often referred to as 'underwater forests', are a sight to behold. These unique habitats are home to a wide range of rare and unusual species, including the critically endangered Cornish wrasse. The discovery of these habitats off the coast of Cornwall is a significant find, as they are the only known locations of this species in the UK. The habitats are made up of dead Maerl rhodoliths, which provide a complex structure for the wrasse to hide in. The discovery was made by a team of researchers from the University of Exeter, who were conducting a survey of the seabed off the coast of Cornwall. The habitats are located in a series of bays and coves, and are thought to be the result of a combination of factors, including the presence of Maerl and the absence of predators. The discovery is a major step forward in our understanding of these habitats, and it highlights the need for further research and conservation efforts to protect them.

Newspaper headlines reporting the discovery of Maerl

Lessons Learned & Next Steps

- Close partnership working and excellent regular communication were key to success.
- Further geophysical data and benthic habitat samples could be collected to provide better resolution maps and habitat distribution.
- Continue mapping of Maerl within the SPA and the Fal and Helford SAC to extend understanding.
- Develop a Marine Condition Assessment for Falmouth Bay to St Austell Bay SPA.
- Continue to raise awareness of the importance of Maerl with local stakeholders.

Acknowledgements

Cornwall Wildlife Trust, Cornwall IFCA, Seasearch, Envision Marine, ASML, Marine Seen, Marine Ecosol.

DIVE SURVEYS (2023 & 2024)

WHAT?

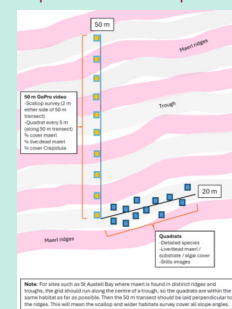
Using Seasearch intelligence on Maerl locations, Natural England dive surveys were conducted by our dive unit, alongside Marine Seen in 2023, funded by G7 Legacy; and Aquatic Survey and Monitoring Ltd in 2024, funded by Natural England through the marine Natural Capital and Ecosystem Assessment programme.

WHY?

To assess the **health and condition** of Maerl beds in Falmouth Bay to St Austell Bay SPA, and to provide data on their role as an **ecosystem asset**.

HOW?

Community composition was recorded in 0.25 m² quadrats along 20m transects, recording all visible epibiota, the percentage of live and dead Maerl, and total algal cover. Additional 50 m transects were used to gather data on Maerl cover, substrate composition, and scallop population structure as part of a natural capital assessment.



Transect methodology



A remotely operated underwater vehicle (ROV) was used to verify dive locations

KEY FINDINGS

Significant live Maerl was found at all surveyed sites, with beds differing structurally. The mean percentage cover of live Maerl was 26% across the eight sites within the SPA. In St Austell Bay, a higher proportion of dead Maerl was recorded, while the Fal and Helford sites had greater coverage of live Maerl [6].

In 2023 the surveys identified **over 350 species** associated with Maerl, including 140 species of seaweed, compared to just 54 recorded using Drop Down Video. **Many of these species were previously unknown**, highlighting the importance of diver-led surveys for capturing fine-scale biodiversity.



Bonnemaisonia clavata, a species last confirmed in the UK in the 18th century, was identified microscopically

Filamentous red algae were observed growing on the Maerl, including non-native species such as Bonnemaisonia hamifera, Asparagopsis armata, Dasyatisphonia japonica, and Grateloupia turuturu, with D. japonica being the most abundant.

The data collected over these two years provides a **valuable baseline for monitoring** the condition of the SPA's coastal Maerl beds and informing future conservation efforts.

DNA analysis of Maerl samples from the survey was carried out by Exeter University, contributing to a broader genetic study. A paper using this data is currently in press

65

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THE MAERL CONNECTION

EXPLORING THE ASSOCIATIONS BETWEEN BIRD FEATURES AND BENTHIC HABITATS WITHIN THE FALMOUTH BAY TO ST AUSTELL BAY SPA
BASED ON THE REVIEW BY JOHN ARCHER-THOMSON 2025



Great Northern Diver (Gavia immer)

Falmouth Bay to St Austell Bay SPA BIRD FEATURES

- The UK's largest wintering population of **black-throated divers**, making it the most important site for the species [1]. The only English SPA designated for wintering **great northern divers** and the most southerly UK site where they regularly occur, contributing to their range [2, 1].
- One of only three UK SPAs classified for wintering **Slavonian grebe**, supporting 1.4% of the GB population [2].

