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Marine and coastal ecosystem stewardship

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1. Introduction

Our seas and coasts are an asset with rich and varied resources, both living and non-living. They support livelihoods through marine and coastal industries such as fishing, aquaculture, energy extraction and tourism. They provide spaces for recreation, play and relaxation. For the many of us who live at the coasts, the marine environment provides a sense of place and identity.

Indeed, in some locations, particularly small island nations, our seas and coasts define cultures, and cultural practices such as ‘pearling’ (the traditional sea-use of harvesting pearls from oyster beds in Bahrain) have even been entered into the World Heritage List¹.

¹ <http://whc.unesco.org/en/list/1364>

However, our oceans and coasts face many challenges (UNEP/GPA 2006). The Deepwater Horizon-BP oil spill is a stark reminder of the dependence of coastal communities on healthy seas. Considered the largest accidental marine oil spill in the history of the petroleum industry, the spill led to extensive damage to the marine environment as well as impacts on other marine industries such as fishing and tourism². Oil spills are but one threat to the marine environment. In 1992, the Canadian Minister of Fisheries and Oceans, John Crosbie, declared a moratorium on the Northern Cod fishery after six Canadian populations of Atlantic cod (*Gadus morhua*) collapsed largely due to overexploitation. In 2011, 28.8 percent of fish stocks were estimated as overfished (FAO, 2014) which causes negative ecological consequences as well as leading to reductions in fish production, with negative social and economic consequences. Dredging and trawling also has major impacts on the ecological communities of the sea floor. Other problems include rising levels of microplastics and waste detritus in general, water-quality issues such as the impacts of agricultural fertiliser and pesticide run-off, the dumping of toxic wastes in the deep sea and the introduction of non-native species. On top of these sea levels are raising, oceans are becoming more acidic, and sea currents are changing as a result of climate change. The need for improved stewardship of coastal and marine resources is increasingly evident around the globe. But what is marine stewardship and how can we apply stewardship in these environments?

This chapter identifies three key challenges to marine stewardship including: the lack of a definition or global understanding of a 'marine stewardship' concept; issues around property rights in the oceans; and difficulties in gaining knowledge/understanding about the marine environment – often limited by accessibility and costs. These are followed by three case studies which highlight and describe ways of dealing with these issues, linking directly back to the principles of landscape stewardship. Commonalities between case studies are then discussed, and we conclude with a definition of what 'marine stewardship' could be.

² <http://uk.reuters.com/article/2010/05/30/us-oil-rig-impact-factbox-idUSTRE64T23R20100530>

2. Challenges in marine stewardship

Landscape stewardship focuses on five principles relating to 1) balancing use and conservation; 2) working at a landscape scale; 3) intersectoral coordination; 4) participation, adaptation and learning; 5) and appreciation of a diversity of knowledges (Cross reference to introduction).

However, there is no existing collective understanding of what constitutes marine stewardship.

Researchers investigating stewardship approaches to our seas have invoked a range of management and governance concepts such as ‘adaptive governance’ and ‘institutional entrepreneurs’, often with a key focus upon policy and legislation (Laffoley 2002, Österblom and Folke 2013, Scyphers, Picou et al. 2014). At other times they have focused upon community-based activities and learning aimed at generating curiosity about the oceans and their conservation (‘ocean literacy’) (Prives 2012, Silbernagel, Host et al. 2015). For some,

‘stewardship’ could refer to protection of the seas, conservation and restoration (Davies 2004).

For others, it might mean sustainable development and a way of managing ‘blue growth’ (Gray and Hatchard 2007). There might also be differences in who is recognised as a ‘steward’:

governments, NGO’s, researchers, local communities? The notion of stewardship has been used

in relation with specific sectors, particularly fisheries (e.g. the Marine Stewardship Council which recognises and rewards sustainable fishing practices³, but does not define ‘marine stewardship’ in holistic terms).

