A PROPOSAL FOR THE ESTABLISHMENT OF A REGIONAL MANAGEMENT FRAMEWORK FOR THE CENTRAL AMERICAN DOME

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ABSTRACT

The Central American Dome (CAD) is an area of high primary productivity in the northeastern tropical Pacific, which supports large pelagic fish, marine mammals, seabirds and marine predators such as tuna, dolphins, cetaceans, and is also considered part of a migration corridor for leatherback turtles. It is a unique oceanographic feature, formed by wind and currents, and is mainly located in areas beyond national jurisdiction, but also straddles a number of sea areas coming under the coastal jurisdiction of Costa Rica, Nicaragua, El Salvador, Guatemala and México.

Commercial fisheries, tourism and shipping are important economic activities that take place in the CAD, which provide incomes and for the Central American countries.

However, and despite of its great ecological and economic value, the CAD is exposed to serious threats and pressures from a variety of anthropogenic impacts including shipping traffic, overfishing, pollution, climate change and ocean acidification. As a result there is an urgent need for the establishment of appropriate management structures and procedures within a regional approach.

This research paper provides background information on the CAD, and analyses, within the international and regional context, the legal and institutional frameworks applicable to this particular area in the Pacific of Central America. In addition, four case studies are examined in order to identify the most relevant elements and actions regarding marine conservation, fisheries management and climate change.

Finally, a tentative proposal for the establishment of a regional management framework for the CAD taking into consideration the lessons that are derived from the four case studies, as well as the legal and institutional frameworks that exist at regional and multilateral levels.

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LIST OF ACRONYMS

ABNJ	Areas beyond national jurisdiction.
AIDCP	Agreement on the International Dolphin Conservation Program.
ASOC	Antarctic and Southern Ocean Coalition.
BBJN	Biodiversity in areas beyond national jurisdiction.
CAD	Central American Dome.
CBD	Convention on Biological Diversity.
CCAD	Central American Commission on Environment and Development.
CCAMLR	Convention on the Conservation of Antarctic Marine Living Resources.
CCCC	Central American Council on Climate Change.
CFP	EU's Common Fisheries Policy.
CLCS	UN Commission on the Limits of the Continental Shelf.
COCATRAM	Central America Commission for Maritime Transport.
COMITRAN	Council of Ministers Responsible for Transport in Central America.
CoP	Conference of the Parties.
EBSA	Ecologically or Biologically Significant Areas.
EFF	European Fisheries Fund.
FAO	Food and Agriculture Organization of the United Nations.
FECAEXCA	Federation of Exporters Chambers.
FECAMCO	Federation of the Central American Chambers of Commerce.
FMC	Fisheries monitoring centre.
GEF	Global Environment Facility.
IATTC	Inter-American Tropical Tuna Commission.
ICCAT	International Commission for the Conservation of Atlantic Tunas.
ICES	International Council for exploration of the sea.
IMARES	Institute of Marine Resources and Ecosystem Studies.
IMO	International Maritime Organization.
ISA	International Seabed Authority.
IWC	International Whaling Commission.
LME	Large Marine Ecosystems.
MAP	Mediterranean Action Plan.
MedSeA	European Mediterranean Sea Acidification Project.
MEPC	Marine Environment Protection Committee.
MFSD	Marine Strategy Framework Directive.
MoU	Memorandum of Understanding.
MRUG	Mediterranean Reference User Group.
NAMMCO	North Atlantic Marine Mammal Commission.
NASCO	North Atlantic Salmon Conservation Organization.
NCP-IUU	Non-Contracting Party IUU fishing vessel list.
NEAFC	North East Atlantic Fisheries Commission.
OCAS	Organization of Central American States.
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic.
OSPESCA	Central American Fisheries and Aquaculture Organization.
PARCA	Regional Environmental Plan.

PSSA	Particularly Sensitive Sea Areas.
QSR	Quality Status Report.
RAC	Regional Activity Centres.
RCU	Regional Coordination Units.
RFMO	Regional Fisheries Management Organizations.
ROCRAM-CA	Regional Cooperation Network in Operational Maritime Affairs.
SBSTTA	Subsidiary Body on Scientific, Technical, and Technological Advice.
SCRS	Sub-Committee on Statistics, ICCAT.
SICA	Central American Integration System.
SOLAS	International Convention for the Safety of Life at Sea.
SPA/BD	Specially Protected Areas and Biological Diversity in the Mediterranean Protocol.
SPA/RAC	Specially Protected Areas Regional Activity Centre.
SPAMI	List of Specially Protected Areas of Mediterranean Importance.
UNCLOS	United Nations Convention on the Law of the Sea.
UNDP	United Nations Development Programme.
UNEP	United Nations Environment Programme.
UNGA	United Nations General Assembly.
VME	Vulnerable Marine Ecosystems.
VMS	Vessel monitoring system.

