Contribution to GSDR 2015 – chapter 3

IOC/UNESCO contribution to Chapter 3: Ocean-Biodiversity-Poverty alleviation nexus

Maintaining the quality of life that the ocean has provided to humankind while sustaining the integrity of ocean ecosystems requires changes in how we view, manage, govern and use ocean resources and coastal areas. Ocean and coastal areas provide many benefits to sustainable development and poverty alleviation, including both human (social and economic) and environmental (ecosystem services). This includes benefits to economic sectors such as fisheries, energy, tourism, and transport/shipping, as well as 'non-market' benefits such as climate regulation, carbon sequestration, habitat and biodiversity, among many others. The scale and intensification of the stresses on the ocean means that deferring action will increase costs in the future leading to even greater losses of benefits.

The fragile and interconnected nature of ocean ecosystems and human activities has in recent decades become readily apparent. From climate change and its diverse impacts on oceans, through to the destruction of and damage to marine ecosystems, the loss of biodiversity and the degradation of the natural environment, including from over- fishing and destructive fishing, human impact on the ocean has been profound. One recent estimate found that at least 40% of the global oceans are 'heavily affected' by human activities. This has a direct impact on sustainable development, with the majority of human settlements located on or near the coasts. Hundreds of millions of people depend on the quality of the marine environment and the availability of living marine resources for their well-being. Poor and marginalised people are usually directly dependent on environmental services, such as local fisheries and other food sources, employment from coastal tourism, coastal forests for fuel etc., and the steady degradation of the natural resource base therefore impacts their lives and livelihoods disproportionately (UNESCO Ocean Blueprint, 2011)

The loss of marine biodiversity is increasingly impairing the ocean's capacity to provide food and other market and non-market services, and the trend of biodiversity loss is accelerating on a global scale. Coastal habitats are under pressure, with approximately 20% of the world's coral reefs lost and another 20% degraded. Mangroves have been reduced to 30 to 50% of their historical cover, impacting biodiversity, habitat for inshore fisheries, and carbon sequestration potential. 29% of seagrass habitats are estimated to have disappeared since the late eighteen hundreds. Over 80% of the world's 232 marine eco-regions reported the presence of invasive species which is the second most significant cause of biodiversity loss on a global scale and the marine bio-invasion rates have been reported as high as up to one invasion every nine weeks. As with non-point source pollution, the challenge is as much institutional inertia as it is scientific consensus in terms of dealing with loss of biodiversity and habitat, and increasing both protection and restoration efforts.

The resilience of ecosystems is crucial to their functioning, persistence and viability. Degraded ecosystems (i.e., those that have lost biodiversity, ecological functions or structural integrity) are less resilient, and, therefore, have less capacity to withstand the additional stresses. Reduced ecosystem resilience is of particular concern because of the anticipated impacts of climate change. Habitats as well as biodiversity and ecosystem resilience are negatively impacted by a wide array of factors including overfishing and destructive fishing, biodiversity loss, invasive species, excessive nutrient loading, other pollution and habitat loss due to industrialisation, population growth and urbanisation, adverse effects of climate change and poorly planned, managed and regulated development.

Example of Biodiversity and Habitat loss on SD dimensions (UNESCO Blueprint)

Environmental dimension	Social dimension	Economic dimension
Loss of biodiversity and key biological and physical habitat reduces ecosystem resilience and overall species diversity throughout the food chain, placing increased pressure on remaining biodiversity and habitat to main- tain ecosystem values in the face of human impact.	Impact on fish stocks from biodiversity and habitat loss changes the dynamics of coastal communities, forcing change in employment, reduction in overall income levels, and ultimately contributing to poverty-related issues.	Fish stocks important for commercial fisheries are reduced by loss of biodiversity and habitat, ultimately impacting entire coastal communities that depend on fishing for liveli- hood.

Biodiversity is our natural capital, our life insurance

In 2002, the World Summit on Sustainable Development in Johannesburg recognized biodiversity as a benefit to society and important to alleviate poverty. This laid the foundation of several political targets. CBD target to significantly reduce the current rate of biodiversity loss by 2010. In 2003, EU target to halt the loss of biodiversity by 2010.

