

Impact case study (REF3)

Institution: University of Plymouth		
Unit of Assessment: UoA14		
Title of case study: The social, economic and environmental impacts of a Marine Protected Area (MPA): Lyme Bay		
Period when the underpinning research was undertaken: 2010-2015		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Dr Siân Rees	Associate Professor	01/08/2008 – present
Dr Emma Sheehan	Associate Professor	01/08/2008 – present
Dr Lynda Rodwell	Associate Professor	01/07/2003 – present
Prof. Martin Attrill	Professor of Marine Ecology	01/09/1992 - present
Period when the claimed impact occurred: 2013 -2020		
Is this case study continued from a case study submitted in 2014? N		
<p>1. Summary of the impact (indicative maximum 100 words)</p> <p>Reefs are internationally important marine habitats supporting food provision, jobs and coastal defense, but the use of bottom towed fishing gear (trawls and dredges) has caused global widespread loss of this habitat. In 2007, pioneering research from this team influenced the designation of the Lyme Bay Marine Protected Area (MPA). In the following 13 years, interdisciplinary research (by this team) has developed a unique and critically important dataset that has significantly changed reef management in the UK. This has led to greater protection of the marine environment; new and ambitious marine policy; economic and well-being benefits for fishermen and; a strengthened interdisciplinary evidence base for fisheries management and conservation. This research models a vital flagship for marine conservation with international reach.</p>		
<p>2. Underpinning research (indicative maximum 500 words)</p> <p>The Lyme Bay Marine Protected Area (MPA) was the first and largest of its kind in the UK. The designation significantly increased the area of UK reef habitat protected from bottom towed fishing (trawls and dredges) from 3.7km² to 206km². Stevens and Rodwell (2007) pioneered new methods to evidence habitat sensitivity to the physical impact from bottom towed fishing gear and provided new evidence of the economic beneficiaries of a healthy reef ecosystem (e.g. recreation, tourism, fishermen using pots). This novel perspective, extensively cited in the formal 2008 Impact Assessment, led to a Government rationale that <i>'intervention is required to ensure an improved outcome for society and the environment'</i>.</p> <p>Rather than closing off small pockets of rocky reef habitat and allowing bottom towed fishing gear to be used on the sediment between rocky reef features, as occurs generally in MPA management, the whole site was closed from bottom towed fishing (incorporating rocky reef and sediment features). This was the first time such a decision had been made by UK government representing a step-change in policy to override the economic interests of a destructive part of the fishing sector in favour of wider sustainable use. Consistent management throughout the MPA across rocky reef features and inter-reef sediment areas has offered a unique opportunity for research on the effectiveness of whole site marine management, something that had never been tested before in the UK. An initial research contract from Defra (2008-2011) to assess the ecological and socio-economic effectiveness of the Lyme Bay MPA (led by Attrill) has primed over a decade of novel and influential research.</p> <p>Sheehan has led the long-term ecological monitoring in Lyme Bay. In the process, Sheehan has devised novel, non-destructive, cost effective underwater survey techniques [3.1]. The ecological monitoring studies demonstrate that there have been positive responses of reef 'recovery' within the MPA closed to bottom towed fishing gear [3.2]. A further study led by Sheehan to analyse data from 'between the reefs' demonstrated, for the first time, that mixed sediment areas between the rocky areas that were not previously considered as reef were now being colonised by reef-associated species, indicating that these were, in fact, thin sediment</p>		

veneers on rock [3.3]. The unique management in Lyme Bay (enabled by the MPA designation in 2008), requiring the cessation of fishing using bottom-towed gear across a whole site of mixed habitats, has demonstrated that the reefs have the capacity for self-repair and self-renewal, particularly in areas that were not previously considered as reef habitat [3.3]. This demonstrated that current UK policy enabling protection focussing on specific features rather than whole sites were limiting the 'site integrity' as defined in the EU Habitats Directive 92/43/EEC [3.4]. Socio-economic research has demonstrated how alternative commercial fishing activities (potting, scallop diving) have proliferated within the MPA [3.5]. Research led by Rees has demonstrated that recreation participants including dive businesses, charter boat operators and divers have increased their use of reef and wreck sites within the Lyme Bay MPA [3.6]. They cite the recovery of the reef habitat, increased angling opportunities and a reduction in conflict with fishermen using bottom towed fishing gear as a reason for increasing their use of the MPA. Divers in particular have increased their frequency of activity within the MPA with a positive effect for local supporting businesses (dive shops and charter boat operators). Between 2008 and 2011 recreation participants and providers increased their use of the MPA resulting in a £2.2 million increase in expenditure (divers and anglers) and associated turnover (dive businesses and charter boat operators) over three years [3.6]

Research to track the ecological and socio-economic effects of the Lyme Bay MPA continues today, with this early research setting a benchmark for improved fisheries and conservation management.