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Introduction

The CAD is an area of high primary productivity in the northeastern tropical Pacific, which supports large pelagic fish, marine mammals, seabirds and marine predators such as tuna, dolphins, cetaceans, and is also considered part of a migration corridor for leatherback turtles.

The CAD is a unique oceanographic feature, formed by wind and currents, and as a result its position and extension changes from year to year, so it is a geographically mobile area with ambulatory boundaries. In this regard, the CAD is mainly located in areas beyond national jurisdiction, but its size and position can vary throughout the year. From a law of the sea perspective, it is important to point out that the CAD also straddles a number of sea areas coming under the coastal jurisdiction of Costa Rica, Nicaragua, El Salvador, Guatemala and México.

Commercial fisheries is an important economic activity that takes place in the CAD, which capture tuna, squids and other important profitable species that provide high incomes and food for the Central American countries. Also, tourism revenue contributes meaningfully to rural economic development in the region, most notably the whale and turtle watching activities have a major commercial impact on local communities.

The biodiversity and environmental importance of the CAD is undisputed and has attracted considerable attention at domestic and international levels. A number of high profile international scientists including the world renowned Sylvia Earle have pointed out that the CAD is exposed to serious threats and pressures from a variety of anthropogenic impacts including shipping traffic, overfishing, pollution from marine and land-based sources, climate change and ocean acidification.

As a result there is an urgent need for the establishment of appropriate management structures and procedures that will enable coastal States and the relevant regional and international bodies to take appropriate conservation and management measures. Such an arrangement is necessary because the CAD straddles ABNJ and the jurisdictional waters of the Central American countries, and the legal regime applicable to this area results in a complex governance matrix. In this regard, the international legal framework in relation to conservation and sustainable use of marine resources in ABNJ is based upon UNCLOS, the 1995 FAO fish stock Agreement, FAO Port State measures Agreement, and the FAO Compliance Agreement, among several other international agreements.

However, it is clearly evident that there is a requirement for a regional approach to the management of the CAD. In his regard, it should also be noted that several States elsewhere in the world have established regional frameworks to address specific concerns in relation to the protection of the marine environment, ecosystems and its resources. Examples include the Convention for the protection of the marine

environment of the North-East Atlantic (OSPAR Convention), the Barcelona Convention, the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) and the Sargasso Sea. Accordingly, one of the objectives of this study is to examine these case studies in order to identify the most relevant elements and actions regarding marine conservation, fisheries management and climate change.

In addition with a view to improving the implementation of conservation and management measures for the marine resources in the CAD, .the role of three regional organizations will be examined, namely: , the Central American Commission on Environment and Development (CCAD), the Central American Commission for Maritime Transport (COCATRAM) and the Central American Fisheries and Aquaculture Organization (OSPESCA). Likewise, the study briefly outlines the role of the Inter-American Tropical Tuna Commission (CIAT) in fisheries management and proposes a number of additional measures that could be taken with a view to enhancing the fisheries management measures that apply to the CAD.

Given this legal and institutional context, this research is structured in II Parts. Part I will address in two chapters the international and the regional legal and institutional frameworks applicable to the CAD. An initial introduction will describe briefly the CAD, and Chapter 1 will then analyse the international legal instruments that are applicable to the CAD, as well as the area based management tools that have been developed under the auspices of United Nations Agencies and its subsidiary bodies. Subsequently, chapter 2 provides a brief overview or the regional legal and institutional setting with a view, identifying the actors and rules applicable to the CAD.

Thereafter, Part II reviews in two chapters the legal and institutional framework, as well as the lessons that may be derived from the four case studies. Chapter 1 will approach the OSPAR and the Barcelona Convention case studies, as examples of regional best practice regarding the adoption of conservation and management measures including the controversial establishment of MPAs in ABNJ. Chapter 2 examines the CCAMLR and the recently developing regional arrangements in the Sargasso Sea. In each case study particular attention is paid to three topics, namely: marine conservation, fisheries management and climate change.

