

MARINE RESERVES – A KEY ROLE IN ECOSYSTEM-BASED FISHERIES MANAGEMENT



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Based on the evidence of international Marine Protected Areas (MPA) science, the Marine Conservation Society (MCS) believe there remains a need to develop extensive MPAs in UK waters. Science shows that fully-protected marine reserves, and well enforced MPAs have to be established over a significant proportion of the seas in order to allow the habitats of the seas to recover from decades of homogenisation of habitat and species complexity, and to increase ocean productivity. Evidence from well-managed and enforced MPAs result in tremendous positive changes in productivity, and spill-over (eg Georges Bank – a 17,000 km² closed area to bottom trawling off NE USA).¹

On average marine reserves increase biomass by 446% and increase species diversity by 21% (when studies on 124 tropical and temperate marine reserves were compiled from over 200 peer reviewed scientific papers)².

The debate within the fishing industry has been dominated by three key questions: – what are MPAs for, what is the management needed to make them work, and what to do about displacement? Undoubtedly, these are relevant questions from a UK fishing industry perspective that has seen only very small scale MPAs, temporal/single gear or species restrictions³ set up in UK waters. MPAs in the UK have thus far been set up either to benefit fish or commercial stocks, and

usually to protect only single species (eg cod), whilst allowing other species (eg haddock) still to be caught – sometimes with the same gear in the same zones.

The key to convincing society that MPAs have to happen in accord with more traditional effort-quota-based management, is the fact that 88% of EU fish stocks remain over-fished, and our fishing industry increasingly relies on subsidies and on species lower in the food chain (eg Nephrops, lobster, crabs and scallops), than was the case 50 and up to 100 years ago. This chain of circumstances is not only because the larger species, in greater biomass have been declining up until this century⁴, but also because the removal of large top-level carnivores such as cod and halibut has freed up those animals and plants lower down in the food chain, which are now more abundant. The marine ecosystem is fundamentally changed.

Some may suggest that the fishing industry can happily exist on invertebrates (nephrops and scallops), and a mixed species hauls from trawling which results in significant by-catch of invertebrates, and discards of undersize or over-quota and non-quota species, or one can simply suggest another management paradigm *which hasn't yet been used in UK seas* – marine reserves, and large MPAs which stop bottom trawling. These will increase production, species diversity and ecosystem complexity.

All this 'debate' on MPAs is in the face of inept management of CFP (Common Fisheries Policy) fisheries, where scientific advice on quota is consistently ignored by politicians in favour of short-term profits and jobs. Furthermore, traditional single species management approach ignores the fact that the same gear damages the seabed, regardless of what species is being targeted – eg bottom trawling for haddock and cod has the same ecological footprint on the seabed, regardless of the species being caught.

This is the choice that UK politicians have at the moment:

To invest in the future of the industry now by creating wide-scale MPA and marine reserve networks that protect the fish AND the ecosystem, and return the seas to productivity, or

To maintain the industry and environmental status quo, with low biomass and trophic level catches from a predominantly degraded ecosystem by an inefficient, subsidised industry.

Ecosystem goods and services provided by the marine environment are widely published:

- carbon capture and storage
- biodiversity
- fish production
- climate regulation
- food security

The last point is worth investigating, and not often reported on. We must start to consider the potential of the marine environment to act as a

form of high interest rate bank account (an unfortunate yet useful analogy at this time). There is evidence from historical catches before the advent of the industrial revolution, diesel engines and freezers that the wider continental shelf acted as a huge reserve for fish, but in the late 1800s this started to change⁵. Not only were the average 'fishing smack' not equipped for anything other than day-fishing, they had no facilities for the overnight storage of fish (ie no ice). They had no diesel engines, and no generators powering vast winches to wind-in heavy and extensive fishing nets. Furthermore, they generally didn't have the power to trawl huge beams across the seabed.

The result was that sail powered fishing vessels often operated near to shore, used nets on open-water species such as herring and mackerel, and hook and line for bottom species such as cod and haddock – there was very little bottom trawling. As such there was virtually no co-lateral damage to seabed habitats, and waters beyond 5-10 nautical miles from shore were virtually unaffected by man, and a surplus of stock remained within these offshore grounds to supply the inshore fisheries. Offshore waters could be considered as *de facto* marine reserves. However, now all areas are exploitable, and even limiting days at sea to reduce the capture of finfish still results in beam trawls and scallop dredging harming the very fabric of biodiversity on the seabed, which helps support higher fish biomass.