It has been used in investing in community initiatives and

projects such as beach cleans (e.g. the Crown Estate Marine Stewardship Programme in the

UK⁴), and also in providing educational tours and programmes (e.g. the Marine and Oceanic

Sustainability Foundation who develop geo-tourism and citizen science projects⁵).

³ <https://www.msc.org/>

⁴ <http://www.thecrownestate.co.uk/our-business/stewardship-programme/>

⁵ <http://www.mosfoundation.org>

Although there are similarities in implementing stewardship activities in both terrestrial and aquatic systems, the notion of stewardship in the marine environment faces unique challenges. Our seas and coasts are complex spaces which complicate stewardship in these areas (Jentoft and Chuenpagdee 2009). In many ways, they are open access and have less-defined property rights compared to terrestrial landscapes. In AD 529 Emperor Justinian declared that the ‘...sea is common to all, both as to ownership and as to use. It is owned by no-one...’(Watson 2009). However, throughout the Middle Ages, coastal states began to exert their sovereignty over their adjacent territorial waters. In 1608, Hugo Grotius wrote ‘Mare Liberum’ (Free Sea) (Grotius 1619) which resulted in the ‘three mile rule’ where states could claim jurisdiction over the distance that a cannon ball could be fired from the coastline. It was not until 1982 that an international convention was adopted which established territorial sea limits and economic jurisdictions (UN General Assembly 1982). However, this is only the right for a nation’s use, not that of an individual. From that point of view, our seas largely still face an open-access regime with ill-defined property rights. Moreover, multiple jurisdictions in the sea can lead to competition and conflict amongst governing bodies as well as uncertainty about accountability, making it difficult to resolve issues around damage from e.g. trans-boundary factors. For the same reasons, enforcement of stewardship activities, such as those affecting harvesting of resources, is more difficult in the sea than on the land.

Furthermore, many of us, when we look at the sea, see an expanse of blue – not comprehending the 3D environment that operates below the surface. A lack of understanding or in some cases misconceptions about the oceans and coasts may mean that the public believe that oceans are too big for people to affect or the resources may be ‘out of sight – out of mind’. However, it is not just the general public who lack knowledge about our seas and coasts. A large amount of biological and geophysical information has been gathered in many areas, however there is still a chronic lack of knowledge about many aspects of the marine environment, particularly in terms of the nature and extent of human effects on these areas. Because of this, we continue to experience ‘shifting baselines’ where each generation believes that what they experience in the

sea is normal, even though the conditions are seriously impaired. Linked to this, offshore stewardship activities (such as research and restoration) are extremely expensive, requiring the use of boats, fuel and occasionally diving. They also have very little direct association to the day to day life of an individual; it is very difficult to engage the general public in offshore stewardship because accessibility is limited. This means that marine stewardship can rank low in the agenda of policymakers.

3. Marine stewardship case examples

3.1 The application of stewardship principles to marine protected area management in England

This case study discusses an informal consultation process on management options for two recently designated Marine Conservation Zones (MCZs) on the Sussex coast, off of the southeast of England. As part of its commitment to the Convention on Biological Diversity and the OSPAR Convention (a convention which started in 1972 with the Oslo Convention against dumping and was broadened to cover land-based sources and the offshore industry by the Paris Convention of 1974), and implementation of the EU Marine Strategy Framework Directive, the UK are following a roadmap to designate an ecologically coherent network of Marine Protected Areas (MPAs) by 2020. Marine Conservation Zones (MCZs) are a new type of MPA designation, set up to protect nationally important marine wildlife, habitats, geology and geomorphology inshore and offshore in England and Wales. Beachy Head West MCZ and Kingmere MCZ were designated in 2013 to protect their unique chalk habitats, and black bream population and nesting sites respectively. These sites are also heavily used for commercial and recreational fisheries and other recreational use on the busy English south coast, and for this reason the Sussex Inshore Fisheries Conservation Authority (SIFCA), in collaboration with the Marine Conservation Society and independent academic researchers, organized an informal consultation process. This process aimed to facilitate deliberation regarding potential implementation measures for

the mobile, static and recreational fisheries sectors in order to inform the decision-making process.

