



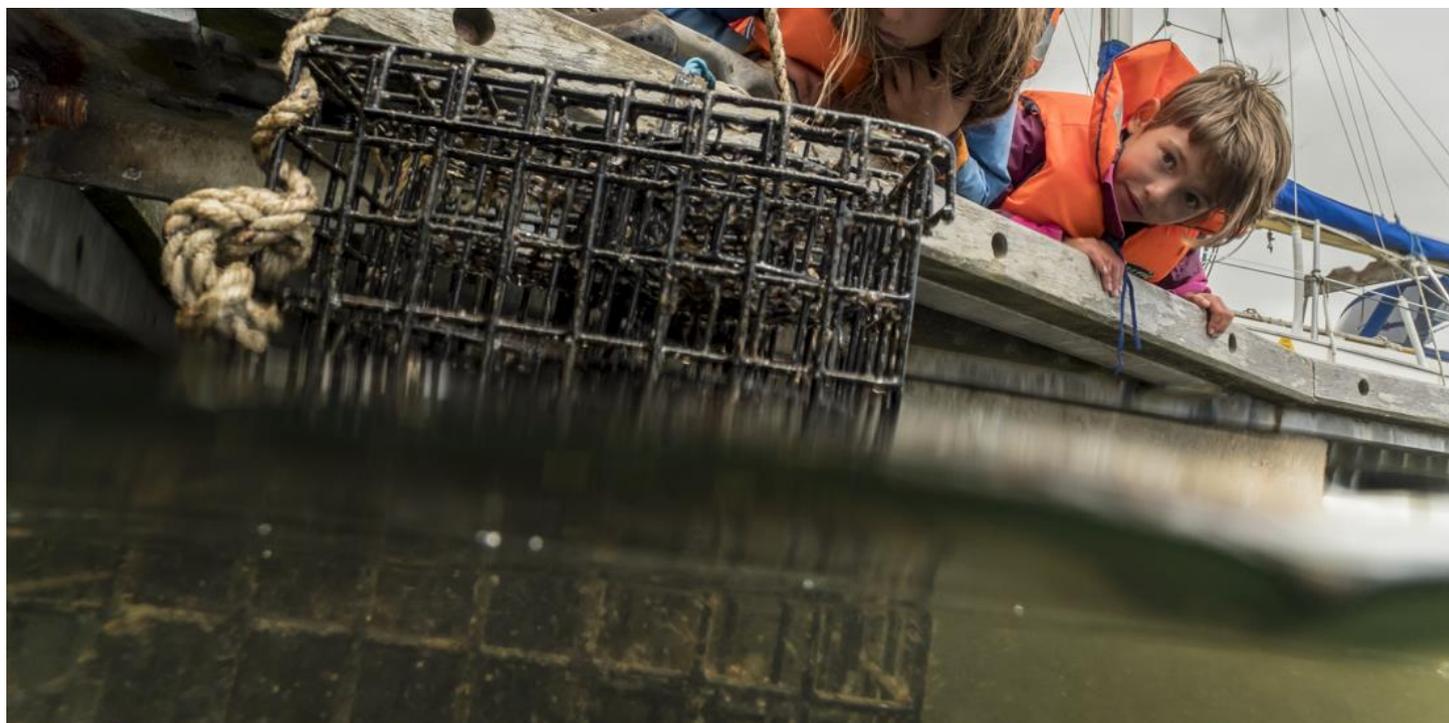
Marine restoration in Scotland: Defining potential for a shared vision



Seagrass, Isle of Skye . Credit: Eileen Armstrong

EXECUTIVE SUMMARY

Active marine restoration efforts in Scotland have emerged from the recognition that many marine habitats, particularly native oyster reefs and seagrass meadows, have been severely damaged by human activity. These habitats have the potential to deliver valuable ecosystem services to humans, including capturing and storing carbon, and so have a key role in meeting Scotland's commitments on mitigating climate change and biodiversity loss. This study sought to provide an overview of current marine restoration activity in Scotland and explore the motivations, challenges and aspirations of a number of existing and planned marine restoration projects, to determine if there is ambition for a shared vision of marine restoration in Scotland. Particular attention was paid to the role of community-led projects in scaling up restoration efforts. Insights gathered from interviews revealed that there are multiple reasons to undertake restoration that extend beyond immediate environmental concerns, including potential socio-economic opportunities linked with tourism and sustainable fishing, as well as enhancing community awareness of, and participation in, the marine environment. A number of challenges were identified that influence restoration project implementation and the capacity for restoration to be delivered at greater scales. There was consensus that community-based groups are best placed to manage marine restoration, but that strategic direction and support is needed. Recommendations are provided that would better enable restoration efforts to be scaled up and to enhance its contribution to overall marine recovery and resilience.



BACKGROUND: MARINE RESTORATION

Marine and coastal habitats – including seagrass meadows, oyster reefs, kelp forests, and saltmarsh – are being lost worldwide at an alarming rate due to human pressures, such as pollution, habitat destruction, and climate change. Recent estimates for global seagrass extent reveal a decline of at least 29% since the 1980s (Waycott, et al., 2009), whereas an estimated 85% of the world’s oyster reefs have disappeared over the last 150 years, making them functionally extinct in many areas (Beck, et al., 2011).

The rapid decline of seabed habitats presents a clear challenge to human society, since they provide many essential ecosystem goods and services, including protecting coasts from flooding and erosion, improving water quality, supporting biodiversity and fisheries production, and providing nature-based solutions to mitigate climate change (Macreadie, et al., 2021).

There is growing acceptance in the conservation community that we need to move beyond just preserving what is left of marine ecosystems through passive interventions (e.g. removing human pressures and allowing for natural regeneration) and complement these with active restoration, where appropriate, to accelerate natural recovery. This can take many different forms depending on the habitat to be restored, but in the marine environment it generally involves techniques such as the translocation of individuals, planting seeds and seedlings, or habitat enhancement to encourage settlement and growth (Bayraktarov, et al., 2016). Parallel to this, the concept of ‘marine rewilding’ has gained popularity in recent years to encompass all actions which promote the recovery of lost or degraded marine habitats, but with a focus on restoring natural ecosystem processes across large scales.¹

The importance of ecosystem restoration, which is broadly defined as “the process of assisting the recovery of damaged, degraded, or destroyed ecosystems” (Society for Ecological Restoration International, 2004) has been recognised at the global level to be crucial for reversing biodiversity loss. This shift in focus is enshrined by the United Nations General Assembly declaring 2021-2030 the UN Decade on Ecological Restoration.² Marine restoration has also gained recent international attention due to the potential mitigation opportunities associated with so-called blue carbon³ sinks (Hoegh-Guldberg, et al., 2019). For example, despite covering less than 1% of the seafloor, seagrass meadows account for up to 18% of total carbon storage in the ocean (Greiner, McGlathery, Gunnell, & McKee, 2013) and can trap and store carbon up to 35 times faster than tropical rainforests (McLeod, et al., 2011).