SUPPORTING HABITATS

The water column and diverse suite of benthic habitats all contribute to the **feeding requirements** of the three species of bird.

Maerl is the collective name for several species of **nodule-forming, coralline red algae** form extensive beds that provide **habitat** for a variety of organisms, including over 150 species of macroalgae and 500 benthic faunal species [3].

The **natural capital** of Maerl beds can be described with reference to a range ecosystem services that the habitat provides.



Burrowing anemone (Cerianthus lloydii)



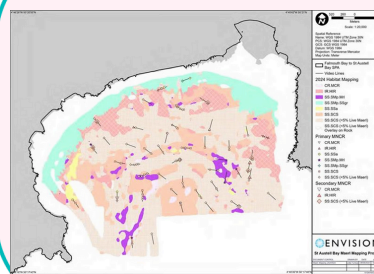
Couch's bream (Pagrus pagrus)

SYNERGY

In a mosaic of benthic habitats, synergistic effects occur between sediment types that enhance its value. For example, **normally unstable and harsh subtidal sands become more hospitable when combined with Maerl**, which stabilises the substrate and allows colonisation by a wider range of species—such as burrowing worms, crustaceans, molluscs, and small fish [4, 5, 6].

Compared with most other sediment habitats, Maerl contributes disproportionately to the biodiversity of the sub-littoral within the SPA and thus to the bird features that the designation was set up to protect.

SPATIAL OVERLAP



Surveys have highlighted **extensive Maerl within the SPA**, particularly in the bays where there are calmer sea conditions, and underwater visibility [7, 8, 9].

Distribution of habitats/biotope from video analysis in St Austell Bay, from Envision Marine, 2024.



Bull huss (Scylorhinus stellaris)



Velvet swimming crabs (Necora puber)

Enhancing the condition of these Maerl beds could potentially lead to increases in the numbers of bird species within the SPA.



Spider crab (Maja brachydactyla)



Cuttlefish (Sepia officinalis)

Potential Threats to Maerl Beds

Maerl beds are vulnerable to various anthropogenic activities. Development activities such as **coastal infrastructure, aquaculture and cabling**, which can physically damage or smother Maerl beds, and increase turbidity and nutrient loading, impacting Maerl growth [10, 14].

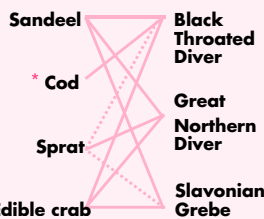
Fishing methods such as **trawling and scallop dredging** which break and bury living Maerl and damage associated biodiversity. Recovery can take centuries [3, 17]. **Anchoring and mooring** can cause physical damage to Maerl and associated organisms [18].

The spread of **non-native species**, such as the slipper limpet *Crepidula fornicata*, can smother Maerl beds and dramatically alter associated communities [19].

Poor **water quality** due to sewage, agricultural and industrial pollution can lead to increased siltation, increases in opportunistic species and subsequent loss of diversity [18, 19].

ESSENTIAL FISH HABITAT

Habitats that support key life stages such as spawning, nursery, feeding, or refuge are vital. The following key prey species are found within both coastal and offshore waters and utilise habitats similar to those found in the SPA:



Simplified illustration of the links between the SPA bird features and their prey items. Known prey item. Likely prey item given opportunistic feeding strategies.

- * Maerl is a known nursery

Maerl is known to be an 'essential fish habitat' and as such, may have a key role to play in bird prey availability [14, 15].



Great scallop (Pecten maximus)



Goby (Pomatoschistus sp.)

Inappropriate management and direct or indirect impacts which may affect the distribution, abundance and availability of prey may adversely affect the population and alter the distribution of birds.