MCS doesn't propose that fishers go back to only using line and sail power, but there is a middle ground (ecosystem-based management) between fisheries of 100 years ago, and

those of today. And the most significant factor is to manage spatially both trawl fisheries (ie reduce it over significant areas of the seabed), and increase the number and scale of no-take marine reserves.

We must free up significant areas of the sea from fishing in order to:

Avoid habitat damage – not just for an increase in 'biodiversity' and 'habitat complexity'. The latter begets the former, by creating multiple niches via stochastic successional processes, and the fact that the build up of epifaunal biomass itself increases complexity of the seabed.

Increase the recruitment grounds for commercial species – the recovery of the seabed, and its complexity allows for a settlement/feeding habitat for a greater biomass of commercial species such as cod and scallop spat (eg Isle of Man and Georges Bank).

Develop a resource bank – No take is permitted inside marine reserves. Problems associated with banning one type of fishing (eg trawling and scalloping), can lead to vast increases in the use of static gears such as gillnets and pots⁶. This has impact on food webs, by-catch and the natural balance of species in areas of sea. The build up of natural resources in any no-take marine reserve will provide a 'bank' out of which adults can be caught that are exported outside the reserve boundary.

Understand the natural diversity and productivity of marine ecosystems – how can we say we sustainably utilise resources if we have no reference point – no 'benchmark' of sustainability, where ecological processes build up food webs to their natural levels?

Marine reserves provide a secure future for our fishermen – Ironically, it is the 'defenders' of the short-term interests of the fishing industry that are likely to do fishermen the most harm, by criticising the role of protected areas – particularly fully-protected marine reserves. We must invest in spatial protection now, to secure jobs for the future.

So why is there still the need to debate the science on marine reserves? Essentially this is because the rigorous scientific study of UK MPAs is wholly inadequate because:

UK MPAs are currently generally lacking the rigorous scientific design (eg BACI analysis) to enable rigorous scientific research to take place.⁷

UK MPAs don't often incorporate use of controls (apart from Lundy)⁸.

MPAs are designed at different spatial scales, and over different habitats, and have different levels of effort and gear permitted within them – this makes rigorous interpretation of results in a controlled fashion rather problematic.

The vast majority of MPAs in UK waters set up for 'conservation' (European Marine Sites) don't effectively control harmful human activities⁹.

UK Government is committed to the design of networks of MPAs such that the result of individual MPAs is greater than the sum of their parts. However, network science is even more nascent than individual MPA science¹⁰.

The fishing industry and other groups have used the above reasons to fight against the implementation of wide-scale networks in UK waters, and their position is understandable, however detrimental to the long-term health and productivity of

the marine environment. In light of the continued debate between conservationists and fishers about the roles and design of MPAs, it has been published that there is a need for UK politicians to progress '*rules of thumb*' on how MPA networks should be designed based on the best available evidence from abroad.¹¹ These involve measures such as protecting a representative set of marine habitats, in an agreed proportion of their distribution in UK seas.

So considering the international commitments of UK and other nations on the development of MPAs¹², coupled with the declines in food fish since the 1900's and more severely since the 1970s using traditional effort-gear management of fisheries, the Marine Conservation Society argues that it is simply good management to set up extensive MPA networks in UK seas.

- 1 Murawski *et al.* (2005). ICES J Science 62 : 1150-1167
- 2 <http://www.piscoweb.org/files/images/SMR/2008/OverallIncrease.JPG> <http://www.piscoweb.org/files/images/SMR/TempTropIncrease.jpg>
- 3 i.e. MPAs have to be permanent, fully-protected, and large (e.g. recommendations of the Royal Commission report on the Environmental effects of Fishing 2004)
- 4 Pinnegar *et al.*, (2000) Environmental Conservation 27(2) : 179-200.
- 5 Research by York University (in prep).
- 6 This has apparently been the case since the Lyme Bay order to close 10% of the bay to bottom-towed fishing gears.
- 7 BACI – Before, After, Control, Impact
- 8 Work commissioned by Natural England has near and far controls, but no 'before' data.
- 9 Current risk review of activities in European Marine Sites that can damage habitats and species.
- 10 Stewart *et al.*, (2009) Conservation Letters 2: 243-253.
- 11 Jones and Carpenter (2009). Marine Policy 33(5): 737-743
- 12 OSPAR / WSSD / CBD