Although there is currently rapid growth in interest for restoration, restoration in the marine environment has tended to lag behind terrestrial restoration in terms of rate and scale of implementation due to a number of challenges, not least uncertainties surrounding the potential for long-term success (Duarte, et al., 2020). Current marine restoration activities are therefore often

¹ See <https://www.rewildingbritain.org.uk/explore-rewilding/what-is-rewilding/defining-rewilding>

² <https://www.decadeonrestoration.org/>

³ Blue carbon is carbon stored in the world’s seas and coasts.

small-scale experimental interventions at individual sites (Bayraktarov, et al., 2016). If such efforts are to be used to help meet global targets on biodiversity and climate, they will need to be implemented at increasingly larger scales (Gillies, et al., 2015). While how this might be achieved in practice is not yet obvious, lessons from wider conservation and restoration practice suggest that local community support is an important factor to project success (Otto, et al., 2013). This is because when people actively participate in the management of their coastal and marine resources, outcomes tend to be more effective and long-lasting. Examples of successful community-based initiatives to marine conservation issues can be found all over the world, from the creation of Locally Managed Marine Areas in the Western Indian Ocean (Rocliffe, Peabody, Samoily, & Hawkins, 2014) to mangrove restoration in West Africa (Quarto & Thiam, 2018). It is most often the communities living adjacent to degraded ecosystems who have the most to gain from their conservation and restoration. Nevertheless, other players are also involved in marine restoration, including conservation non-governmental organisations (NGOs), academic institutions, government agencies, and private companies. The role and level of involvement of each of these actors varies according to the project.

AIMS AND OBJECTIVES

Community-led marine restoration offers exciting, locally-specific visions for marine habitat recovery in Scotland. However, these initiatives have materialised in an ad-hoc way in the absence of any national vision or strategy with few guidelines or policies directly supporting projects. It is therefore not clear the extent to which community-led restoration efforts can be replicated and scaled up as part of a more integrated national approach.

This project aims to investigate the current status of marine restoration in Scotland and understand the drivers for restoration, the potential challenges restoration projects face, and the scope and aspirations for scaling up marine restoration. This report makes a series of recommendations for how this might be achieved, looking particularly at the role of local communities in marine restoration.

Interviews were held with project staff and community members involved in both existing and planned restoration projects around the Scottish coast. These were supplemented with an interview with a staff member at NatureScot⁴, due to their role in providing advice to restoration projects. Other organisations with an interest in or influence on marine restoration were contacted to take part in the study but did not respond or were unavailable.

The scope of this study is limited to only include *active* marine restoration activities that involve human intervention to restore marine habitats, rather than efforts to reduce pressure on systems and allow natural recovery (e.g. through Marine Protected Areas (MPAs) or spatial management). Nevertheless, we recognise that both active restoration and passive “leave it alone” approaches form part of growing efforts to enable and encourage ecosystem-scale marine recovery (so-called marine rewilding).

⁴ NatureScot is the agency responsible for Scotland's natural heritage and have a role in assessing human activities in the Scottish marine environment.



MARINE RESTORATION IN SCOTLAND

Interest in restoring marine habitats, mainly seagrass meadows and native oyster reefs, has emerged from growing awareness of their importance as part of a healthy marine ecosystem, as well as an acknowledgement that traditional marine management practices may not be sufficient to address their decline (Beck, et al., 2011).

European native oysters (*Ostrea edulis*) were once widespread around Scotland's coastal waters and dense beds used to be found in estuaries and sea lochs. Areas such as the Firth of Forth once supported thriving oyster fisheries, with annual yields of up to 30 million oysters being reported. However, the entire UK population of native oyster has all but disappeared due to over-harvesting, pollution and disease. Only a few remnant populations exist in sea lochs around the west and north coasts of Scotland (University Marine Biological Station Millport, 2007). Oyster reefs are considered to be ecosystem engineers, providing essential habitat for other marine life, much like tropical coral reefs. Oysters can also contribute to improved water quality and clarity by removing excess nutrients and pollutants as they filter feed (Bricker, et al., 2018). A single adult oyster can filter up to 200 litres of water a day.

Seagrass meadows (comprising *Zostera*⁵ spp.) (often referred to as eelgrass in Scotland) are also an important habitat for many marine species, including as nursery grounds for commercially important fish species. Their root structures help stabilise the shoreline and prevent coastal erosion while their long blades trap fine sediments and particles that are suspended in the water column, which increases water clarity and promotes productivity. There has been a significant reduction in seagrass cover in Scotland: approximately⁶ 58% since 1936 (that compares with 44% across the UK) (Green, Unsworth, Chadwick, & Jones, 2021). Remaining seagrass meadows are often fragmented and in poor condition. The reasons for this are complex, however the main drivers of decline include physical disturbance, coastal development and pollution, as well as climate change.

There is legislative recognition of the need to restore and protect both seagrass and native oyster habitat. Both are considered a Priority Marine Feature (PMF) under the Marine (Scotland) Act 2010, a UK Biodiversity Action Plan habitat and an OSPAR⁷ threatened and/or declining habitat. The potential impact of human activities on the condition of PMFs throughout their range is assessed and mitigated through the marine licensing process administered by the Scottish Government (through Marine Scotland). Additional proposals may be introduced to manage specific human impacts (e.g. bottom-towed fisheries) within the Scottish Marine Protected Area (MPA) network. However, there are few legal incentives for restoring marine ecosystems beyond general policy support provided by Scotland's National Marine Plan, which states that "*consideration should be given to opportunities to enhance biodiversity and associated ecosystem services, including recovery and/or enhancement of degraded habitats or species populations*".

⁵ Scotland has two species of seagrass, *Zostera marina* and *Zostera noltii*.

⁶ Seagrass extent is still poorly mapped and historical records on seagrass distribution are limited.

⁷ Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention) 1992

The need for marine recovery is likely to feature in the upcoming Post-2020 Scottish Biodiversity Strategy, since the Scottish Government has already committed to bring forward legislative changes to restore and protect nature, including nature restoration targets to cover both the terrestrial and marine environment. High-level support for marine restoration is also demonstrated by the launch of new project funding mechanisms, including the Scottish Marine Environmental Enhancement Fund⁸ (SMEEF) and the Scottish Government Nature Restoration Fund⁹. Both of these funds are intended to help address ongoing environmental decline. Funding is also being provided by the Scottish Government to support blue carbon research, including to map Scotland's seagrass habitats and identify areas requiring intervention. It is interesting to note that support for restoring marine ecosystems extends beyond the marine policy realm and their capacity to sequester and store carbon has drawn interest from the climate mitigation policy sphere, particularly around opportunities to incorporate blue carbon into the UK's greenhouse gas inventory to help meet net-zero commitments.