NATURAL CAPITAL

Biodiversity Maerl beds serve as important habitats for a diverse range of marine species - some of which are confined to Maerl habitat or are rarely found elsewhere [10].

Fisheries support: The complex structure of Maerl beds are often associated with commercially important fish, molluscs and crustacean species as they provide a suitable environment for juveniles [10, 11, 12, 13, 14, 15, 16].

Carbon sequestration: Maerl beds contribute to carbon sequestration by trapping and storing carbon dioxide into their calcium carbonate structure.

Coastal protection: The physical structure of Maerl beds can help stabilise sediments and provide protection against coastal erosion.

Recreational and aesthetic value: Maerl beds contribute to recreational activities such as snorkelling, diving and angling, enhancing tourism and providing aesthetic value to coastal areas.

Maerl beds are beautiful, interesting structures and are worthy of protection for these reasons alone.



Streaked gurnard (Chelidonichthys lastoviza)



Norwegian topknot (Phrynorhombus norvegicus)

Next steps

Extended bird observations: Long-term bird observations are needed to better understand distribution patterns and how they vary. This will help further clarify the relationship between bird species and Maerl habitats.

Benthic surveys: Continue validating sidescan survey data through SCUBA diving surveys to refine the habitat prediction models and extend survey coverage across the rest of the SPA.

Taxonomic expertise: Involving expert taxonomists will improve understanding of species associations with Maerl habitats, and its contribution to the Falmouth Bay to St Austell Bay SPA and Fal and Helford SAC.