The process involved two stages. First a series of ethnographic video interviews were undertaken with 41 stakeholder representatives from the different fisheries sectors, government, agencies, conservation and recreation sectors. These interviews focused upon key issues in relation to the MCZs and were compiled in a structured way in a documentary using the Community Voice Method (CVM; Cumming and Norwood 2012) to reflect the wide range of different views held by stakeholders. The CVM is an approach to stakeholder engagement that aims to foster more informed, inclusive, and ongoing civic dialogue in communities, particularly where there has not been a history of successful planning initiatives. The documentary presented a distillation of local discourse around the seascape and MCZs in general, and Kingmere and Beachy Head West in particular. The film then fed into a series of six qualitative participatory multi criteria analysis workshops with 13-21 participant each, facilitated by one of the authors (Kenter) and a colleague, where participants were asked to evaluate potential management options against the criteria for good management that were expressed by stakeholders in the film. These criteria included the conservation objectives of the sites, the potential impacts on livelihoods for different fisheries sectors, impacts on recreational use, ease of enforcement and degree to which particular management might lead to conflict between different users. The criteria were discussed in small sub-groups, and then individuals voted on which management options best met the particular criterion. Following this extended deliberation, participants were presented back with the results and voted on which management option they would prefer overall, with a final opportunity to suggest changes or make provisos. The workshop was openly advertised through a wide range of channels. The majority of workshop participants represented different fisheries interests (static gear, mobile gear, commercial angling/chartering, recreational angling), and a large minority representing conservation interests, formally (i.e. NGO or agency representatives) or informally (members of the public with a conservation interest), reflecting SIFCA's competency. A small number of

individuals represented other interests (e.g. diving, archeology, aggregate extraction). In the discussions, local knowledge played a more important role than expert knowledge, and the main power dynamics revolved around the relative social status of different individuals within the fishing community, and tensions between different types of fishing; these issues were actively managed by facilitators to try and guard inclusivity as much as possible.

While not explicitly framed as taking a Marine Stewardship approach, the transdisciplinary study reflected the five landscape stewardship principles to a lesser or greater extent. There was deliberation on how to bring together both use- and conservation related goals, and explicit recognition of who would win and who would lose out as well as attention to dealing with different stakeholder interests fairly (Principle 1). In terms of scale (Principle 2), the areas under policy consideration were fairly large, reflecting areas coinciding with seafloor geology and –morphology, and benthic ecosystems. However, a clear limitation of this principle in practice is that, as with bird species, fish populations can be highly mobile, so there are limitations to managing them within MPAs, and this could frustrate the discussions. For example, in Kingmere MCZ the defining sea bream population was a seasonal resident, and participants regularly commented that ‘if we protect them, the French will just catch them’. Fisheries management is also restricted in that there are different regulations and management agencies for inshore and offshore fleets. The project was highly inter-sectoral (Principle 3) with a wide range of stakeholder interests reflected, though not in equal proportions. Relative representations reflected the remit of SIFCA, which was to balance fisheries and conservation interests, but it was not empowered to legislate other sectors. This reflects some progress but also continued institutional challenges in transcending departmental silos. The film and consultation emphasized participation and a diversity of knowledges (Principle 4). The approach also recognized the limitations of scientific evidence, and participation and local knowledge was also emphasized in some of the proposed management options, e.g. where fishermen themselves were active data-gatherers contributing to the monitoring required for adaptive management (Principle 5).