Marine habitats, species, and ecosystems support natural capital and economic flows, together referred to as ecosystem services. Marine and coastal ecosystems provide many services such as food, wood, fibre and other resources. Coastal habitats, including coral reefs and mangroves, protect homes, communities and businesses from storms and surges. (Linwood, 2012).

Example of Marketed values

Food (Fisheries, Aquaculture)
Pharmaceutics (anticancer, painkillers)

What is the medical value of marine biodiversity?

Undiscovered cancer treatments from marine organisms could be worth between US $563 billion (€428.5 billion) and US $5.69 trillion (€4.33 trillion), according to a recent study. The researchers estimate that there may be as many as 594,232 novel compounds waiting to be discovered in unstudied marine species, and that these could lead to between 55 and 214 new anti-cancer drugs. The study only accounted for anti-cancer drug revenues. In reality, these chemicals from the sea can have numerous other biomedical applications including antibacterial, antifungal, antiviral and anti-inflammatory uses

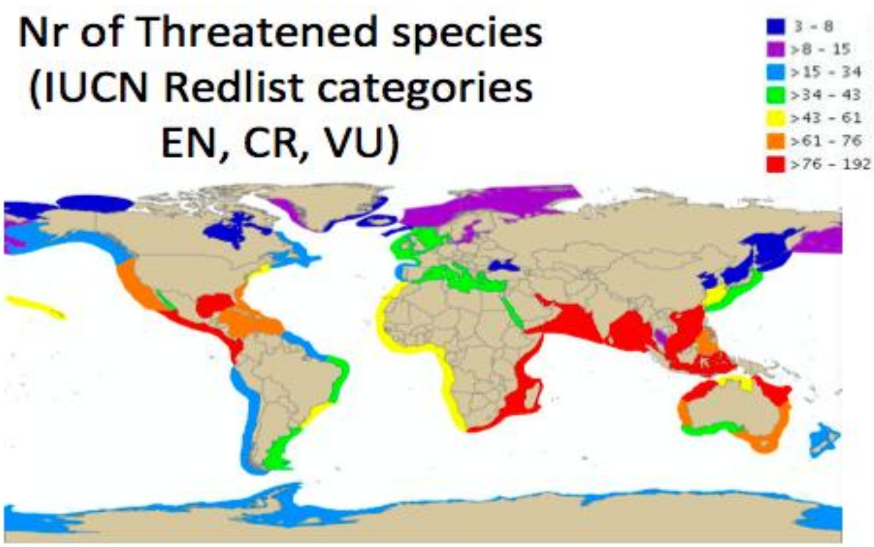
Tourism (diving, snorkling, fishing, swimming with e.g. dolfins):
See WWF report : The Value of our Oceans: The Economic Benefits of Marine Biodiversity and Healthy Ecosystems
http://awsassets.wwf.org.au/downloads/mo003_g_the_value_of_our_oceans_1jun08.pdf

Case study: The Economic Value of Marine and Coastal Biodiversity to the Maldives economy
http://cmsdata.iucn.org/downloads/policy_briefs_the_economic_value_of_marine_and_coastal.pdf

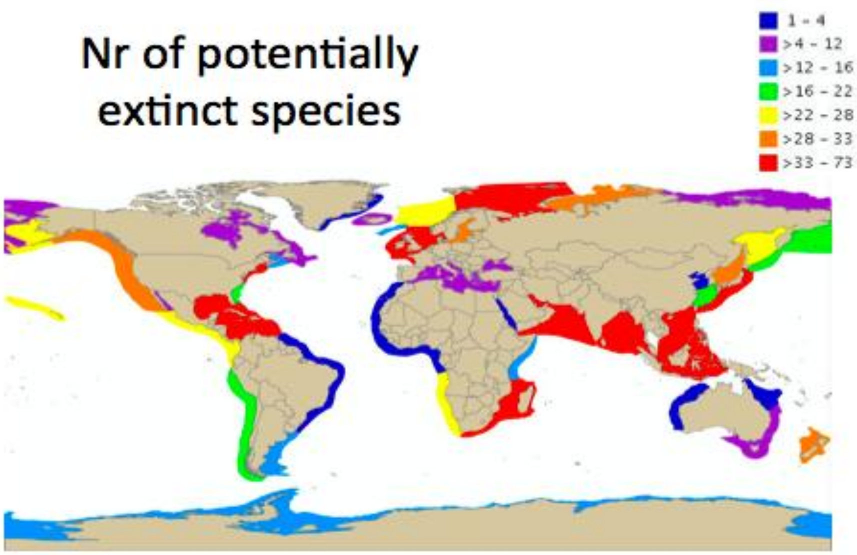
Monetized value of ecosystem services from Constanza (2014):