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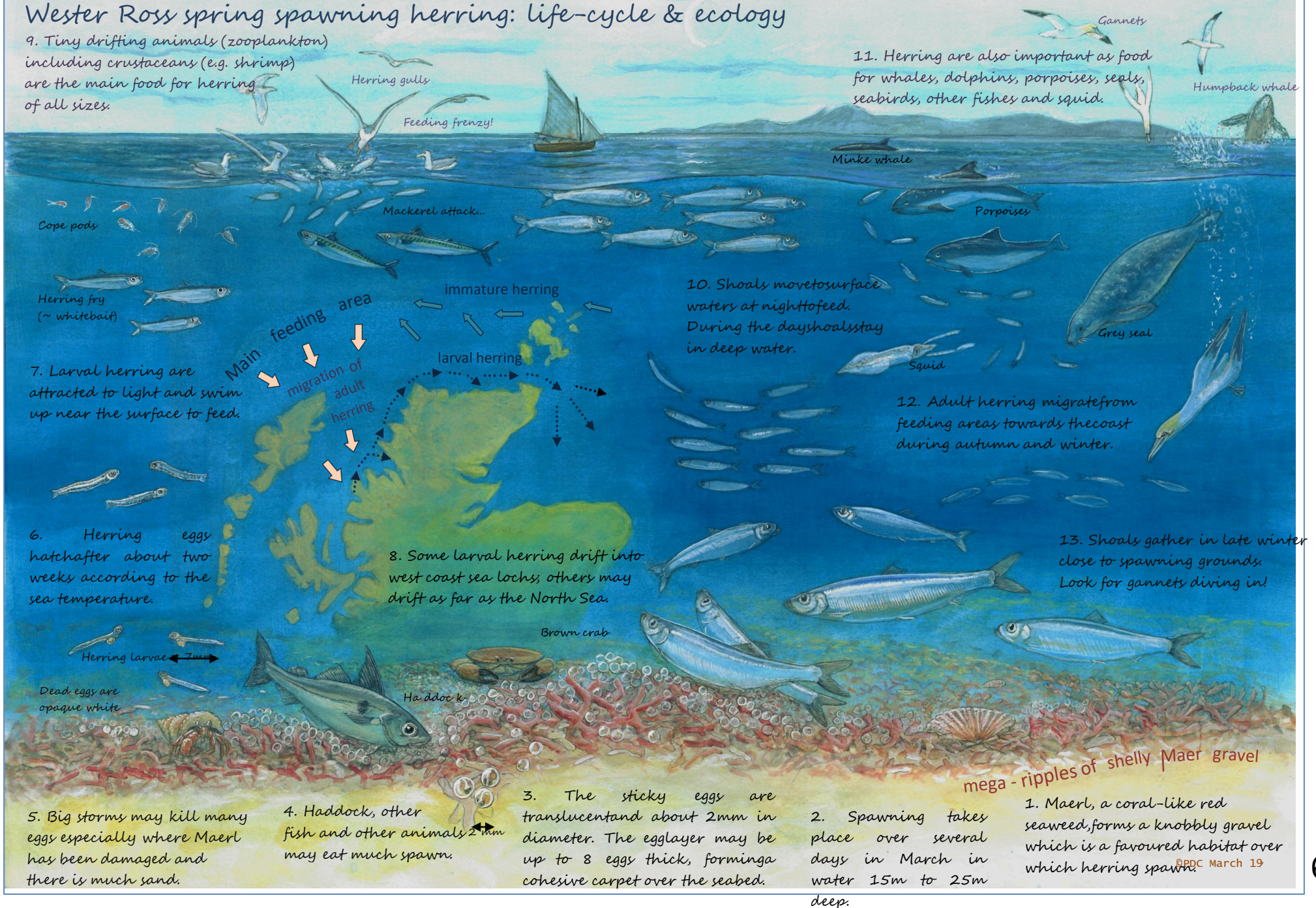
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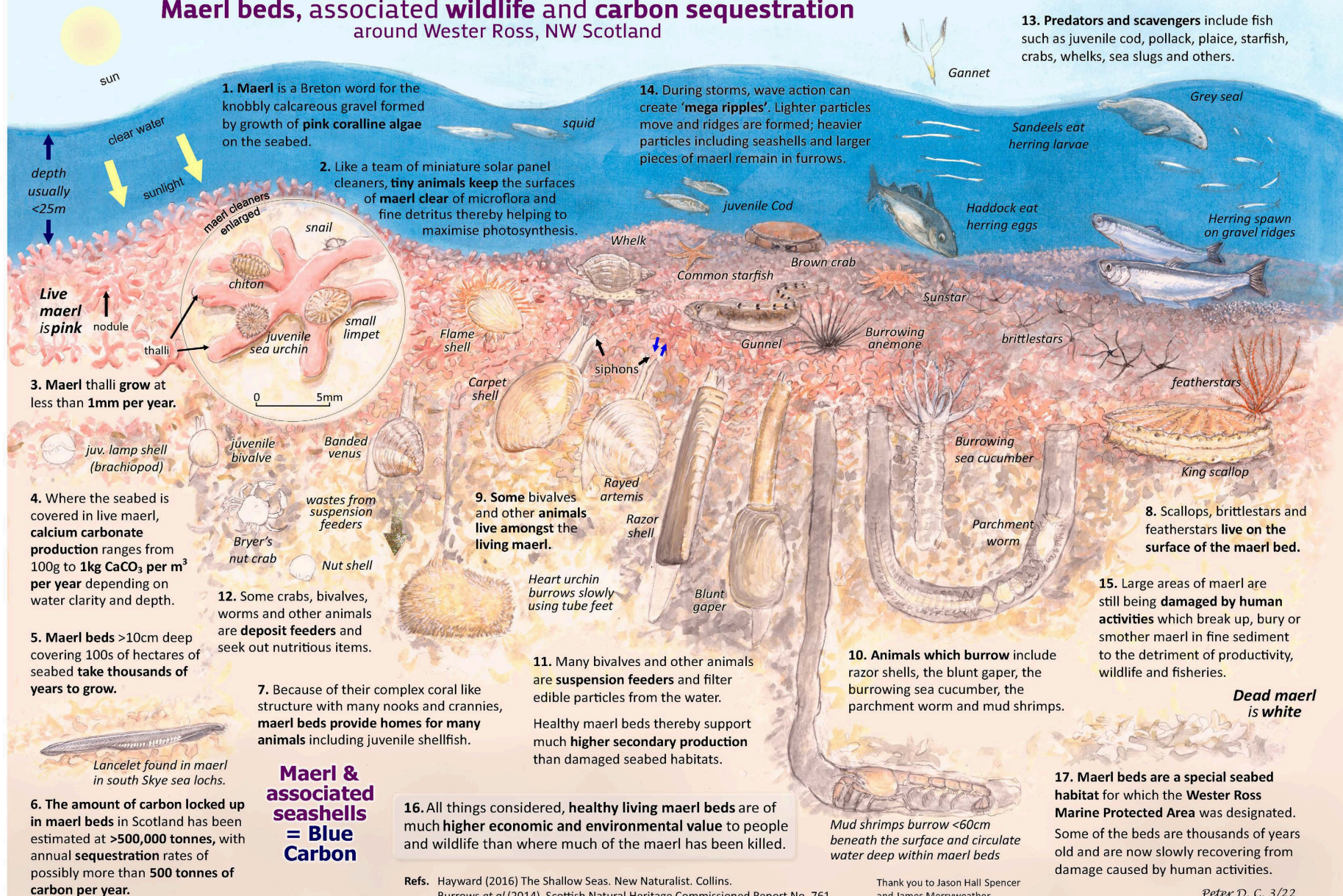
Wester Ross spring spawning herring: life-cycle & ecology