Despite many misgivings about the MCZs by some stakeholders, and significant potential for conflict between different interests, the process generated significant learning between participants from different backgrounds. It was also seen as a positive way for SIFCA to engage with stakeholders, while it also helped decision makers themselves to reflect on the social impact of different management measures. The bylaws that eventually were put into place by SIFCA largely followed the workshop outcomes, combining more adaptive management for activities that have less ecological impact (recreational and static gear fisheries) with more severe restrictions for use of mobile gear. Thus, as a whole the project can be seen as an expression of marine stewardship, and the mostly positive experience with the process means it will be further developed around the implementation of other MPAs. However, it is also important to recognize that Land/seascape Stewardship principles can only be implemented in so far as the institutional setting allows it. Examples of important restraints in this case were the designation of the two MCZs themselves and their conservation objectives, which was not up for discussion, the limitations of SIFCA's competency to deal with only a subset of marine activities, political boundaries that did not always match ecological reality, and larger scale social-economic constraints (e.g. EU fish quota's).

3.2 Transformations in a marine co-management process on the island of Barra, Scotland

The island of Barra in the Outer Hebrides, Scotland, has seen particular, interlinked social and environmental challenges that have conditioned the community throughout time. Buffeted by the Atlantic sea and perched at the periphery of the most westerly inhabited islands in Scotland, Barra is linguistically different to mainland Scotland, religiously distinct from much of the rest of the Hebrides and bears the psychological legacy of nineteenth century Highland Clearances (mass evictions of people to make way for sheep-farms and hunting-estates). This case-study illustrates how local understandings of the meaning of conservation are inextricably linked with a human value system which shapes, and is shaped by, the natural environment. The context for

this case study is a prolonged and bitter conflict between the local community and the Scottish Government around the creation of two marine protected areas (MPAs) off the coast of Barra, an island with a strong maritime heritage. This conflict illustrates how the above- and underwater seascape of the marine environment shapes, and is shaped by, complex interactions between human ideas, social structures and processes, and the physical features of the natural environment. It also shows how a marine stewardship ethic is in the process of unfolding in relation to management of one of these MPAs, in the form of a transformational community-led co-management process with the Scottish Government. References to 'community', 'local people' and 'islanders' in this case study are by no means intended to imply the existence of a homogenous 'community' on Barra who share similar values, interests, positions and needs. Rather, the local voices involved in the conflict on Barra comprised a heterogenous, dynamic and richly diverse group of people, who were not necessarily always in agreement with each other. This reflects the power relations at play within this small and close-knit community (in addition to the power relations at play between members of the local community and members of the policy environment).

Since 2000, many islanders on Barra fiercely resisted the creation of two European-driven MPAs (as part of the Natura 2000 network), espousing a fear of losing control over their marine resources. Visions of space produced by maps generated by the Scottish Government conflicted with local visions of space that emerged from embodied ways of knowing the marine environment on Barra (for example, through fishing). The conflict was characterized by a lack of meaningful communication and co-operation, different 'languages' being spoken at local level and within the policy environment, different value systems at play and local people feeling that their voices were not being heard by the Scottish Government. The island's rich maritime heritage suggested the presence of embedded values that appeared to be colliding with values driving the MPA designation process. In-depth research carried out by Brennan (2015) on Barra tried to understand what 'conservation' means for the islanders and to find a way of connecting the worldviews of decision-makers with the marine environment lived and experienced by local

people. This research was shaped from the outset by a desire to value ‘a diversity of perspectives and “ways of knowing”, including local and indigenous knowledge, of landscapes and natural resources’ (Principle 5). Brennan argues that for a community with a strong fishing heritage, and who are shaped by their relationship with their marine environment, the definition of place needs to explicitly include immaterial forms. This is not least because what lies beneath the surface of the ocean is largely invisible to most people. Herein lies an important distinction between more ‘terrestrial’ communities and an island community such as Barra which has had, throughout its history, a dynamic and complex relationship with the sea. MacKinnon and Brennan (2012) have observed emotional ‘communities at sea’ (St. Martin 2006) which embody a sense of belonging and responsibility to the waters around Barra. This work reflects the importance of valuing, and making legible within the policy environment, a different way of knowing the marine environment (Principle 5).

Local relationships with the natural environment (notably how people work and manage it) embody and express distinctive cultural values. In this sense, the fear of loss of local control over marine resources can be understood as a fear of loss of a distinctive way of knowing and sense of belonging to place.