The final chapter sets out a tentative proposal for the establishment of a regional management framework for the CAD taking into consideration the lessons that are derived from the four case studies, as well as the legal and institutional frameworks that exist at regional and multilateral levels.

Part I. Legal and Institutional Framework applicable for the CAD

Part I of the present study will address in two chapters the international and the regional legal and institutional frameworks applicable to the CAD initiative. An initial introduction will describe briefly describe the CAD, afterwards, Chapter 1 will analyse the international perspective, as well as the area based management tools developed under the auspices of the different United Nations Agencies, and that could be applied to the CAD. Subsequently, chapter 2 will make a brief overview or the regional legal and institutional context, to identify the actors and rules applicable for the progress of the CAD initiative.

The Central American Dome

The aim of this opening chapter is to concisely describe the CAD (CAD), its geographical and environmental features, as well as the threats to the conservation of the marine resource and unique biodiversity of the region. The discussion focuses on three predominate activities, marine conservation, fisheries and tourism, which have major economic and ecological significance within the region. The findings of recent scientific studies and reports are summarized with a view to highlighting anthropogenic impacts that have to be tackled by any putative regulatory framework. The chapter concludes by briefly outlining some of the international agreements that have been ratified by countries within the region, as well as a degree of inaction on their part, with a view to providing context for the discussion in subsequent chapters of this thesis.

Geographical and Environmental Features of the CAD

The CAD, also known as the Costa Rican Dome, is an area of high primary productivity in the northeastern tropical Pacific, which supports large pelagic fish, marine mammals, seabirds and marine predators such as tuna, dolphins, cetaceans (including the endangered blue whale), and is also considered part of a migration corridor for leatherback turtles.

The CAD has been observed and studied by a number of scientists and international bodies since the late 1950s, when tuna fishery began to develop in the region (Fiedler, 2002). The CAD is defined in the specialist literature as a shoaling of the generally strong, shallow thermocline with cold nutrient-rich upwelling (Fiedler, 2002).

To comprehend the name of this natural phenomenon, it must be understood that the boundary between the warm surface water and cold deep water (called a thermocline) forms a dome-like feature, and this in turn gives the area its name (Hofmann et al, 1981; Xie et al, 2005; Ballestero, 2006; Kahru et al, 2007).

Another important aspect to consider is that the CAD is formed by wind and currents, as a result its position and extension changes from year to year, so it is a geographically mobile area with ambulatory boundaries. The CAD is associated with a cyclonic circulation of surface currents and is seasonally affected by large- and coastal-scale wind patterns[1] (Kessler, 2006).

The CAD is mainly located in areas beyond national jurisdiction, with a mean position near 9°N, 90°W, but the latter can vary in size and position throughout the year, covering an area of approximately 1,570,47 km^2. From a law of the sea perspective, it is important to keep in mind that the CAD also straddles a number of sea areas coming under the coastal jurisdiction of Costa Rica, Nicaragua, El Salvador, Guatemala and México. (Fiedler 2002).