- 124 trillion US$ per year, of which 49 trillion (40%) is provided by the ocean
- The relative monetary value (per surface area) is twice as high for coastal compared to terrestrial areas.
- In 1997, Constanza et al estimated that 1% of global ecosystem service values came from coral reefs and that relatively they were 3 times more valuable than tropical forests. However, in their 2014 paper they corrected their figures and concluded that coral reefs, albeit only 0.05% of the surface of our planet, provide not less than 8% of all ecosystem service values; and are 650 times more "valuable" per surface area than tropical forests.

Biodiversity is highest in region with lowest HDI and Fisheries revenues
-LME fisheries revenues (TWAP LME Assessment)
-LME human development index (TWAP LME Assessment)
-LME biodiversity statistics: Illustration for IOC’s OBIS database (http://www.iobis.org)

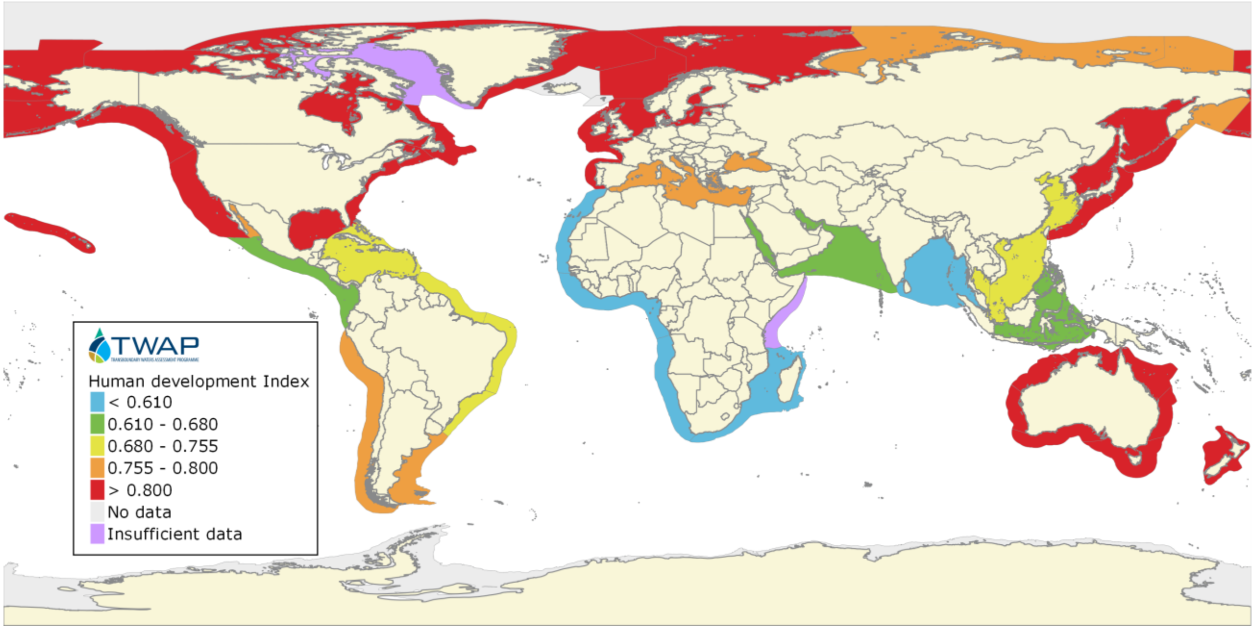


Source IOC/OBIS

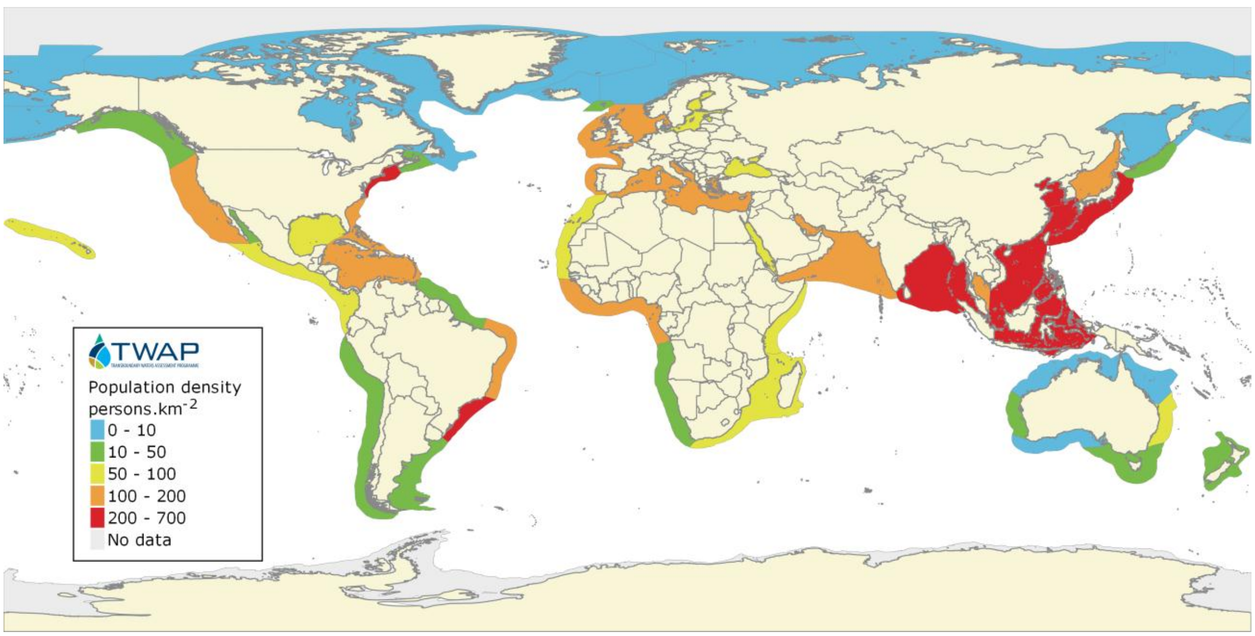


Species observed >10 times, but not any more in the last 50 years

Source IOC/OBIS



(source IOC/UNESCO)



(source: IOC/UNESCO)

The existence of a spatial link between biodiversity and poverty is often presented as a basic rationale for why biodiversity conservation and poverty reduction can or cannot be pursued jointly or separately (e.g. Malloch Brown 2004; Fisher and Christopher 2006). It may be too simplistic to say that the majority of the world's biodiversity is in the South which is also where the poorer countries of the world are (Schei 2007; Matiku 2008), and it is certainly not the case that significant biodiversity only occurs in areas of poverty. Yet there is mounting evidence to suggest that, at a variety of scales and in many different ways, biodiversity and poverty do coincide (Hernandez-Morcillo et al. 2010).

Overfishing is considered the primary driver of biodiversity loss in marine ecosystems (Dulvy et al., 2003; Baillie et al., 2010; Hoffmann et al., 2010). Of the 133 local, regional, and global extinctionsof marine species documented worldwide, mainly in the last two centuries, with a few dating as far back as the 11th century, 55% were caused by unsustainable exploitation, with the remainder driven by habitat loss and other threats (Dulvy et al., 2003).

Need for more systematic global scientific assessments addressing the Ocean biodiversity/poverty nexus

We need to develop knowledge managements systems that will help Member States understand how marine and coastal biodiversity affect the provisioning of ecosystem services and how the benefits of these marine ecosystem services are distributed around the globe.