Since 2012, a slow transformation in the relationship between key government officials and leading members of the Barra community has resulted in the emergence of a community-led co-management process for the most contested of the two MPAs, located in the Sound of Barra off the east coast of the island. This MPA also affects two other small island communities (South Uist and Eriskay) which border the Sound of Barra. The fiercest resistance to the MPA has, however, come from islanders on Barra. The current constructive engagement of key Barra islanders with the policy environment through dialogue with Marine Scotland, the responsible Scottish Government agency, illustrates the carrying out of planning and management at ‘landscape’ scale while recognising the implications of management at different scales, through working with the policy environment (Principle 2). It seems that key people on Barra realise

that having control of their marine resources is not a static concept and that they need to be open, through dialogue, to coming to mutually acceptable ways of describing this control. There appears to be an emerging acknowledgement that control of marine resources in the Sound of Barra may not look like what it has looked liked in the past, before the conservation area was designated. Both policy-makers and the people of Barra appear to be moving from existing (static) to evolving (dynamic) conceptions of management and stewardship of the marine environment. The delegation of responsibility to local people by the Scottish Government suggests that policy-makers are recognising and acknowledging the relationship between cultural diversity and biodiversity expressed in local people's relationships with their marine environment. The people of Barra are in the process of finding a way to articulate the management of local marine resources in a way which respects these relationships and existing social structures and also meets the needs of the policy environment (specifically, the satisfaction of the conservation objectives associated with a marine Special Area of Conservation under the European Habitats Directive).

The evolving and emerging co-management process on Barra reflects changes in the positioning of key actors in the conflict, illustrating recognition by Marine Scotland of islanders' ways of knowing (Principle 5). It also reflects willingness by key islanders to work with the policy environment to develop a way to sustainably manage the natural resources of the Sound of Barra in a way which makes sense, culturally and socially, to the people who live and work that environment.

A distinctive feature of the community-led co management process is that is it unfolding. It was realised at by Marine Scotland at the end of 2012 that anything which suggested a *fait accompli* would not achieve a workable partnership with the Sound of Barra communities. For example, a draft management proposal sent by Marine Scotland to the Barra community at the end of 2012 was not well received, despite its reflection of community concerns, such as the effect of the conservation designation on Barra airport. The unfolding, and deliberately unrushed (on the

part of Marine Scotland), nature of the process has created a space and a process to enable the values, worldviews and ways of knowing and doing of the Sound of Barra communities to be articulated (Principle 5).

In 2014, Marine Scotland appointed (and funded) local community organisation Voluntary Action Barra and Vatersay (VABV) as facilitator of the development of a community-led co-management structure for the Sound of Barra MPA. This is a clear departure from the policy environment norm of appointing an external 'expert' to fulfil this role. It is also an important acknowledgement of local knowledge and expertise. The remuneration of VABV to carry out this role conveys a powerful message, both symbolically and literally, that Marine Scotland values and respects local ways of knowing and doing on Barra (Principle 1). This message is being reiterated by Marine Scotland's willingness to fund VABV to carry out further work needed to determine the management group structure and members. The balancing of the protection of biodiversity of the Sound of Barra with the rural livelihoods intertwined with that diversity is illustrated by Marine Scotland's willingness to support the Sound of Barra communities in leading the co-management process (Principle 1). The social learning associated with this highly participatory management approach is huge (Principle 4), not least because the Scottish Government has never before engaged in an approach that is quite so radical in relation to management of the marine environment.

Despite the opportunity for community empowerment presented by the community-led co-management process (or perhaps because of it), tensions continue to exist between key actors on Barra. These tensions are notably between those constructively engaged with dialogue with the policy environment to find a way forward, and some members of the local protest group SHAMED (Southern Hebrides Against Marine Environmental Designations) who continue to remain intransigent and suspicious. (SHAMED was formed by several islanders on Barra in 2008, in response to the proposed MPAs). While key members of this group are actively involved in the co-management process, their involvement is not always constructive.