Figure 1. Approximate location of the CAD

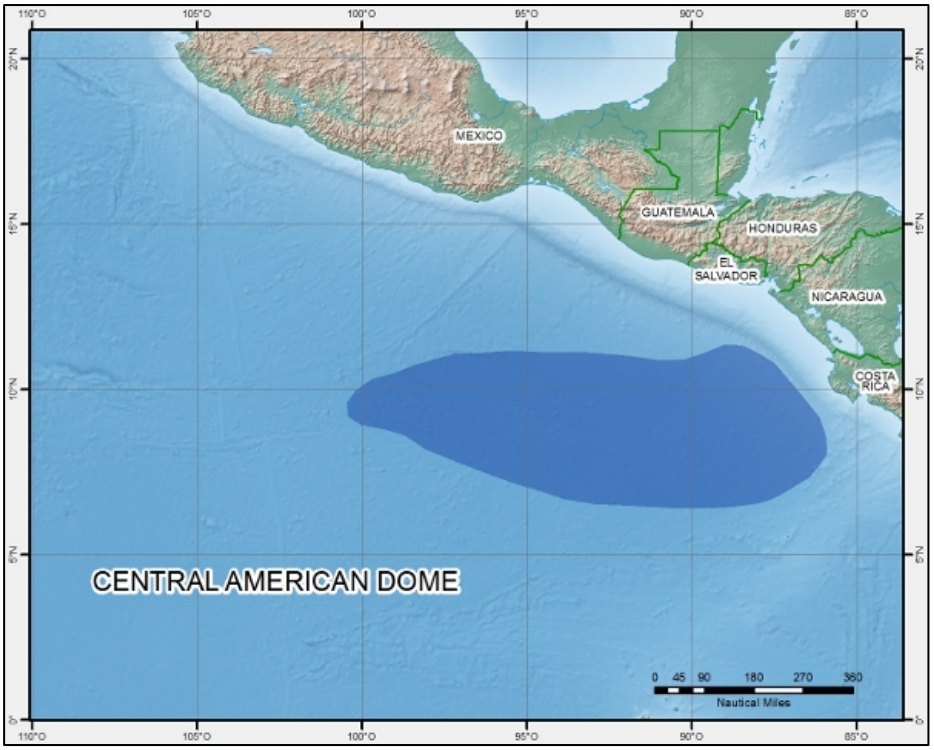


Figure 1. Approximate location of the CAD

Source: MarViva Foundation.[2]

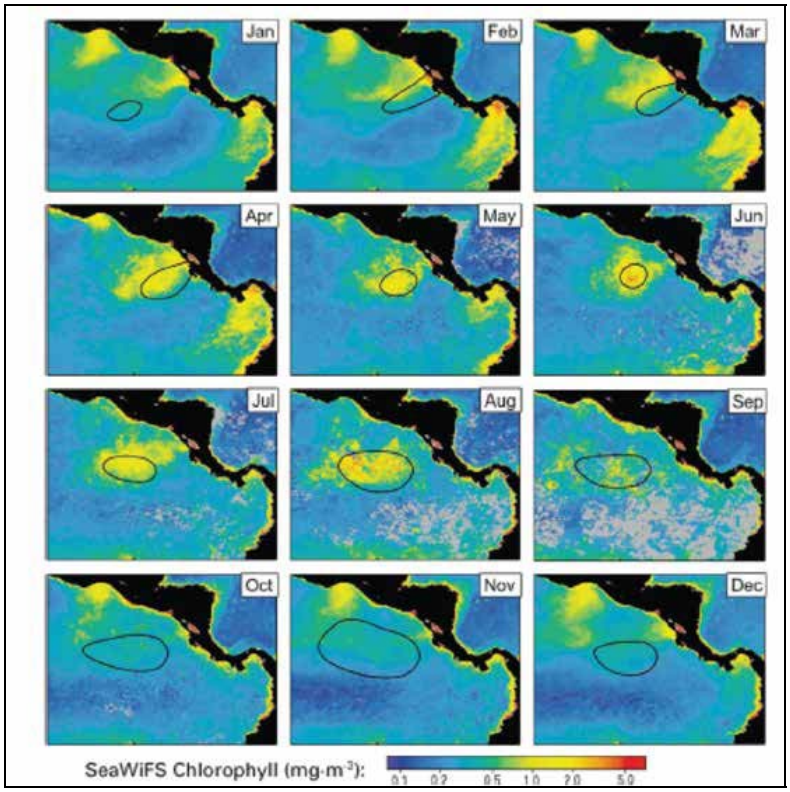
[1] There is a strong physical and biological interconnectivity between the coastal wind forcing in the Papagayo and Tehuantepec Coastal Regions and the Central American Dome. (Vierros et al, 2013)

[2] MarViva Foundation. http://www.marviva.net/index.php/en/2011-12-15-15-50-51/notes-archive/422-marviva-organizes-international-experts-workshop-on-the-central-american-dome

There are seasonal variations with the CAD forming near the Pacific coast in February-March as a result of a coastal wind jet, before strengthening offshore between July and November and eventually diminishing by December-January (Hofmann et al. 1981).

An important physical singularity to consider is the upwelling of cold waters full of nutrients in the CAD, which generates a special environmental condition in this area. This condition produces surface waters with lower temperature and higher in nitrate and chlorophyll than surrounding areas, resulting in high levels of primary production (Broenkow, 1965; Chavez & Barber, 1987; Fiedler, 2002, Vilchis et al, 2006). Significantly, this unique condition creates a distinct biological habitat, where phytoplankton and zooplankton biomass are higher than in surrounding tropical waters (Fiedler, 2002), which support economically important fish and other species at higher trophic levels.