NatureScot has recently responded to the increased interest in marine restoration with the publication of the first Scottish seagrass restoration handbook (Kent, et al., 2021) to inform and support communities and others undertaking seagrass restoration projects. Similarly, for native oysters, the European Native Oyster Habitat Restoration Handbook (Preston, Gamble, Debney, & Helmer, 2021), produced by the Native Oyster Network, was published to provide general information on native oyster restoration methods and considerations. NatureScot plans to publish a Marine Enhancement Framework to further support restoration projects in terms of regulator information requirements for different restoration techniques.

Although there is not yet an explicit national policy framework supporting marine restoration at the ecosystem scale, a small number of locally-run restoration projects have already sprung up in Scotland, and more are being developed (see Table 1 for a list of existing and planned restoration projects and Figure 1 for a map of these projects). The majority of these projects are aimed at reintroducing native oysters to the inshore seabed, although some projects are also investigating potential opportunities for restoring seagrass. The Scottish charity, Seawilding¹⁰, is currently leading on the only seagrass restoration project in Scotland in Loch Craignish, Argyll.

The multi-partner Restoration Forth project is planning to restore both seagrass and native oysters in the Firth of Forth. As part of WWF's UK-wide 'Seeds of Hope' programme, it will involve WWF-UK working in partnership with community-based groups, scientists, and other charities to co-design a blueprint for restoration and management of coastal habitats in the Firth. Once underway, this will be the largest marine restoration project in Scotland with project costs estimated to be £2.4 million.

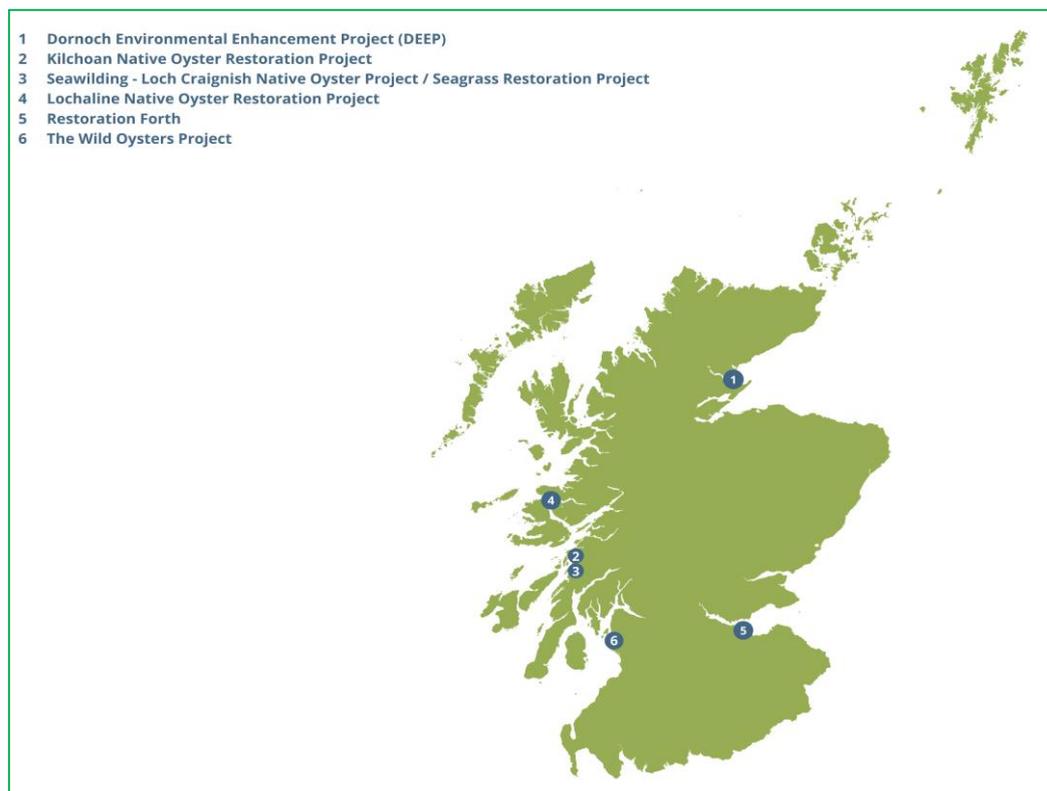


Figure 1. Marine restoration projects in Scotland

⁸ <https://www.nature.scot/SMEEF>

⁹ <https://www.nature.scot/funding-and-projects/scottish-government-nature-restoration-fund>

¹⁰ <https://www.seawilding.org/>

Project	Location	Implementing organisations	Status	Target spp.	Restoration targets
Dornoch Environmental Enhancement Project (DEEP)	Dornoch Firth, Highland	Glenmorangie Distillery, Marine Conservation Society, Heriot Watt University	Ongoing since 2014	European oyster	4 million oysters over 5 years
Kilchoan Native Oyster Restoration Project	Loch Melfort, Argyll	Kilchoan Estate	Ongoing since 2021	European oyster	24,000 oysters per year
Loch Craignish Native Oyster Project	Loch Craignish, Argyll	Seawilding, Craignish Restoration of Coastal and Marine Habitats (CROMACH)	Ongoing since 2020	European oyster	1 million oysters over 5 years
Loch Craignish Seagrass Restoration Project	Loch Craignish, Argyll	Seawilding, Project Seagrass, Scottish Association for Marine Science (SAMS)	Ongoing since 2021	Seagrass	Plant up to 1/4 hectare of seagrass
Lochaline Native Oyster Project	Loch Aline, Argyll	Community Association of Lochs and Sounds (CAOLAS), Seawilding	Ongoing since 2021	European oyster	10,000 oysters initially
Restoration Forth	Firth of Forth	WWF-UK, Edinburgh Shoreline Project, Fife Coast & Countryside Trust, Heriot Watt University, Marine Conservation Society, Project Seagrass, Royal Botanic Garden Edinburgh, Scottish Seabird Centre, The Ecology Centre, The Heart of Newhaven Community, Wardie Bay Beachwatch	Planned for 2022	European oyster, seagrass	Plant 4 hectares of seagrass and 10,000 oysters per year by 2025 / 42 hectares by 2030.
The Wild Oysters Project	Firth of Clyde	Zoological Society London, Blue Marine Foundation, British Marine, Clyde Porpoise CIC	Ongoing since 2021	European oyster	To create a self-sustaining oyster population in the Firth of Clyde (1300 oysters reintroduced as of December 2021)