9. Tiny drifting animals (zooplankton) including crustaceans (e.g. shrimp) are the main food for herring of all sizes.

11. Herring are also important as food for whales, dolphins, porpoises, seals, seabirds, other fishes and squid.



Maerl beds, associated wildlife and carbon sequestration around Wester Ross, NW Scotland



Appendix III – Full Forum Workshop Results

1. What do we still not know about Maerl?

Biology and ecology:

- How do you map the distribution of live and dead Maerl and what value should be placed on each?
- How mobile is Maerl?
- Does seasonality influence Maerl and if so, how does it change annually or over greater time periods.
- The definitive distribution, extent, and condition of Maerl beds locally, nationally, and globally.
- Identifying food webs associated with Maerl and their association and connectivity with other species.
- The influence of Maerl on larval settlement and spawning (e.g. scallop, invertebrates, fish etc).
- Maerl condition and biotic and abiotic condition drivers (e.g. oceanography, bathymetry, dissolved nutrients) in Cornwall.
- The control of sediment dynamics on Maerl such as critical bed stress from wave action, variability in sediment grain and shape, porosity.

Environmental impacts and threats:

- The impact of unsustainable fishing on Maerl beds.
- How we can transition away from unsustainable fishing practices.
- Identification of local pressures causing poor water quality, resulting from pollution, sewage, excess nutrients, and which have the greatest impact.
- The impact of historic pressures on Maerl such as China clay, mining waste and other activities on Maerl.
- The impact of future pressures on Maerl, including predicting climate change effects.
- The impact of invasive and non-native species on Maerl beds and management options.
- Understanding if globally and locally is Maerl still being commercially exploited.
- Options for managing boat anchoring impacts.

Education and engagement

- Does the public already know about Maerl beds, is it as few people as we think and how receptive are they going to be to increased Maerl media coverage?
- Is Maerl a part of Cornish identity?

Conservation and natural value

- Identifying Maerl beds currently contained in MPAs and how Maerl positively influences them (e.g. attracting fish).
- Can Maerl beds be restored, recover/prevented from damage/loss, relocated, grown in lab settings. What methods are needed to do this and are there any examples of successful recovery?
- Calculating the value of Maerl as a blue carbon store, sediment value and live vs dead value.
- Calculating the value of Maerl bed ecosystem services/ natural capital accounting.
- Calculating profit gained from fishing above Maerl, fishing above Maerl with increased recruitment (e.g. scallops), and how this could be redirected to ensure maintained economic gain.

Policy and funding

- Ownership of seabed in Maerl locations, responsibilities of, and willingness to act to protect Maerl as an asset, by seabed owners.
- How to increase local and global movement towards legal protection.

2. What has worked well for Maerl so far? Protection, discovery, recovery, education, and research?

Biology and ecology:

- Increased discovery and mapping of Maerl beds, including using and embracing innovative technology to understand extent and distribution.
- Increased research to better understand Maerl and contribute to targeted conservation action.
- Recognition of Maerl's vulnerability, rarity, and scarcity at an international level to drive the importance of protection.