Figure 2. Chlorophyll concentration in the CAD



Monthly mean fields of SeaWifs chlorophyll concentration in the CAD region. Source: Fiedler, 2002.

Apart from its geographical significance, it is important to point out that the CAD provides valuable goods and services to countries in the Central American Region, as it will be detailed in the next sections.

Fisheries

Arguably, fishing activity is the most important economic activity that takes place in the CAD, where commercial fishing boats capture tuna and other important profitable species that provide high incomes and food for the Central American countries.

In 2009, the Woods Center for the Environment at Stanford University estimated that fishing activities in Central America contributed at least USD $750 million annually to the economies within the region and supported 450,000 people.[3] This contribution of course cannot be attributed to fisheries entirely in the sea areas of the CAD, as the study is related to both Central American coasts.

Nonetheless, the importance of this area should not be underestimated in so far as the CAD supports important pelagic fisheries, particularly tunas and squids (FAO, 2005). A productive tuna fishery developed in the CAD area since the 1950s (Fiedler, 2002) makes this area a current site of a major yellowfin tuna fishery (Pennington et al, 2006). Annual catches of yellowfin tuna, by all types of gear combined, in the Pacific Ocean were of 191,358 tons in 2012[4].

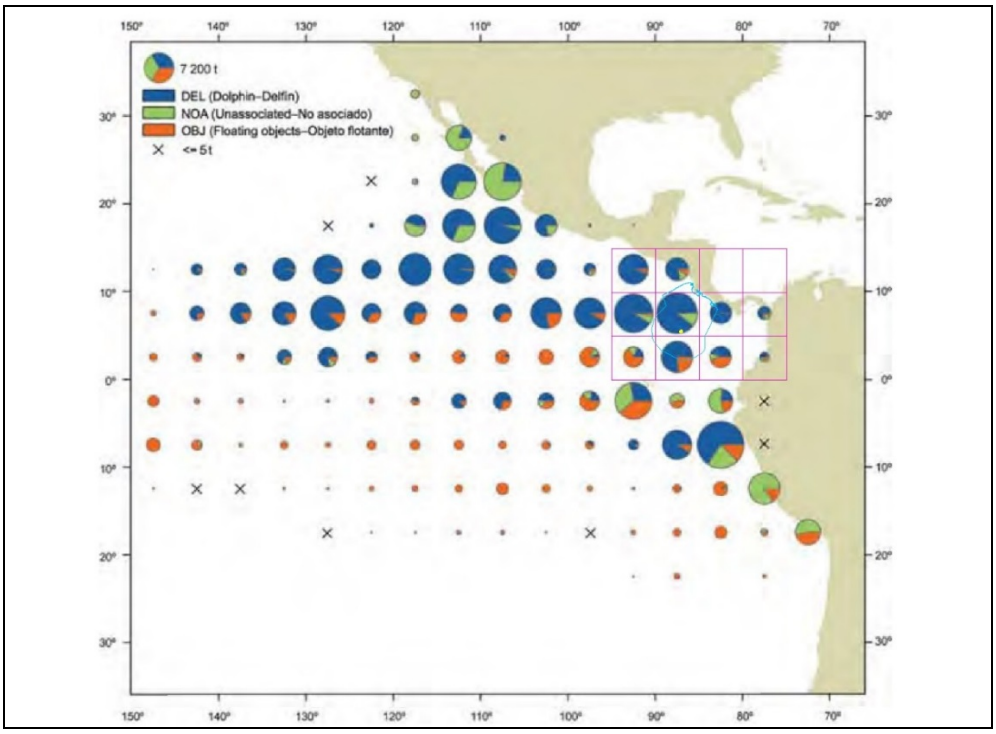
Also, it is important to visualize that the distant-water longline fleets of China, Chinese Taipei, French Polynesia, Japan, the Republic of Korea, Spain, the United States and Vanuatu, fish for tuna in the Eastern Pacific. In this scenario, the most common targeted fish are Bigeye and Yellowfin tunas (IATTC, 2012).

Figure 3. Annual distributions of purse-seine catches of yellowfin tuna. 2010[5]

[3] Center for Ocean Solutions. 2009. Pacific Ocean Synthesis: Scientific Literature Review of Coastal and Ocean Threats, Impacts, and Solutions. The Woods Center for the Environment, Stanford University. California. Pg 42.