Table 1. Details of existing and planned marine restoration projects in Scotland

A common element in marine restoration projects in Scotland and elsewhere has been the role of local communities in both their design and delivery. In Scotland, this sits against a growing trend in community participation in local marine conservation efforts, recognising that despite having a stake in healthy, well-managed seas, their voices have traditionally been excluded from decision-making. Community-led marine conservation efforts were spearheaded by COAST, a group of Arran residents who campaigned for the establishment of the country's first (and only) no-take zone as well as the South of Arran MPA. Since then a number of other local community-based groups have sprung up around the coast to address local marine conservation issues. Fauna & Flora International (FFI) has been supporting such communities in playing an active role in marine conservation and facilitating a collective voice for better management of inshore waters through the Coastal Communities Network¹¹. The role of communities in taking forward marine restoration, as part of a cohesive and integrated national approach, in Scotland is therefore pertinent to explore.

¹¹ <https://www.communitiesforseas.scot/>



OVERVIEW OF METHODS

A total of seven targeted semi-structured interviews were held throughout the month of December 2021 (see Table 2 for a list of participating groups). All interviews were conducted online and recorded with the participant's consent. Most interviews were conducted on a one-to-one basis, however some involved more than one individual representing the same group. Interviews lasted approximately 30 to 60 minutes.

Not all groups invited to participate were able to and so information available online for these projects was used as far as possible. COAST was invited to take part in the study despite not having defined plans for undertaking active restoration. Nevertheless, this group has had long-term success in promoting marine recovery through the Lamlash Bay No-Take Zone and supporting other communities to engage in marine conservation more generally, so their perspectives were considered particularly valuable around the topic of community involvement. Friends of Loch Hourn were also invited to take part since they have started work on a potential pilot project for restoration, although have not yet defined their aims.

A pre-prepared topic sheet was used to guide the interview based on several key themes identified *a priori* with a set of questions listed under each theme. These themes included: project motivations and aspirations; the role of communities; challenges and barriers, and; looking to the future of marine restoration in Scotland. The semi-structured nature of the interview allowed a degree of flexibility to explore emerging themes and ask follow up questions.

Participating organisation	Organisation type
Community Association of Lochs and Sounds (CAOLAS)	Charity / community-based group
Community of Arran Seabed Trust (COAST)	Charity / community-based group
Friends of Loch Hourn (FoLH)	Community-based group
Kilchoan Estate	Private landowner
NatureScot	Government agency
Seawilding	Charity / community-based group
WWF-UK	Nature conservation NGO

Table 2. List of participating organisations

The interviews were transcribed and analysed qualitatively using NVivo 11 for Windows. An iterative inductive-deductive process of coding was used to organise and sort the data (Bryman, 2012). This involved close reading of the interview transcripts and assigning passages of text codes to identify key concepts and themes. Relevant project documents were analysed in the same way.



RESULTS AND DISCUSSION

The results are presented and discussed according to the central themes emerging from the interviews. These are organised into three categories:

- 1) Motivations
- 2) Challenges
- 3) Aspirations

Quotations are taken from the interview transcripts to illustrate some of the key points.

MOTIVATIONS

Motivations underpinning marine restoration projects may be varied and complex. Understanding the reasons particular groups decide to restore marine habitats provides insight into the potential for aligning project goals and scaling up restoration practice. In this study, motivations for restoration varied among the participating groups but generally included both ecological and social reasons, including: repairing degraded ecosystems to enhance biodiversity and provide ecosystem services (e.g. improved water quality), delivering local livelihood benefits, and promoting opportunities to reconnect people to the sea.

ENVIRONMENTAL IMPROVEMENT

The emphasis placed on ecological and social motivations varied between interview participants, but all community-based groups responded that the initial motivation to explore restoration was due to a concern for the state of their local marine environment and, in some cases, discovering that there was once thriving native oyster reefs and/or seagrass meadows on the seabed. This was the case for the residents of Loch Hourn who, although primarily concerned with preventing the expansion of a nearby salmon farm due to its ecological impacts on the loch, had discovered remnants of an old oyster population and decided to explore how to reintroduce them. Similarly, members of CAOLAS spoke of their concern for the disappearance of the local native oyster population in Lochaline after finding old oyster shell deposits. The Kilchoan Estate's native oyster reintroduction project in Loch Melfort was discussed as an extension to the Estate's wider rewilding initiative to recover lost biodiversity.

A notable outlier in terms of project motivations in this study is DEEP which was set up to restore native oysters as part of The Glenmorangie Distillery's wider sustainability strategy (supported by Heriot-Watt University and the Marine Conservation Society) to deal with organic waste produced by the distillery and enhance the water quality of the Dornoch Firth.

SOCIO-ECONOMIC OUTCOMES

Some groups also spoke of being motivated by potential long-term socio-economic benefits that could be gained by regenerating the local marine environment, with aspirations to create jobs either through links with tourism or sustainable shellfish harvesting.

“I think there's commercial opportunity in the sense that we might have a sustainable community fishery in the long-term... There's an economic imperative behind what we're doing.”

Providing employment opportunities and tackling depopulation is a key concern for sparsely populated rural coastal communities, which often find themselves economically marginalised following the collapse of traditional industries. Restoring the marine environment was suggested to go hand in hand with supporting local jobs and businesses, such as has been demonstrated on Arran, where visitor numbers have increased since the establishment of the Lamlash Bay No-Take Zone and associated Discovery Centre, including divers who come to witness the marine life thriving just offshore. In Ardfern, Seawilding has already created four fulltime equivalent jobs and attracted up to 200 volunteers to assist with its native oyster reintroduction and seagrass restoration projects. Future aspirations for Seawilding include establishing a local sustainable fishery within Loch Craignish and potentially developing a snorkel trail similar to what has been done on Arran.

PROMOTING AWARENESS AND CONNECTION

Generating local interest in the marine environment was also presented as a motivation for undertaking restoration, and there was a strong desire to get people more involved in marine protection. One participant spoke of the transformational power of getting people in the water to handle oysters and seagrass.

“As soon as you get somebody broadcasting something in the water, they're basically signing up to an idea, which is taking ownership of the loch and protecting what they have and trying to restore it.”

Many of the restoration projects encourage participation by organising community volunteer weekends to release oysters or harvest and plant seagrass. Some projects also provide educational opportunities by deploying so-called “Oyster Hoisters” which house juvenile oysters below marina pontoons where they can be readily retrieved and used for engagement. The participant from CAOLAS discussed how local school children had “adopted” the oysters growing in these cages and participate in monitoring their growth until they can be released into the loch. The rationale for this idea was that the children will grow up feeling a sense of ownership for these oysters and, subsequently, the loch.