Environmental impacts and threats:

- Acquiring evidence of harmful impacts (e.g. before and after dredging impacts in Jersey helped spread awareness through school engagement which increased political response.)
- Stopping/ reducing fishing pressure above Maerl beds.
- Stopping/reducing anchoring pressure on Maerl beds.
- Pilot investigation by South West Water to better understand and manage sewage and storm water.

Education and engagement

- Raising public awareness of Maerl via art, the press, and educational materials (e.g. performance art, Seasearch, Your shore network, imagery).
- Raising stakeholder awareness of Maerl (e.g. meeting with fishers to discuss the value of Maerl for scallop populations).
- Collaboration of stakeholders to increase awareness of Maerl.

Conservation and natural value

- Using policy and law to directly protect Maerl beds (e.g. Maerl as a sub-feature of the Fal-Helford SAC).
- Acknowledgement of what is working well within the fishing industry to protect Maerl.
- Use of clear conservation objectives.

Policy and funding

- Protection through regulations, including banning bottom towed fishing gear, banning commercial extraction and incidental protection such as cabling.
- Lobbying/ pressure on authorities, such as using the GES argument alongside strong evidence.

3. What do you think are the top actions for protecting Maerl moving forward?

Biology and ecology:

- Greater surveying of Maerl beds.
- Research identifying already healthy and diverse Maerl beds to ultimately lead to their protection.
- Research gathering benchmark science to assess the health status of Maerl beds and their tolerance to human activities.
- Collect a repository of high-quality video and images of Maerl, Maerl beds and their associated fauna.
- Establish formal definitions of what Maerl is.

Environmental impacts and threats:

- Improving water quality and manage pollutants and their impact on Maerl using catchment and marine based methods (e.g. excess nutrients, sedimentation).
- Effectively managing human activities that are currently impacting or associated with Maerl beds (e.g. fishing, scallop dredging, boat anchoring), using new or strengthened regulation and policy.
- Research gathering evidence of damaged Maerl beds resulting from human activity.

Education and engagement

- Increasing public and stakeholder awareness of the value of Maerl beds (e.g. blue carbon store, fish nursery ground) and how it is affected by anthropogenic impacts (e.g. human activity, climate change, invasive species). Using the media, educational programmes, interpretation tools, and community group activities.
- Providing up to date and accessible Maerl bed distribution maps for stakeholders to avoid Maerl beds.

Conservation and natural value

- Designating Maerl as a marine irreplaceable habitat (the same status as terrestrial habitats).
- Including Maerl in MPA network reviews or within designation of new Maerl protected area.
- Research quantifying the value of Maerl beds to different stakeholders.

Policy and funding

- Using enforcement measures to manage illegal activity and or damage to Maerl beds (e.g. fining, judiciary).
- Using grants/funding to decommission current scallop dredge gear and adapt vessels for alternative methods such as diving, or disco scallop pots.
- Using seabed leasing/ownership to protect Maerl through private means, additionally better understanding responsibility of owner and quantifying the impact of leasing on stakeholders.
- Explore funding opportunities for further Maerl research and or Maerl associated projects.

4. Taking those top actions, have some inspiring ideas of delivering them?

Environmental impacts and threats:

- Improving water quality and manage pollutants and their impact on Maerl using catchment and marine based methods (e.g. excess nutrients, sedimentation).
- Effectively managing human activities that are currently impacting or associated with Maerl beds (e.g. fishing, scallop dredging, boat anchoring), using new or strengthened regulation and policy.
- Research gathering evidence of damaged Maerl beds resulting from human activity.
-

Conservation and natural value

- Formalise a Maerl network.
- Connect Maerl with other habitats such as seagrass.
- Use, embrace and explore innovative technology for Maerl conservation.
- Collaborate with local conservation projects such as the Disco Scallop project.