[4] Inter-American Tropical Tuna Commission. Tunas and billfishes. 2012. http://www.iattc.org/PDFFiles2/FisheryStatusReports/Fishery-Status-Report-11SPN.pdf

[5] Documento IATTC-82-05. Atunes y peces picudos. 2010 (On line): http://www.iattc.org/Meetings/Meetings2011/Jun/PDFfiles/IATTC-82-05-Atunes-y-peces-picudos-en-el-OPO-2010.pdf



The sizes of the circles are proportional to the amounts of yellowfin caught in those 5° by 5° areas. Source: Inter-American Tropical Tuna Commission. Document IATTC-82-05. The CAD area is delineated in turquoise.

Another specie that is captured around the CAD is the jumbo flying squid (Dosidicus gigas). The CAD is thought to be a hatchery area for this specie (Waluda and Rodhouse, 2006). In this regard, higher chlorophylla concentrations found in the area may lead to a favorable feeding ground for the jumbo flying squid (Vierros et al, 2013).

As seen above, the CAD provides unique environmental benefits for squid fishery areas, considered the largest cephalopod fishery in the Eastern Pacific, with both commercial and artisanal fleets operating of the coasts of Peru, Mexico (Gulf of California), Central America and Chile (Waluda and Rodhouse, 2006, Ichii et al, 2002). Global landings of jumbo flying squid were 906 310 tons in 2011.[6] The squid is caught to serve the European market (Spain, Italy, France and Ireland), but also Russia, China, Japan, Southeast Asian, and increasingly North and South American markets. (Vierros et al, 2013).

In light of the importance of fisheries to the region, one must highlight **food security** as an important factor to be taken into consideration when proposing regulatory conservation measures for the CAD. This is clearly a global concern as is evident from the specialist literature, which notes that:

> "Food safety remains a major concern facing the seafood industry and it is a critical component in ensuring food and nutrition security worldwide. The issue of food safety is even more important in view of the growth in international fish trade, which has undergone tremendous expansion during the last three decades, increasing

[6]FAO. Capture production by principal species in 2011. ftp://ftp.fao.org/fi/stat/summary/a1e.pdf

> from US$8 billion in 1976 to a record export value of US$102.5 billion in 2010. Developing countries play a major role in international fish trade. In 2010, their exports represented 49 percent (US$42.5 billion) of world fish exports in value and 59 percent (31.6 million tons live weight equivalent) in volume." [7]

In the context of the Central American region, the rates of annual consumption in each country shows that a high percentage of protein comes from fish products. Significantly, the highest country rate of annual fish consumption per capita are Costa Rica (5.8 kg)[8] and El Salvador (3.3 kg)[9], followed by Honduras (3.2 kg)[10], Nicaragua (2.6 kg)[11] and Guatemala (2 kg). [12] Clearly, for these Central American countries, food security and the protection of fisheries are of fundamental importance and thus remain one of the principal objectives of foreign policy within the region.

Tourism

Tourism activities in coastal areas, such as turtle[13] and whale watching, are linked with species that are closely linked with the unique environment of the CAD. Tourism revenue provides economic support for communities in the coastal regions of Central America. Again, there is considerable evidence of its relative importance to local economies within the region. For instance, WWF have pointed out that:

> "Marine turtle use and conservation generate revenue and create jobs in developing countries throughout the world. The non-consumptive use of marine turtles generates more revenue, has greater economic multiplying effects, greater potential for economic growth, creates more support for management, and generates proportionally more jobs, social development and employment opportunities for women than consumptive use."[14]

A word of caution, however, because it is difficult to quantify the real ecological services and economic value of some species as a result of the complex ecological interactions between them and the marine ecosystems. Nevertheless, some experiences with specific species have been quantified, one of them is in relation to the leatherback turtles (Dermochelys coriacea), classified as critically endangered on the 2010 IUCN Red List of threatened Species (Bailey et al, 2012).