With regard to inter-island relations, the appointment of VABV as facilitator of the development of a community-led co-management structure was not without controversy. Marine Scotland suggested employing a facilitator who would live in the Barra community for a year; *Stòras Uibhist* (the local community landlord on South Uist) proposed appointing an external consultant; The Development Manager of VABV put VABV forward as being prepared to fulfil the facilitation role in-house. Marine Scotland chose to entrust the role to VABV. The relationships that had been built up between the policy environment and key local people on Barra (including the Development Manager of VABV) convinced Marine Scotland that VABV was capable of successfully facilitating the process to provide options for a governance structure to manage the Sound of Barra. This appointment inevitably created tensions within the South Uist community where Barra was perceived as driving this new process with the Scottish Government.

This is a time of huge potential for the Scottish Government and the people of Barra to open up new possibilities for natural resource management and conservation. The progressive community-led co-management process which is currently unfolding on Barra is starting to shape a new narrative which links cultural diversity with biodiversity. This is a direct result of the emphasis by VABV on the need for local decision-making power so that management can be carried out 'through the eyes of the local people'. It also illustrates a repositioning of different kinds of knowledge so that scientific and 'expert' knowledge are less likely to be perceived as tools of oppression. It marks a clear departure from mainstream conservation policy and practice which tends to treat humans and nature as separate by assuming that non-human nature is distinct from human culture. The form that this new narrative takes has the potential to become an exemplar of a more integrated understanding of conservation and natural resource management in practice which better reflects the complex and dynamic nature of social-ecological systems. In particular, it is suggested that this process has planted the seeds

necessary to reflect the entanglement of nature with culture and society and to respect local ways of knowing and doing.

3.3 Interactive marine spatial planning for offshore renewable energy

The world's largest ever single prize for innovation in marine renewable energy, the £10 million Saltire Prize Challenge, was launched in Scotland in 2008. To be considered for this prize, teams must demonstrate, in Scottish waters, a commercially viable wave or tidal stream energy technology that achieves the greatest volume of electrical output over the minimum of 100GWh over a continuous two year period using only the power of the sea. In 2010, to enable this competition, Marine Scotland (managers of Scotland's seas) and the Crown Estate (owners of the UK seabed), made available a number of seabed lease opportunities. One such potential lease site was located at the south end of the Kintyre peninsula, on the south-west coast of Scotland. However, diverse industries and activities operate around and within the lease area including fishing (mostly creeling/potting), shipping, tourism (wildlife boat tours and tours on the world's last sea-going paddle steamer), recreational sailing and diving, all of which may be affected by tidal energy development (Alexander, Janssen et al. 2012). In addition, a number of cetacean species can be found around the area including harbour porpoise, bottlenose dolphin and minke whale. Furthermore, due to a previously proposed wind farm development in the locality, conflict already existed within the local community. The pre-existing conflict, in addition to the myriad ongoing uses of the site, provided the perfect opportunity for collaborative marine planning to identify areas of least conflict for an offshore renewable energy development.

This case study tested an approach which used a combination of Geographic Information Systems (GIS), spatial Multi Criteria Analysis (MCA) and touch-table technology to facilitate stakeholder dialogue in two workshops. A touch-table is an interactive touch screen - more recently developed as a large-scale tablet computer built in a table format - which allows

simultaneous input from a number of users; and which provided the interface between the data and the workshop participants. Workshop participants represented the key users of the tidal energy lease site: the fishing industry, the sailing community, tourism operators, representatives from a local dive club, renewable energy industry, local council and a natural heritage representative to represent biodiversity. The key objectives were to gather spatial information regarding use values across a number of social representations, to identify potential conflicts and to develop a mechanism to support negotiation for planning of tidal energy extraction through a deliberative process.