“I think the oysters are really just a hook. Because then we can start talking about what else. What else is in the loch?”

“I can see that restoration projects are a very interesting, practical opportunity to really engage sectors of the community in more practical activities involved with the sea.”

It could be argued that the feeling of empowerment and connectedness resulting from the physical act of engaging in the marine environment can be just as important an incentive for restoration as the regeneration of habitats. This view was shared by Seawilding in particular which, alongside its mission to restore degraded marine habitats in Loch Craignish, seeks to empower community members and others to engage in marine protection. The Restoration Forth project will work with communities through various community hubs where partner organisations will deliver outreach and educational activities, including providing hands-on experience with planting and processing seagrass seeds, showing how oysters grow, and communicating the biological, social, and cultural significance of restoring these habitats in the Firth of Forth.

“The benefits of people being connected with their local coastline goes way beyond the restoration project itself. It draws people in and keeps people interested.”

Most active restoration projects have so far largely relied on either a local community group, or individuals with a concern for the marine environment, to deliver the project on the ground. However, not every location where there is a restoration opportunity will there be a community which shares the same motivations to restore the marine environment. As one participant noted, “it's not that easy to find groups that want to do it.”

Understanding local motivations for actively engaging in restoration will be important for scaling up restoration practice in Scotland. It was pointed out that there may need to be better alignment of national drivers for marine restoration (e.g. related to climate mitigation) and local priorities (e.g. job opportunities, education, etc.). The participant at WWF-Scotland spoke of how restoration is often framed in terms of delivering blue carbon benefits in order to garner political support, but reflected that communities, in their experience, were not as motivated by this outcome. This claim is supported by this study insofar as that although climate change mitigation was discussed by participants as a benefit of restoration, it was not presented as the primary reason for initiating projects. It can be argued then that framing marine restoration in ways that resonates with communities is more likely to leverage community support.

Different motivations can influence the choice of metrics used to monitor and evaluate a restoration project. Current restoration projects in Scotland seem to be focussed on the immediate ecological outcomes (i.e. amount of habitat created) of restoration and less so on monitoring social outcomes. It could be argued that this is because most projects have not been running long enough for tangible social outcomes to be realised.

In order to help inform a common understanding of what restoration success looks like and allow for comparability, there needs to be a standardised monitoring and evaluation framework, such as is being used and promoted by Seawilding, that tracks a range of ecological, social and economic metrics. This would allow for the overall impact of restoration action to be measured at local, regional, and national scales and thus facilitate knowledge sharing.

CHALLENGES

Communities and others planning to undertake marine habitat restoration face a number of substantial challenges, which would need to be addressed if restoration efforts are to be replicated and delivered at scales needed to promote ecosystem-level recovery. This study identifies five key challenges, but recognises there may be other challenges related to local contexts.

COMMUNITY CAPACITY

Low levels of organisational capacity to undertake restoration activities emerged as a common theme in interviews with community-based groups. Before starting any restoration project, a feasibility study is needed to understand baseline environmental conditions and whether there are local stressors which might inhibit habitat recovery. Following the selection of suitable restoration sites, communities then need to obtain the necessary licensing and permissions, before proceeding with the project. Once these have been granted, donor sites need to be identified from which a source population can be secured. There are strict biosecurity protocols that need to be adhered to, as well as steps to ensure that local or regional genetic diversity is maintained. This is not to mention the need for ongoing monitoring of the restoration sites following dispersal or planting. For a local community group of volunteers, these steps can seem prohibitively complex and time consuming.

New guidance, such as the seagrass restoration handbook produced by NatureScot, goes some way to address this challenge, but restoration projects are labour intensive and can require up to a year of planning before anything can be placed in the water. Relying on the goodwill of volunteers was identified as a common struggle for many projects. Friends of Loch Hourn discussed how only a subset of “activists” within the group were engaged in taking forward plans for restoration, despite wide community support for the idea, while at Loch Melfort, the Kilchoan Initiative talked of issues around motivating local residents to commit to volunteer time for releasing and monitoring oysters.

“Most community groups are not paid therefore their interest can dwindle after a weekend of training.”

Groups such as CAOLAS, Seawilding, and the Kilchoan Estate discussed that employing paid staff members, fully or partly dedicated to setting up and overseeing their projects, has benefited them in terms of what they can achieve, but this of course requires securing financial resources, which, for some non-constituted community groups, is not currently feasible.

“When we've been talking about restoration, we don't feel with our current complement of staff...that we could actually run a restoration project with the existing resources.”

Lack of expertise was cited as another obstacle for communities wanting to engage in restoration. Many of the projects in this study were in a process of trial-and-error to determine what works best given the local environmental conditions. The risk of failure, however, can be costly for community-based groups.

For this reason, community-led projects are often collaborating with universities and other actors for technical expertise. The Firth of Clyde Wild Oysters Project for example, relies on local delivery partners supported by a national collaboration of organisations¹². The local charity Seawilding (which itself was born from the local community association CROMACH) has partnered with Project Seagrass and the Scottish Association for Marine Science to deliver the Loch Craignish Seagrass Restoration Project.

Knowledge sharing between projects was also found to be an important source of expertise. For example, Seawilding offered bespoke support to help establish native oyster restoration projects at both Lochaline and Loch Melfort (including writing project plans, securing licences and designing equipment). Plans are underway to support other community groups to do the same.

Community-level capacity development is clearly an important consideration for any restoration project and one that needs further attention. Relying on willing volunteers is not necessarily a sustainable model and this study identified a need for 1) investment in paid staff capacity to help run projects and 2) formal mechanisms for capturing and sharing community experiences with restoration. The CCN could be well placed to provide a forum for capacity development and knowledge-sharing, including helping coastal community groups access funding.

FUNDING

Closely related to the issue of community capacity is that of limited funding mechanisms available for projects. Most existing restoration projects are entirely reliant on third sector grants (with the exceptions of the DEEP and the Kilchoan Native Oyster Project, which are both privately funded, and the Loch Craignish Seagrass Restoration Project, which is partly funded by NatureScot in addition to third sector grants). Current challenges around grant funding raised by participants include unrealistic funding deadlines and/or the short duration of support (usually two years.) This creates inherent uncertainties in being able to deliver project outcomes, since the recovery period of native oysters and seagrass can be up to 10 years. The costs of restoration are also likely to be outwith what many community-based groups can feasibly fundraise at an individual level, particularly without dedicated paid capacity to do so.