There is a need to integrate efforts such as the European Commission's Mapping and Assessment of Ecosystem Services (http://biodiversity.europa.eu/maes), Mapping Ocean Wealth (http://www.nature.org/ourinitiatives/habitats/oceanscoasts/mapping-ocean-wealth.xml), and mapping marine biodiversity by IOC-UNESCO's Ocean Biogeographic Information System (http://www.iobis.org), in order to create value functions and maps that demonstrate how the benefits of ecosystem services flow from ecosystem to the beneficiary states.

As a result, Member States cannot adequately manage marine ecosystem services efficiently. Further, without dynamic maps of marine ecosystem service values, the beneficiaries of ecosystem services are often unaware of whence these benefits come. Without this information, it is likely that foreign aid and other sources of funding will not be efficiently directed to better managing these sources of biodiversity and ecosystem services.

UNESCO/IOC would be well suited to integrate these key international efforts and disseminate the data and methods publicly in order to improve the development and application of knowledge for decision-making and the management, sustainable development and protection of the environment.

Who benefits most from fisheries and are benefits shared equitably?

Updated figures from Pauly (2006, personal communication): Over 12 million fishermen are employed in small-scale fisheries today. Together they produce 30 million tonnes of fish for human consumption, and about 0.5 million tonnes are discarded at sea. Per capita they receive ±400 US$ in government subsidies. In contrast, only 0.5 million fishermen are employed in large-scale fisheries. They catch 40 million tonnes of fish for human consumption and an additional 25 million tonnes of fish is reduced to meals and oils. They discard 20 million tonnes of fish at sea (40 times more than small-scale fisheries), they consume 5 times more fuel than 12 million artisanal fishermen together and per capita receive 50,000 US$ of government subsidies.

Most high seas fishing is carried out by just 10 nations, most of them developed countries. If it were not for State subsidies, these high seas fishing industries would not be financially viable (http://missionocean.me/).

Examples of economic losses due to biodiversity/natural habitat loss/pollution threats:

Case 1: See paper by Ricardo Serrao Santos: Towards an ecosystem approach for understanding public values for marine biodiversity loss

Abstract:

Recent European legislation requires the adoption of an ecosystem-based approach for managing marine systems in which societal values and good science contribute to attainment of 'good environmental status' for Europe's seas by 2020. At present, there is a lack of studies that consider public values for marine biodiversity changes taking into account the cultural diversity within Europe. We used a contingent valuation survey to explore respondents' marginal willingness to pay (WTP) and motivations to prevent 3 levels of species loss (10, 25 and 50%) as compared to current levels for fish and all marine species. The survey was undertaken in 2 sites: the Azores islands (NE Atlantic) and the Gulf of Gdansk (Baltic Sea). Results, based on 747 interviews, showed that motivations underlying WTP for marine species conservation encompassed primarily bequest values and direct use values. Respondents from different locations differed in their attitudes and values towards marine biodiversity conservation. Scope tests revealed significant differences in WTP for different levels of species loss; however the magnitudes of the scope sensitivity were constrained by a lack of awareness about the consequences of biodiversity changes and the welfare trade offs involved. This result highlights the need for the scientific community to better communicate knowledge about the link between biodiversity changes and human well-being and to embrace a fuller dialogue between policymakers and the public. A successful ecosystem based approach must accommodate the diversity of preferences and hence may need to be adapted to reflect regional diversity within Europe. (**DOI: 10.3354/meps09967, Publication Date: 2012, Marine Ecology Progress Series)**

Case 2: What could be the economic value if marine ecosystems were made more ecologically healthy, robust and resilient.

(Linwood, 2012) It is clear that the ecological and economic productivity of the ocean we know today is only a fraction of what it could be. Sumaila & Suatoni, (2005) estimate that the present value of the fisheries of the United States would be $374 million greater if only 17 seriously depleted fish stocks were at their ecologically optimal levels. A World Bank report finds that worldwide the lost economic value of overfished stocks is about $50 billion annually (World Bank, 2009).