In both workshops, participants had little understanding of the concept of tidal energy and therefore researchers provided advance background information regarding tidal energy, tidal energy devices and uses of the marine environment in the location. The first workshop focused on eliciting local knowledge from five local stakeholders representing the main activities in the area: fishing, sailing, tourism and diving. It used GIS to present existing industry/activity use data in a map format and collect new spatial data using a 'map valuation tool', which allowed users to 'draw' onto the maps displayed on the touch table, inputting features of importance not identified on the original maps, and to change the value of features according to relative importance. Values from 1-10 were assigned to a grid of 500m x 500m cells based on the size of the study area and the likely size of tidal devices to be installed. Although during this workshop data on each sector was input separately, the participants actually worked together combining their knowledge, even when they were not necessarily the 'expert'. For example, whilst data was input by the fisherman regarding areas in which fisheries operated, the yachtsman would also note that he had seen other fishermen laying pots in this or that area, as did the divers. A second workshop focused on negotiation between four stakeholders representing the aforementioned activities at a higher level (e.g. fishing association rather than local fisherman). This workshop was also observed by academics and local government. This workshop used GIS to present the updated data (from the first workshop) in combination with a trade-off tool which used spatial MCA for comparison and ranking of a number of offshore energy

development scenarios. This made it possible to structure, and aggregate, the information in order to facilitate negotiation. The tool displayed the 'best' and 'worst' areas (i.e. those with the highest and lowest values) for particular stakeholder groups (Tidal energy, Commercial and Social – grouped to allow information presented to be more manageable for the workshop participants). Workshop participants were asked to trade negotiable cells under three scenarios; thus locating the optimal areas for a tidal energy extraction development, with the least possible damage to the interests of other users. This meant that all participants were fully involved in the planning process, acting in partnership. During this workshop, the stakeholders raised a number of points, questioning e.g. the size of exclusion zones, safety implications relevant to tidal energy devices and the issue of precedence. This enabled participants to not only establish their own standpoints regarding these issues, but also to learn about the positions of other stakeholders. In both workshops, participants shared ideas and questioned each other and this 'interactivity' was central to the approach.

Although this approach was not explicit in relation to the landscape stewardship principles that provide the basis of this book, several of the principles were in evidence. The approach undertaken occurred at a landscape scale, taking a holistic approach and looking at biodiversity issues in tandem with local economies (Principle 2). It involved inter-sectoral co-ordination of activities, with the different sectors of the economy (observed by local government) coming together to negotiate on the optimal location for a new marine industry, one which would cause the least damage to the interests of other users of the same space (Principle 3). This approach was highly participatory, requiring the participants in the marine landscape to share their values of that landscape and to work together to create a solution (Principle 4). Finally, this approach took into account a diversity of perspectives and ways of knowing, particularly in its combination of scientific data and local knowledge (Principle 5).

By taking an approach at the landscape scale, participants were able to view the bigger picture and not focus purely on their own areas of interest. Although, interesting to note was the fact

that the concept of stewardship did not arise at any point during either of the workshops.

Participants appeared only interested in how to make the most of resources available from the sea, rather than any focus upon protection or conservation of resources (not even in the form of sustainable development).

In the local knowledge workshop, it emerged that participants found it difficult to give values to specific features in the area, as they were used in different ways, e.g. at different times of year and in different types of weather. This highlights the complexity of use of the marine environment. The workshops identified problems with existing 'scientific' baseline data. Whilst some data can only be collected commercially, e.g. bathymetry and tidal flows, other data is better provided by local people, particularly on a fine-scale, e.g. stakeholder use, ideally across all relevant stakeholder groups. Local knowledge cross-referenced with commercially gathered data could enhance robustness and reliability. The approach used in this study allows for the collection, collation and integration of local-knowledge with scientific data; and furthermore was a form of 'joint fact-finding' central to consensus building and dispute resolution. During both workshops all contributors were involved in working with all value maps, participants shared ideas, reflected, asked each other questions and brought up pertinent points which were then developed by others. As a result of deliberation and social learning, which provided all representations an opportunity to gain a holistic view of the issue, participants with opposing perspectives successfully managed to identify areas where tidal devices could be situated with minimal disruption to existing activities. Furthermore, the offshore industry has expressed interest in the approach.