SMEEF, which has not yet launched at the time of writing, is intended to provide an innovative funding model whereby users of the marine environment voluntarily donate to the Fund which is then used to create ongoing grants for projects which contribute to the recovery of Scotland's seas and coasts. The mobilisation of private finance to fund marine restoration may address some of the shortcomings of other funding models.

PERMITTING AND LICENSING

As restoration is a relatively new field in the marine environment, processes for permitting and licensing projects have not yet fully developed and were described by participants as being cumbersome, lengthy, and confusing. A combination of consents, licences or planning permission may be required for either oyster or seagrass restoration projects. The exact requirements depend on the size of the project, its location, and the intended methods of restoration. For example, depositing material (e.g. a cage) on the seabed would be considered a 'licensable marine activity' under the Marine (Scotland) Act 2010 and require a Marine Licence from Marine Scotland and potentially a seabed lease from Crown Estate Scotland. Planning permission would also need to be sought from the local authority for on-bottom methods, even where it is privately-owned, but not if cages are suspended from an existing marina pontoon.

The main issue highlighted by participants was the difficulty to find someone within the local authority with relevant knowledge on marine restoration to guide them. Marine restoration is an unfamiliar area for many planners.

"They still actually don't know how these oyster restoration projects work. We need to get planning permission and that took eight months. It was an absolute nightmare. People that work for the Council have no idea. It doesn't tick any of the boxes."

As such, licencing requirements can cause significant delays to projects. However, it was reported that the permissions framework is already evolving as more projects get established and the statutory agencies become aware of their requirements. The Marine Enhancement Guidance Framework will, when published, provide additional guidance to projects on aspects such as licensing and planning. However, there are statutory periods for determination of planning applications and scope to reduce this is highly unlikely.

KNOWLEDGE GAPS

Identifying suitable opportunities for marine restoration involves developing baseline knowledge of the

¹² The Wild Oysters Project is a collaboration between the Zoological Society of London (ZSL), Blue Marine Foundation (BLUE) and British Marine.

biological, ecological and physical characteristics of the local environment to determine whether it is suitable for the survival, growth and reproduction of the target species. It is also essential to understand the status of any existing habitat and the potential reasons for its decline or disappearance; just because there was once a relic population does not mean restoration is possible as environmental conditions may have changed. Seagrass restoration in particular has a high risk of project failure which has historically been due to inadequate consideration of seagrass habitat requirements and the stressors that caused the original decline.

Having good baseline data for restoration sites provides a benchmark against which future changes can be measured and factors contributing to project success or failure can be readily identified. The lack of historical baseline data to develop this understanding was reported as a potential barrier for projects. Either the data simply does not exist or is scattered across multiple disparate sources.

“In terms of informing an understanding of where your opportunities might be for restoration, I actually think it's quite challenging for communities to get to the bottom of what information already exists.”

Participants spoke of their own investigations of the nearshore environment through shoreline walks, underwater transects and partnering with universities and government scientists to develop hydrodynamic models of their loch, conduct oyster shell radiocarbon dating and environmental DNA analysis. Local knowledge was also used to ascertain the historical and/or current presence of oysters and seagrass.

In England, the Marine Management Organisation has taken a more strategic approach and developed a national dataset of sites potentially suitable for marine habitat restoration. This is intended to aid local site selection processes. There is certainly a need for a similar exercise to be carried out in Scotland to provide a strategic overview of what can be achieved, and where, in terms of marine habitat recovery. The Restoration of Seagrass for Ocean Wealth (ReSOW) UK Project¹³, which launched in 2022, aims to fill some data gaps around management and restoration of seagrass.

PROTECTION OF RESTORED SITES

Human activities such as bottom-contact fishing, boat anchoring, and finfish aquaculture can all negatively impact native oyster and seagrass, either directly or by altering the environmental conditions necessary for their survival. A key concern for individuals engaged in marine restoration is how to ensure effective and ongoing protection of the restored sites. Around the west coast of Scotland, deep sea lochs and sheltered inshore waters are actively exploited by bottom-trawl and dredge fishing. The sheltered conditions are also viewed as ideal by Scotland's salmon farming industry, which has undergone rapid expansion over the last decade. Scotland has ambitions to increase aquaculture production even further by 2030.

Several participants expressed frustration about the mismanagement of the inshore environment and that damaging activities could legally occur in the areas where they planned to restore seabed habitats.

“And you know what, why are we bothering if they're going to keep on sort of allowing these trawlers and dredges to come in and allowing the expansion of a very unsustainable [salmon farming] industry?”

At present, there are limited options available for communities seeking to protect their restored sites, particularly if these sites are not already situated within an existing MPA (even then protection is not guaranteed as many MPAs lack adequate fisheries management measures). Scottish Government policy was viewed as being contradictory in that it incentivised marine restoration (through the creation of funding mechanisms) but simultaneously encouraged expansion of extractive and other environmentally damaging activities.

“What's the point of piling in hundreds of thousands of pounds into this Nature Restoration Fund if the other half of government is licencing the release of chemicals or bottom-contacting fishing gear in sensitive areas. It just doesn't make any sense.”

There is a growing need for a holistic consideration of the challenges presented by multiple conflicting uses of the inshore marine environment, and a need to integrate marine restoration into sustainable marine management. Regional Marine Plans offer one such possibility, if they enable community-based groups more local ownership over decision making about the marine environment through membership of

¹³ <https://www.smmr.org.uk/funded-projects/restoration-of-seagrass-for-ocean-wealth-resow-uk/>

Marine Planning Partnerships, but their roll out has been slow and fraught with difficulties. Other management options may be available to communities to protect their local marine resource. Two projects in this study are exploring the possibility of pursuing Demonstration and Research MPA (DRMPA)¹⁴ designation for their waters, which although a relatively untested marine management tool, would give communities a greater role in shaping management measures. One distinct advantage of a DRMPA lies in the fact that it allows communities the chance to trial novel management approaches that might otherwise not be available using other management mechanisms, such as Marine Conservation Orders (to protect nationally important species or habitats within Nature Conservation MPAs) or Crown Estate Scotland seabed leases. These tools have been generally underutilised.

A further opportunity for enhancing the protection of restored habitats may lie in their value as a blue carbon store. There are increasing calls for the blue carbon value of habitats to be included as a criterion for MPA designation and protected from damaging activities. MPAs in Scotland have so far not been designated on the basis of their role in climate change mitigation, but this is likely to change as understanding develops on the contribution of blue carbon habitats to meeting Scotland's climate change targets.

ASPIRATIONS

This section focusses on what participants thought of the future of marine restoration in Scotland and how it could be delivered at scale.