A summary of key findings from Marine Reserves adapted from Ballantine (2014). (published in Biological Conservation, Costello, 2014)

Socio-economic
-People enjoy them and learn at firsthand what more natural marine ecosystems are like.
- People have a limited frame of reference for what is natural. Marine Reserves provide this reference
- People understand marine ecosystems better, and can relate to the need for conservation in other places
- Marine Reserves attract tourists, local and international, and benefit the local economy
- Opposition occurs whenever Marine Reserves are proposed from special interest groups who have had the privilege of access to this public resource and do not understand or believe the benefits, or wish to recognise the public interest; but after reserves are established and the public witness the recovery of species and enjoy experiencing it, there is virtually unanimous public support for reserves
-With community support, the public, local fishermen and research scientists, quickly report people breaking the rules
- The line of crayfish pots and line fishing at the boundaries of Marine Reserves show that people know there is higher abundance of animals inside reserves
-Marine Reserves do not have to be only in the most remote, pristine, beautiful or diverse areas
- Some Marine Reserves should be established near major cities so the public can appreciate and learn from them
- The government provides the legal framework and management support for Marine Reserves, and the local community can benefit from it; so both government and local support is needed to establish and maintain reserves

Ecological
-Fish and lobster numbers increase in reserves faster than expected by local recruitment, suggesting a change in animal behaviour
- Fish behaviour changes in Marine Reserves; they lose their fear of people and can become more residential compared to fish outside
- Partial-take MPA attract fishing and lead to similar loss of biodiversity as unprotected areas
- Indirect impacts of fishing (i.e. trophic cascades) on benthic communities and thus habitat structure were not predicted
- Future ecological changes in Marine Reserves may yet occur, such as due to the recovery of large predatory mammals and fish, but can only be speculated
-In contrast to land reserves, no management intervention is needed for Marine Reserves to recover to a natural state (so called 're-wilding'); species colonise and adjust their abundances naturally
-Detailed scientific data is not a prerequisite to establish Marine Reserves, although irreplaceable for studying changes over time
- Marine Reserves are essential control areas for the scientific understanding of ecosystems, including the effects of climate change
- Marine Reserves could provide valuable reference sites for management of coastal resources

Case 3: Example of benefits derived from marine conservation (extract from DESA report - How oceans and seas contribute…. IOC Contribution/F. Santoro)

The role and effectiveness of MPAs in the Mediterranean region have been extensively investigated in the context of different programmes and projects. MPAs are important for protecting the marine environment, but they can also have substantial socio-economic and cultural impacts. In the following section, various examples of the environmental and socio-economic impacts of MPAs in the Mediterranean region are presented.

Environmental impacts

MPAs generally increase the diversity, abundance, and average size of exploited species. However, with the aim of adopting an ecosystem approach, MPAs should aim at rebuilding ecosystems rather than simply controlling fishing mortality for target species. As mentioned, that the Mediterranean Sea is characterized by high habitat diversity. Habitat structure is likely to drive a large part of spatial variability in the distribution and abundance of Mediterranean target species, and to influence the strength of protective measures.

By analysing habitat patterns and distribution, Nowell at al. (2013) have shown that disturbed seascapes consist of larger, fewer, and less complex patches of habitats,[7] whereas protected areas were found to be more heterogeneous. Fractals were used by Kostylev et al. (2005) to explore the species-area relationship in intertidal zones. They found that complex habitats support more species.

One example of a marine protected area is the Cabrera Archipelago situated off the Southern tip of Mallorca and consisting of 19 small islands and islets covering around 10,000 hectares, of which nearly 9,000 hectares are marine environment (see Figure 6).

The Archipelago represents a high biodiversity area with significant sea grass meadows (Posidonia oceanica and Cymodocea nodosa) as well as a number of important benthic habitats, including coralligenous and precoralligenous communities. Human activities have been limited around the Archipelago since 1916 when it became a military zone. The Cabrera Archipelago was declared a National Park (IUCN Category II) in 1991 and a Specially Protected Area of Marine Importance in 2003 under the Barcelona Convention. It was protected in order to preserve the large-scale ecological processes and diverse array of coastal and marine habitats. Damage as a result of bottom trawling has been reported in the north and east of the Archipelago, resulting in a proposal to extend the national park.