Education and engagement

- Invite policy makers, MPs, and leading stakeholders to engage in a discussion on why and how Maerl should/can be protected and the effect of Maerl protection to current practices (for their own and others benefit).
- Collaborate with Southwest universities to explore possibilities of Maerl based projects – restoration, mapping, identifying assemblages.
- Crowdfunding with local community groups to lease Maerl seabed and or to “own a square of Maerl.”
- Rebranding Maerl to increase engagement (e.g. Celtic coral, ancient coral gardens, pink twiglets).
- Using the media to get Maerl in the news.
- Create a “Maerl Month” using an interactive exhibition (somewhere like the maritime museum), with mixed media to spread public awareness.
- Create a “World Maerl Day”.
- National marine week Maerl focus.
- Create films, documentaries, and virtual reality with Maerl as a focus.
- Use established tourism organisations and community groups to spread awareness of Maerl (e.g. dive and snorkel on Maerl beds, drop down video tours on vessels).
- More accessible webinars, workshops, and events for those outside stakeholder and scientific communities.
- Use art to raise awareness including; performance art, stories, song, interactive activities.

Policy and funding:

- Enforcement measures such as fining to include a “Maerl awareness course.”
- Write to newly elected IFCA representatives.

Question 1: What do we still not know about Maerl?	Votes
Identification of local pressures causing poor water quality, resulting from pollution, sewage, excess nutrients, and which have the greatest impact.	20
How we can transition away from unsustainable fishing practices.	13
How to increase local and global movement towards legal protection.	11
Can Maerl beds be restored, recover/prevented from damage/loss, relocated, grown in lab settings. What methods are needed to do this and are there any examples of successful recovery?	11
The impact of future pressures on Maerl, including predicting climate change effects.	9
Calculating the value of Maerl bed ecosystem services/ natural capital accounting.	8
The influence of Maerl on larval settlement and spawning (e.g. scallop, invertebrates, fish etc).	8
Ownership of seabed in Maerl locations, responsibilities of, and willingness to act to protect Maerl as an asset, by seabed owners	8
The impact of invasive and non-native species on Maerl beds and management options.	6
The control of sediment dynamics on Maerl such as critical bed stress from wave action, variability in sediment grain and shape, porosity.	6
Options for managing boat anchoring impacts.	6
Does the public already know about Maerl beds, is it as few people as we think and how receptive are they going to be to increased Maerl media coverage?	6
The definitive distribution, extent, and condition of Maerl beds locally, nationally, and globally.	6
How mobile is Maerl?	6
How do you map the distribution of live and dead Maerl and what values should be placed on each?	6
Identifying food webs associated with Maerl and their association and connectivity with other species.	5
The impact of unsustainable fishing on Maerl beds.	4
Calculating profit gained from fishing above Maerl, fishing above Maerl with increased recruitment (e.g. scallops), and how this could be redirected to ensure maintained economic gain.	4
Calculating the value of Maerl as a blue carbon store, sediment value and live vs dead value.	4
Maerl condition and biotic and abiotic condition drivers (e.g. oceanography, bathymetry, dissolved nutrients) in Cornwall.	3
Does seasonality influence Maerl and if so, how does it change annually or over greater time periods?	3
The impact of historic pressures on Maerl such as China clay, mining waste and other activities on Maerl.	1
Is Maerl a part of Cornish identity?	1
Understanding if globally and locally is Maerl still being commercially exploited.	0
Identifying Maerl beds currently contained in MPAs and how Maerl positively influences them (e.g. attracting fish).	0

Question 2: What has worked well for Maerl so far?	votes
Increased discovery and mapping of Maerl beds, including using and embracing innovative technology to understand extent and distribution.	18
Protection through regulations, including banning bottom towed fishing gear, banning commercial extraction and incidental protection such as cabling.	17
Recognition of Maerl's vulnerability, rarity, and scarcity at an international level to drive the importance of protection.	16
Aquiring evidence of harmful impacts (e.g. before and after dredging impacts in Jersey helped spread awareness through school engagement which increased political response.)	15
Stopping/reducing fishing pressure above Maerl beds.	14
Using policy and law to directly protect Maerl beds (e.g. Maerl as a sub feature of the Fal-Helford SAC).	12
Raising public awareness of Maerl via art, the press, and educational materials (e.g. performance art, Seasearch, Your shore network, imagery).	10
Increased research to better understand Maerl and contribute to targeted conservation action.	10
Collaboration of stakeholders to increase awareness of Maerl.	6
Stopping/reducing anchoring pressure on Maerl beds.	5
Lobbying/pressure on authorities, such as using the GES argument alongside strong evidence.	5
Acknowledgement of what is working well within the fishing industry to protect Maerl.	5
Raising stakeholder awareness of Maerl (e.g. meeting with fishers to discuss the value of Maerl for scallop populations).	3
Use of clear conservation objectives.	2
Pilot investigation by South West Water to better understand and manage sewage and storm water.	0