3. References to the research (indicative maximum of six references)

- 5.1 **Sheehan, E.V.**, Stevens, T.F., **Attrill**, M.J., 2010. A quantitative, non-destructive methodology for habitat characterisation and benthic monitoring at offshore renewable energy developments. *PLoS One* 5(12), e14461. <https://doi.org/10.1371/journal.pone.0014461>
- 5.2 **Sheehan, E. V.**, T. F. Stevens, S. C. Gall, S. L. Cousens and **M. J. Attrill** (2013). "Recovery of a Temperate Reef Assemblage in a Marine Protected Area following the Exclusion of Towed Demersal Fishing." *PLoS ONE* 8(12): e83883. <https://doi.org/10.1371/journal.pone.0083883>
- 5.3 **Sheehan, E. V.**, S. L. Cousens, S. J. Nancollas, C. Stauss, J. Royle and **M. J. Attrill** (2013). "Drawing lines at the sand: Evidence for functional vs. visual reef boundaries in temperate Marine Protected Areas." *Marine Pollution Bulletin* 76(1): 194-202. <https://doi.org/10.1016/j.marpolbul.2013.09.004>
- 5.4 **Rees, S. E.**, **E. V. Sheehan**, E. L. Jackson, S. C. Gall, S. L. Cousens, J.-L. Solandt, M. Boyer and **M. J. Attrill** (2013). "A legal and ecological perspective of 'site integrity' to inform policy development and management of Special Areas of Conservation in Europe." *Marine Pollution Bulletin* 72(1): 14-21. <https://doi.org/10.1016/j.marpolbul.2013.03.036>
- 5.5 Mangi, S. C., **L. D. Rodwell** and C. Hattam (2011). "Assessing the Impacts of Establishing MPAs on Fishermen and Fish Merchants: The Case of Lyme Bay, UK." *Ambio* 40(5): 457-468. [10.1007/s13280-011-0154-4](https://doi.org/10.1007/s13280-011-0154-4)
- 5.6 **Rees, S. E.**, S. C. Mangi, C. Hattam, S. C. Gall, **L. D. Rodwell**, F. J. Peckett and **M. J. Attrill** (2015). "The socio-economic effects of a Marine Protected Area on the ecosystem service of leisure and recreation." *Marine Policy* 62: 144-152. <https://doi.org/10.1016/j.marpol.2015.09.011>

Between 2008 and 2019 approximately £1.4 million of research funding has been awarded to UoP to enable the Lyme Bay MPA long-term interdisciplinary research.

4. Details of the impact (indicative maximum 750 words)

Greater protection of the marine environment in the UK

Natural England report that the UoP research '**has developed a unique and critically important dataset that has already significantly changed how we manage temperate reef ecosystems and consider their recovery rates under different circumstances.**

This has resulted in a significant shift in management of England's subtidal reefs as Annex 1 features under the Habitats Directive and features of MCZs.' [5.1].

Management measures for MPAs are devised through fisheries byelaws. **The Sheehan 2013 research provides sole UK evidence** in the Marine Evidence Based Sensitivity Assessment database (MarESA) for the recovery of

reefs (specifically *Eunicella verrucosa* and *Pentapora foliacea* on wave-exposed circalittoral rock) following the exclusion of bottom towed fishing gear [5.1].

The MarESA evidence base is used by the UK statutory agencies, including Natural England and the Inshore Fisheries and Conservation Authorities (IFCAs), to inform on the management of activities in the marine environment. MarESA evidence has underpinned 'The Revised Approach' for the management of bottom towed (demersal trawl) fishing gear over reef habitat [5.2]. As a result, reefs are assigned as 'high risk features' and fisheries management measures (byelaws) were rolled out between 2013 and 2016 across all MPAs where this high risk interaction took place [5.1 & 5.2]. There is clear impact with 2179km² of reef features in English waters now protected by a fisheries byelaw to restrict bottom towed fishing gear <https://map.mpa-reality-check.org/>.

Natural England have used UoP Lyme Bay evidence to develop Conservation Advice Packages [5.1]. This has included the wider designation of Lyme Bay and Torbay Special Area of Conservation in 2017 a 312km² MPA. *'In response to Natural England's Conservation Advice Packages for protected reef features and the evidence from Lyme Bay, Devon and Severn Inshore Fisheries and Conservation Authority (D&S IFCA) have proposed buffer zones around all reef features in the district, four times the depth of the warp length'*. This is a **unique approach to fisheries management** by D&SIFCA, *'allowing for greater protection of these habitats building in potential for recovery and renewal of reef habitats.'* Sarah Clark Deputy Chief Officer Devon and Severn IFCA [5.2]. In November 2017, **Natural England used the UoP Lyme Bay data to communicate to the Marine Management Organisation** and advise against scallop stock assessments (using heavy towed bottom fishing gear – dredging) by the local IFCAs, thereby protecting the integrity of the whole site. Further, in 2018 the scallop dredging fleet requested access back into the Lyme Bay MPA in 2018 to pursue economic interests. Natural England rejected the request and cited UoP research in the Habitats Regulations Assessment ensuring that the MPA remains protected as a whole site [5.1 & 5.2].