In the case of the Balearic Islands, reducing disturbance in the coastal zone, for example by relocating commercial shipping routes away from the islands, would certainly influence seascape structure and therefore in consequence also biodiversity.

Socio-economic impacts

Although the main purpose of MPAs is to safeguard nature, they can also support economically valuable activities and have social impacts. Tourism, small scale sustainable fisheries, nursery grounds and recruitment habitats are examples of sources of economic revenues that are supported by the existence of MPAs. In the Mediterranean region, many of the MPAs are found in the southern part of countries or in remote areas, and small islands. In the majority of cases, the economies of these areas are based on agriculture and fishing. Tourism is seen as both a potential and fundamental source of income.

Some specific studies to evaluate the economic impact of Mediterranean MPAs have been carried out in Spain and Italy. In Spain, MPAs can be considered multiple-use areas, with different areas having variable degrees of protection. The Biosphere Reserves approach of the Man and the Biosphere Programme (UNESCO, 1971) was adopted there with the aim to achieve a sustainable balance between the goals of conserving biological diversity, promoting economic development, and maintaining associated cultural values. As a result, the Medes Islands were protected in 1983 as a no-fishing area. Economic activities in the small village on the mainland, as opposed to the islands, are exclusively related to tourism, and represent a direct income of about US$ 7 million per year.

MPAs in Italy have a more recent history. At present, there are 15 MPAs in Italy and one marine area belongs to a National Park. A recent study has provided an estimation of natural capital by assessing the value of sea grass (Posidonia oceanica) in the smallest Italian MPA, namely the Isola di Bergeggi. In this particular case, ecological functions and the area's derived ecosystem services have been considered, instead of those ecosystem services having direct advantages for the local population, since the former benefit the ecosystem itself. One example of these ecosystem services is oxygen release and carbon fixation, the so-called "blue carbon".

Degradation and restoration cost methods for sea grass (Posidonia oceanica) were also applied in other parts of Europe. The cost of restoration has an average value of 56 euros/m_2 and in some restoration experiences in Italy the cost ranged from 175 to 300 euros/m_2. Since the recovery of this degraded ecosystem was shown to be more efficient in MPAs where human activities were prohibited, the calculated degradation and restoration cost can indirectly provide an estimation of the economic impact of the establishment of MPAs.

Although only few data exists in the Mediterranean on the exact socio-economic impacts of MPAs, Badalamenti et al. (2000) draw the conclusion that a general increase in tourist activities and in the abundance of larger fish species is evident in the Mediterranean MPAs. The data also shows a large increase in the number of visitors and divers.

References

- Constanza et al. (2014). Changes in the global value of ecosystem services. Global Environmental Change 26: 152–158
- Linwood, P. (2012). Introduction, In: Green Economy in a Blue World. UNEP, FAO, IMO, UNDP, IUCN, WorldFish Center, GRIDArendal.
- Pauly, D (2006) Major trends in small-scale marine fisheries, with emphasis on developing countries, and some implications for the social sciences Maritime Studies (MAST) 4(2): 7-22.
- Sumaila, U., & Suatoni, E. F. (2005). Economics: The Benefits of Rebuilding U.S. Ocean Fish Populations. Vancouver: Fisheries Economics Research Unit, University of British Columbia.
- World Bank. (2009). The Sunken Billions: The Economic Justification for Fisheries Reform. Washington, DC: The International Bank for Reconstruction and Development/The World Bank.

Other useful materials:
http://www.google.be/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&cad=rja&uact=8&ved=0CD0QFjAD&url=http%3A%2F%2Fpovertyandconservation.info%2Fdocs%2F20100901_ZSL_Symposium_Report.pdf&ei=75F8VP3aDcbfywOemYCYBQ&usg=AFQjCNFMUTB25oit9vdhxt347ITpjb-x4Q&bvm=bv.80642063,d.bGQ

www.cbd.int/doc/publications/cbd-ts-55-en.pdf

See annex 1 for possible published case studies/global assessments