4. Discussion and conclusions

Three key challenges to marine stewardship were identified at the beginning of this chapter: the lack of a definition or global understanding of a 'marine stewardship' concept; issues around property rights in the oceans; and difficulties in gaining knowledge/understanding about the

marine environment. Two of these challenges arise in all three case studies and the other challenge can be seen in two of the case studies.

The challenge which arises across all examples is the management of property rights in the sea. In all case studies, stakeholders had conflicting interests over who should be restricted in terms of use and access rights, and where. In the first case study some of the participants were concerned that if they protected a particular resource (sea bream), then outsiders might free ride on their efforts and harvest that resource instead. In the second case study, islanders were concerned about losing control of 'their' resources. The aim of the third case study was to identify an optimal location for the placement of a marine industry, one which would cause 'least harm' to other users of the same space. This challenge is perhaps the biggest that marine stewardship faces: to manage the seas effectively as a common pool resource, rather than having it continue to degrade through unregulated, open access. According to Ostrom, this requires, amongst other things: clearly defined boundaries; a collective, participatory process of management involving those who can appropriate resources; effective monitoring, sanctioning and conflict resolution mechanisms; and an emphasis on adaptation to account for new knowledge and change (Ostrom 1990, Ostrom 2008). In marine governance and planning, it is gradually recognised that, as nobody 'owns' the space, stewardship is a collective affair, where the Government needs to find a balance between a facilitative and directive role. This was exemplified in different ways by each the case studies, and landscape stewardship principles 3) inter-sectoral coordination and 4) participation, adaptation and learning helped to address these issues. What is not as clear is who the champions or 'change agents' will be in implementing these landscape stewardship principles. In Scotland, a potential champion may be the Scottish Marine Planning Partnerships who are tasked with delivering local planning within the Scottish Marine Regions. In England and Wales it may be the Marine Management Organisation. What is clear is that in a common pool landscape, the Government must take some sort of role.

All case studies recognised the challenge in gaining knowledge/understanding about the marine environment, particularly in relation to the limitations of scientific evidence and the need to integrate this type of knowledge with local knowledge. The case studies used different means by which to collect and integrate this knowledge. It is not possible to identify the most appropriate method, each was appropriate in its own setting, and perhaps this suggests that some flexibility is required when dealing with local knowledge. However this challenge was, and can be, addressed directly by following Principle 5 of the landscape stewardship principles, which recognises and values a diversity of 'ways of knowing' and includes local and indigenous knowledge as well as that collected scientifically.

A lack of a common understanding of the meaning of marine stewardship may have hampered the process described in the case study 2. The conflict was characterised by 'a lack of meaningful communication' and the use of 'different languages'. It took a long time for different actors to agree on the terms of reference for the conflict, and only when this was finally achieved it enabled progress to be made. Thus, rather than focusing on implementation measures at the start, those facilitating a process of marine stewardship need to develop a common understanding both of the problem and of the type of outcome sought, as a first step to balancing use and conservation. In case study 3, the concept of stewardship was not raised at all, with all stakeholders looking at how resources could be used so that everyone benefited, with no examination of how to do this sustainably. Had the 5 principles of landscape stewardship been used as a framework in this instance, protection as well as the use of resources could have been considered by all involved.

Despite the lack of a universal understanding of the concept of marine stewardship, many avenues of research and practice resonate with the five principles of landscape stewardship, as identified in the case examples above. These are often described in different terms and frameworks, such as 'adaptive management', 'integrated coastal zone management', 'co-management' of marine areas or fish stocks and 'precautionary approaches', which all link to a

subset of the principles. Increasingly marine policy and planning is focused on cross-sectoral harmonisation and multi-use of areas. Although further work is required to formulate a common understanding, and to identify champions and methods; marine stewardship based on the landscape stewardship principles could provide a solid and comprehensive foundation help ensure conservation and sustainable use of the sea as our common heritage.

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