Question 3: What do you think are the top actions for protecting Maerl moving forward?	votes
Effectively managing human activities that are currently impacting or associated with Maerl beds (e.g. fishing, scallop dredging, boat anchoring), using new or strengthened regulation and policy.	25
Improving water quality and manage pollutants and their impact on Maerl using catchment and marine based methods (e.g. excess nutrients, sedimentation).	21
Designating Maerl as a marine irreplaceable habitat (the same status as terrestrial habitats).	15
Using enforcement measures to manage illegal activity and or damage to Maerl beds (e.g. fining, judiciary).	14
Increasing public and stakeholder awareness of the value of Maerl beds (e.g. blue carbon store, fish nursery ground) and how it is affected by anthropogenic impacts (e.g. human activity, climate change, invasive species). Using the media, educational programmes, interpretation tools, and community group activities.	13
Including Maerl in MPA network reviews or within designation of new Maerl protected area.	11
Using grants/funding to decommission current scallop dredge gear and adapt vessels for alternative methods such as diving, or disco scallop pots.	9
Greater surveying of Maerl beds.	7
Providing up to date and accessible Maerl bed distribution maps for stakeholders to avoid Maerl beds.	7
Using seabed leasing/ownership to protect Maerl through private means, additionally better understanding responsibility of owner and quantifying the impact of leasing on stakeholders.	5
Explore funding opportunities for further Maerl research and or Maerl associated projects.	5
Research quantifying the value of Maerl beds to different stakeholders.	4
Research gathering evidence of damaged Maerl beds resulting from human activity.	4
Research identifying already healthy and diverse Maerl beds to ultimately lead to their protection.	3
Collect a repository of high-quality video and images of Maerl, Maerl beds and their associated fauna.	2
Establish formal definitions of what Maerl is.	2
Research gathering benchmark science to assess the health status of Maerl beds and their tolerance to human activities.	1

Question 4: Taking those top actions, do you have some inspiring ideas of delivering them?	votes
Invite policy makers, MPs, and leading stakeholders to engage in a discussion on why and how Maerl should/can be protected and the effect of Maerl protection to current practices (for their own and others benefit).	15
Collaborate with Southwest universities to explore possibilities of Maerl based projects – restoration, mapping, identifying assemblages.	13
Designate an MPA with Maerl as the feature of interest.	12
Write to newly elected IFCA representatives.	10
Using the media to get Maerl in the news.	10
Create films, documentaries, and virtual reality with Maerl as a focus.	10
Use established tourism organisations and community groups to spread awareness of Maerl (e.g. dive and snorkel on Maerl beds, drop down video tours on vessels).	10
Rebranding Maerl to increase engagement (e.g. Celtic coral, ancient coral gardens, pink twiglets).	9
Formalise a Maerl network.	7
Crowdfunding with local community groups to lease Maerl seabed and or to “own a square of Maerl.”	6
Create a “Maerl Month” using an interactive exhibition (somewhere like the maritime museum), with mixed media to spread public awareness.	5
Connect Maerl with other habitats such as seagrass.	5
Collaborate with local conservation projects such as the Disco Scallop project.	5
Create a “World Maerl Day”	4
Develop a citizen science method for mapping and collecting Maerl data.	4
Enforcement measures such as fining to include a “Maerl awareness course.”	3
More accessible webinars, workshops, and events for those outside stakeholder and scientific communities.	3
Use art to raise awareness including; performance art, stories, song, interactive activities.	3
Use, embrace and explore innovative technology for Maerl conservation.	3
National marine week Maerl focus.	1

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