Informing new and ambitious marine policy 'the whole site approach' to help reverse the decline in biodiversity and protect societal benefits

To date, the delivery of MPA policy through fisheries byelaws is to protect individual features within the boundaries of MPA sites. The evidence from Lyme Bay demonstrates how recovery of marine systems can occur if a whole site is protected from damaging fishing pressure. **D&S IFCA have further introduced a Mobile Fishing Permit Conditions for Lundy MPAs sediment (between reef) habitats** *'to monitor the fishing activity, gathering greater evidence to remove uncertainties and set trigger points that may lead to a review [of] permit conditions where necessary.'* [5.2].

The possibility for 'recovery' and 'renewal' of marine habitats with potential for linked social and economic benefits through the protection of a whole site is cited as an ambition of the 2018 UK Government's 25 Year Environment Plan ('Whole Site Approach'). The whole site approach is also recognised as integral to UK fisheries management following EU Exit [5.3]. *'Highly Protected Marine Areas (HPMAs) allow marine ecosystems to recover to a mature state. By taking a 'whole site approach' to designation, thereby protecting all habitats and species in their boundaries, HPMAs give nature the best chance to thrive'* [5.4]. **Lyme Bay research is the dominant body of evidence in the 2020 Defra Review of HPMAs.** Drawing individually on the research presented in this Impact Case Study, the review concludes that HPMAs are an essential component of the UK Marine Protected Areas network, and government should introduce them into Secretary of State waters [5.4].

Economic and Well-Being Benefits for local fishermen resulting from the long standing Lyme Bay MPA

In 2016, the University of Plymouth undertook an evaluation of the social and economic impact of the MPA using quantitative and qualitative research methods, an approach to conservation

evaluation that has never been undertaken before in the UK. The evaluation concludes that there have been **clear social and economic benefits from the long-standing Lyme Bay MPA** (IE5). Interviews with local fishermen in 2016 demonstrated that the prohibition of bottom towed fishing gear in **the MPA has supported increased catches of shellfish (crab, lobster and scallops) from within the MPA. Scallop divers, in particular, have increased their income by £3119 per fisherman, per month** [5.5]. *'I have found an area [the MPA] where my style of fishing (diving with some potting and nets) is supported'* (Lyme Bay fisherman interviewed in 2016, 5.5). *The social economic work undertaken by the University of Plymouth has been important in highlighting the benefits of the Lyme Bay Reserveto the rest of the country as a leading example'* (Sarah Clark Deputy Chief Officer Devon and Severn IFCA [5.2]

A strengthened interdisciplinary evidence base and tools for fisheries management and conservation

A novel underwater video method was developed for the Lyme Bay monitoring and has since (in 2015) been assessed by the UK Government Joint Nature Conservation Committee (JNCC) as **current best practice for benthic monitoring at a European level** to greatly improve scientific understanding of the location and condition of marine habitats in response to management measures [5.6]. The method has been used by statutory bodies e.g. to develop Condition Assessments (a legal requirement under the EC Habitats Directive) for Flamborough Head and to ground truth habitats across the Devon and Severn IFCA district [5.2]. **Fisheries managers are extending to include social and economic research** *'D&S IFCA appreciates the importance of the social and economic research in its decision making, andD&S IFCA is currently using the social – economic survey design from Lyme Bay within their Marine Pioneer Fisheries Research and Management Plan projects in North Devon'* Sarah Clark Deputy Chief, Devon and Severn IFCA [5.2]. Evidence from the Lyme Bay research also forms the evidence for the 2014 Natural England's Ecosystem Services Transfer Toolkit (NECR159) for marine 'no take zones' [5.1]. **The development of the tool kit represents an institutional shift within NE towards linking management of the ecological and socio-economic system [5.1].**

A cultural shift into fisher science partnerships providing a vital flagship for marine conservation
Interdisciplinary, evidence-based research has provided the basis for the long-term sustainable management of the Lyme Bay MPA, **overcoming conflict and mistrust in marine conservation** from the fishing sector. The evidence has formed the basis of a fisher-science partnership *'Plymouth University has been an integral member of the Lyme Bay Consultative Committee since its creation in 2013. The Committee set up by BLUE to bring fishermen, conservationists, regulators and other stakeholders together to manage the MPA has used annual research by the University to underpin management decisions and target interventions'* Morven Robertson Senior UK Projects Manager Blue Marine Foundation [5.7 and 5.9]. *'The University of Plymouth's presence has been integral to the success of the Lyme Bay Consultative Committee and working group.'* Sarah Clark Deputy Chief, Devon and Severn IFCA [5.2].