KEEP IT LOCAL

When communities are involved in marine management, and local knowledge is incorporated into defining management solutions, more locally sensitive and lasting outcomes can be achieved. This is something that all the participants recognised when they spoke of the role of communities in marine restoration. There was consensus that communities are best placed to manage marine restoration, with one participant highlighting that small-scale restoration projects represent a tangible means to respond to the global nature and climate crises.

“We can't save the planet. But you can do your little bit in your backyard...And I think there's strength in that, and there's resilience, and there's sustainability.”

When asked how projects are currently involving local communities in restoration, the most common responses were through citizen science, educational outreach and volunteering activities. These were discussed as a means to not only raise awareness of marine restoration projects, but to enable broader participation in marine conservation.

Seawilding can be said to be the true pioneer of the community-led approach to marine restoration in Scotland. Although embedded in the community of Ardfern at Loch Craignish, the Seawilding team develop and disseminate best practice, low-cost marine habitat restoration methods to help other communities develop and manage their own projects. They also employ a community outreach team to deliver training to communities all along the west coast of Scotland in baseline survey, coastal biodiversity survey and oyster monitoring techniques. The participant from Seawilding described it as having evolved into a network, involving other community-based groups, schools, and volunteers.

“The wider aim of the charity is to look beyond Loch Craignish to use this as a sort of testbed, and to help other communities do the same thing as we are doing.”

NatureScot was also supportive of a community-led approach, acknowledging that it addresses the logistical difficulties of monitoring the marine environment in remote areas. They nevertheless cautioned the need for projects to adhere to protocols around biosecurity planning and robust data collection and encouraged projects to contact them at the pre-planning stage.

There is clearly appetite for community-led marine restoration in Scotland with one participant noting how a top-down government-led approach would take too long and be bureaucratic. Participants discussed how mobilising people to engage in grassroots restoration action can create a sense of ownership of the seabed, which in turn would help secure long-term interest in its protection and sustainability. It also addresses a growing desire among coastal communities to have more rights and control over their marine resource. A community-led model, involving groups of passionate, committed individuals providing informal peer-to-peer support, is one which has enormous potential for replication at scale. It can be “fleet of foot” and is not beholden to demands of multiple stakeholders. Communities and ‘friends-of’ marine groups sharing a waterbody or an interest in the same protected area could be identified and

¹⁴ Any non-state party in Scotland can put forward their own proposals for a DR MPA which would specifically test sustainable marine management approaches. There is currently only one DR MPA in Scotland.

supported to progress joint restoration actions through networks such as the CCN.

“And then we start working not only as a Friends of Loch Hourn, but we start working as a community in the CCN network.”

Small patches of restored habitat across a seascape can grow and potentially seed additional patches near to the restoration area, creating a habitat mosaic. Nevertheless, scaling restoration efforts beyond the small-scale, short-term, projects to larger projects spanning entire waterbodies requires greater levels of political support, scientific research, and the mobilisation of financial and other resources, not to mention the need for a diverse set of skills and experience to coordinate multiple restoration activities. This kind of support is usually leveraged by communities seeking partnerships with other actors, including nature conservation NGOs, universities and other marine users. The Restoration Forth project offers one model for how a large-scale partnership approach to restoration might be achieved in practice; dividing roles and functions among different partners and across community hubs to develop a shared vision of a healthy marine environment in the Firth of Forth. Although NGO partners are currently leading the project, the hope is that by the project’s completion it will have inspired greater involvement of other local communities in the restoration activities.

Such “flagship” projects, involving many partners, have the added benefit in that they can attract positive political and media attention and generate wide public support for marine protection, exemplifying the benefits of successful restoration and catalysing further action. However, the role of the community via local community institutions is still singularly important for achieving lasting conservation outcomes and thus multi-partner projects should ensure community-based groups are viewed as equal, autonomous partners in all aspects of project design and delivery.

STRATEGIC SUPPORT

Despite the role of the local community being viewed as essential in progressing marine restoration in Scotland, it was acknowledged by some participants that some level of national support is necessary, with one participant noting that *“communities are really having to go it alone.”*

A frequent suggestion was for the Scottish Government to have a role in providing a national framework or plan that would provide strategic direction and support for community-led marine restoration. A new Natural Environment Bill is due to be introduced to the Scottish Parliament in 2024, which will include, among other legislative changes, legally binding nature recovery targets to halt the decline of Scotland’s biodiversity by 2030. This will cover both the marine and terrestrial realms. Such a strong legislative driver will undoubtedly prompt national level interest in marine restoration project development but, as has been demonstrated already, the community-led model is one which has significant potential to deliver benefits beyond just ecological recovery.

To ensure community voices are front-and-centre of efforts to recover the health of Scotland’s seas, one option would be to establish a Marine Restoration Working Group to act as a forum through which to develop and promote marine restoration best practice, capture and address the various barriers to restoration project development, coordinate monitoring to fill key knowledge gaps, identify funding and provide a platform for community groups to influence future policy. In the short-term, however, communities and others already involved in restoration projects need to feel confident that their efforts are not going to be undermined by policy incoherence that simultaneously promotes marine environmental recovery and allows for the continuation of environmentally damaging practices in inshore marine areas. Effective policy is needed to better protect marine habitats. Local measures that promote recovery of Scotland’s marine environment also need to be recognised and valued as not only good for local communities, but for society at large, and community-based groups should be incentivised to implement restoration efforts.