There is unprecedented stakeholder commitment to the partnership in Lyme Bay. In 2018, a Lyme Bay 10 year research celebration event led by UoP was attended by 60 people representing 15 organisations, highlighting the wide reach of the research and the unique nature of the partnership between scientists, fishermen and regulators. *'All partners feel that they get equal worth from the work and the money that they have put into Lyme Bay'* Tim Robbins Former Chief Devon and Severn IFCA [5.7].

More recently, **the fishermen have part funded a UoP PhD** (2013-2018) to understand sustainable levels of potting activity on the reef ecosystem and UoP research to assess the effect of storms on MPA resilience compared to fishing effects. Every year the UoP team work with local fishermen to deploy research equipment from fishing boats. **The collaboration has provided a foundation for a cultural shift of fishermen engaging with conservation science.** *'The important thing is that analysis is being done over a good*

period. That's got to be the best quality evidence that you can have.' Robert King Fisherman and Skipper, Lyme Regis interviewed in 2018 [5.8]. Fishermen involved in the partnership support reef protection, trust the science and feel supported *'Of course we [fishermen] had differences between ourselves about the way which we were moving but, we are actually very lucky....that we've got a forum where the fishermen and those people that are in charge of enforcing the rules, conservationists, are all able to come along and put in their 'two pennith'.* Angus Walker. Fisherman and Skipper Axmouth interviewed in 2018 [5.8].

The Lyme Bay research still continues moving into its 13th year in 2020, with on-going commitment to maintain funding and effort to the longest standing, most robust MPA evidence base available to inform UK and EU marine management. *'The long-term nature of this unique dataset has enabled an unprecedented level of analysis and has allowed a significantly deeper understanding of UK temperate reef communities' [5.1]. 'Natural England continue to support the University of Plymouth's Lyme Bay Research and are working closely with DEFRA to fund 2020 and produce an ongoing long term funding model for this work. 2020 will be year 13 of the long-term dataset. 2020 is a key year in terms of assessing reef recovery from mobile towed gear as well as understanding the impacts of storm damage on reef communities' [5.1].*

The Blue Marine Foundation (BLUE), an international NGO, highlight Lyme Bay as a 'flagship project, proving that responsible fishing can co-exist with conservation' *'BLUE has worked for almost a decade in close partnership with Plymouth University to deliver robust [interdisciplinary] scientific monitoring within the Lyme Bay MPA.'* *'The model is now being applied across BLUE's sites both in the British Isles and overseas. Sites around the British Isles cover: Berwickshire (in operation for three years), North Devon (three years) and Jersey (three years) with scoping underway in Sussex and East Anglia. Overseas the model has been adapted in the Mediterranean with the Aeolian Islands (four years), Torre Guaceto (one year), Agadi (one year) and scoping in the Balearics is underway. The model has also been implemented in the Maldives (three years) where BLUE is working with fishermen and resorts to encourage tourism to provide incentives for sustainable fishing. Across all of these sites the methodologies are being applied to different species, habitats and users demonstrating its adaptability at scale' [5.9].* Morven Robertson Senior UK Projects Manager Blue Marine Foundation.

Footnotes

<https://www.marlin.ac.uk/habitats/detail/77>)

4. Sources to corroborate the impact (indicative maximum of 10 references)

- 5.1 Letter from Natural England
- 5.2 Letter from Devon and Severn Inshore Fisheries and Conservation Authority
- 5.3 POST (2018). UK Fisheries Management. The Parliamentary Office of Science and Technology. POSTnotes POST-PN-0572.
- 5.4 Benyon Review into Highly Protected Marine Areas.
- 5.5 Rees, S. E., M. Ashley, L. Evans, S. Mangi, L. Rodwell, M. Attrill, O. Langmead, E. Sheehan and A. Rees (2016). An evaluation framework to determine the impact of the Lyme Bay Marine Protected Area and the activities of the Lyme Bay Consultative Committee on ecosystem services and human wellbeing. A report to the Blue Marine Foundation by research staff the Marine Institute at Plymouth University, Exeter University and Cefas. Pp139.
- 5.6 Hitchen, R., Turner, J.A., and Verling, E. (2015) Epibiota Remote Monitoring for Digital Imagery: Operational Guidelines. Joint Nature Conservation Committee pp29
- 5.7 Video MPArty https://www.youtube.com/watch?v=Aefa4kAkVxU&feature=emb_logo
- 5.8 Video RETURN [UoA14](#)
- 5.9 Letter from The Blue Marine Foundation.