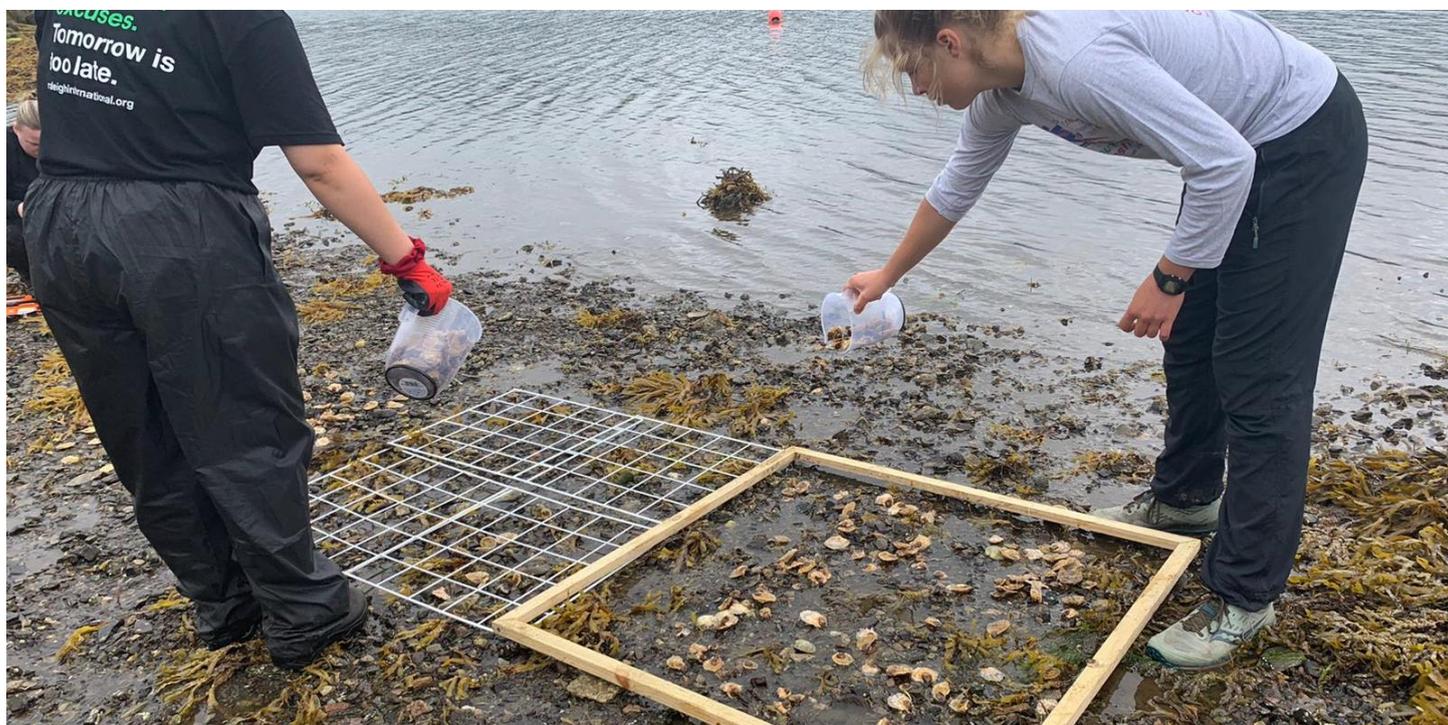
CONCLUSION

Marine restoration is a new but rapidly growing field in Scotland, responding to concerns of the deterioration of marine habitats and the other potential opportunities that can be gained from facilitating their recovery, including job creation. Yet current marine restoration activities are mostly small-scale, community-driven, projects that have arisen in the absence of a cohesive national vision or framework. For restoration to provide ecosystem service benefits and help achieve Scotland's biodiversity and climate commitments, efforts need to be scaled up.

The findings of this project suggest that it is perhaps too early to say whether a more integrated scaled up approach to marine restoration will emerge, but what is clear is that the community-led approach, supported by an emerging informal peer network, is one with significant potential for replication across Scotland, reflecting a desire among coastal communities for greater control over management of their marine area. Local-scale restoration projects can deliver not only ecological outcomes, but also promote wider community awareness and involvement in the marine environment, which should be considered just as valuable. However, current projects face numerous challenges including limited community capacity, lack of access to long-term funding, lengthy and complex permitting processes, knowledge gaps and the absence of a guarantee that restoration sites can be protected from other damaging activities. As projects increase in spatial scale they require levels of planning, coordination and financing that can be accessed by forming collaborative partnerships with conservation NGOs, universities and others. The Restoration Forth project in the Firth of Forth offers one such partnership model that could be replicated in other parts of the Scottish marine area.

Scaling up also requires developing strategic direction. Greater support from the national level is needed for restoration activity, both in terms of providing an overarching framework as a basis and guide for new projects, but also to address some of the challenges identified in this study. It is essential that any form of national input or oversight does not undermine or restrict the bottom-up approach to marine restoration that has appeared in Scotland. This will require careful consideration.

As we move through the UN Decade on Ecosystem Restoration, there needs to be recognition of the critical role of people as stewards of their marine environment and empowering communities should be at heart of efforts towards recovery and protection of damaged and modified marine habitats. Local leadership is needed to reverse biodiversity loss and help strengthen the resilience of the marine environment so that it can continue to provide long-term societal and climate benefits.



RECOMMENDATIONS

The findings set out in this report have been synthesised and used to make a series of recommendations that would help address some of the common challenges that have been identified as relevant for scaling-up marine restoration practice in Scotland whilst ensuring a community-centred approach to efforts to recover Scotland's marine environment.

1) Convene a Marine Restoration Working Group, with strong community representation, to develop a national strategy/framework for restoration.

This could allow for discussions around the need for, and format of, strategic support for restoration, which addresses the various challenges and opportunities identified in this study.

2) Facilitate networking and promote development of collaborative projects among communities with an interest in marine restoration.

There is a clear role here for the CCN to provide the forum for this kind of community exchange and support projects in seeking funding.

3) Streamline the consenting framework for different restoration techniques.

A more streamlined and consistent consents and licensing approach for marine restoration projects would speed up the approval process and reduce the financial and bureaucratic burden on projects.

4) Encourage projects to use a standardised monitoring and evaluation framework that captures the full range of restoration outcomes.

In order to capture the multiple potential outcomes of marine restoration projects and measure progress towards meeting future restoration targets, there is a need for a coordinated approach to monitoring and evaluation across ecological, social and economic outcomes.

5) Undertake a high-level strategic assessment of opportunities for restoration to inform where more detailed site-based assessments are required.

A key challenge for new projects is identifying suitable sites for restoration. Local level site selection could be better supported by a strategic assessment of restoration potential using a combination of current and historical records and habitat suitability modelling.

6) Develop long-term funding mechanisms for restoration projects, including investment in community capacity.

The recovery of marine habitats can take many years and so there is a need to scale up investment for

for marine restoration. The establishment of SMEEF is likely to address this challenge but other innovative finance mechanisms may become available as the science around blue carbon and blue carbon credits advances and should be explored.

7) Better enable local participation in the conservation of marine areas through the use of management tools (such as DRMPAs, Crown Estate Scotland leases, etc.)

There is a desire among those undertaking restoration to be able to ensure the long-term viability of what they have restored, which links to broader discourses of community disempowerment when it comes to the way the marine environment is managed. A number of statutory tools exist that support local management of marine areas, however their use in enabling stronger community control in marine management has been limited.

8) Recognise the key role communities have in protecting and restoring marine biodiversity in Scotland and encourage community-led restoration activities to help meet Scotland's targets on nature and climate.

Coastal communities should be encouraged to play an active role in marine conservation and restoration efforts, recognising that the benefits of local action extend beyond immediate environmental outcomes to include enhanced community participation and stewardship. The community-led approach to restoration which has emerged in Scotland should be welcomed and supported to maximise the benefits from marine recovery.

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Oysters on mudflat. Credit: Seawilding

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