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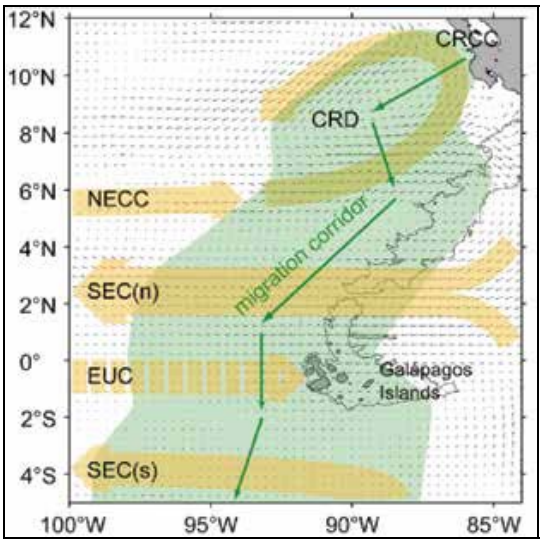
[7] FAO. 2012. The State of World Fisheries and Aquaculture 2012. Rome. 209 pp
[8] FAO country profiles. Costa Rica. ftp://ftp.fao.org/FI/DOCUMENT/fcp/es/FI_CP_CR.pdf
[9] FAO country profiles. El Salvador. ftp://ftp.fao.org/FI/DOCUMENT/fcp/es/FI_CP_SV.pdf
[10] Bonilla Flores, Edwar Josue. Comercialización y caracterización de los hábitos y tendencias de consumo de pescados y mariscos. 2010. On line: http://bdigital.zamorano.edu/bitstream/11036/505/1/T2915.pdf
[11] FAO country profiles. Nicaragua. ftp://ftp.fao.org/FI/DOCUMENT/fcp/es/FI_CP_NI.pdf
[12] FAO country profiles. Guatemala. ftp://ftp.fao.org/FI/DOCUMENT/fcp/es/FI_CP_GT.pdf
[13] Bailey et al (2012) mapped tracking data for leatherback turtle populations throughout the Pacific Ocean. Turtles tagged at Playa Grande, Costa Rica, are shown to migrate through the Central American Dome and its surrounding area.
[14] Troëng, S. and Drews C. (2004). Money Talks: Economic Aspects of Marine Turtle. Use and Conservation, WWF-International, Gland, Switzerland www.panda.org

The CAD and its surrounding area encompass an important migratory path for a population of endangered leatherback turtles nesting in Costa Rica (Shillinger et al., 2011).

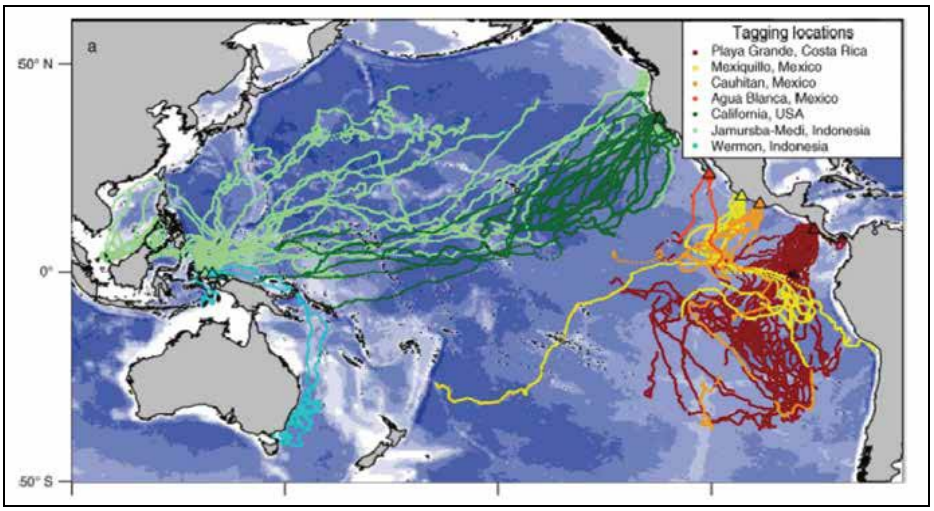
Figure 4. Leatherback turtle migration corridor through the equatorial current system.



CRD: Costa Rican Dome/CAD. Source: Shillinger et al, 2008.

In this context, it is important to point out the example of the leatherback population nesting at Playa Grande (Costa Rica), which migrates through the CAD, and has become a major tourist attraction.

Figure 5. Turtles migration paths on the Pacific.



Tracks in red belong to turtles tagged at Playa Grande, Costa Rica, and are shown to migrate through the CAD and its surrounding area. Source: Bailey et al, 2012.

The economic data is impressive and demonstrate the importance of this charismatic species to the region. Thus, for example, Gutic (1994) estimated that a third or

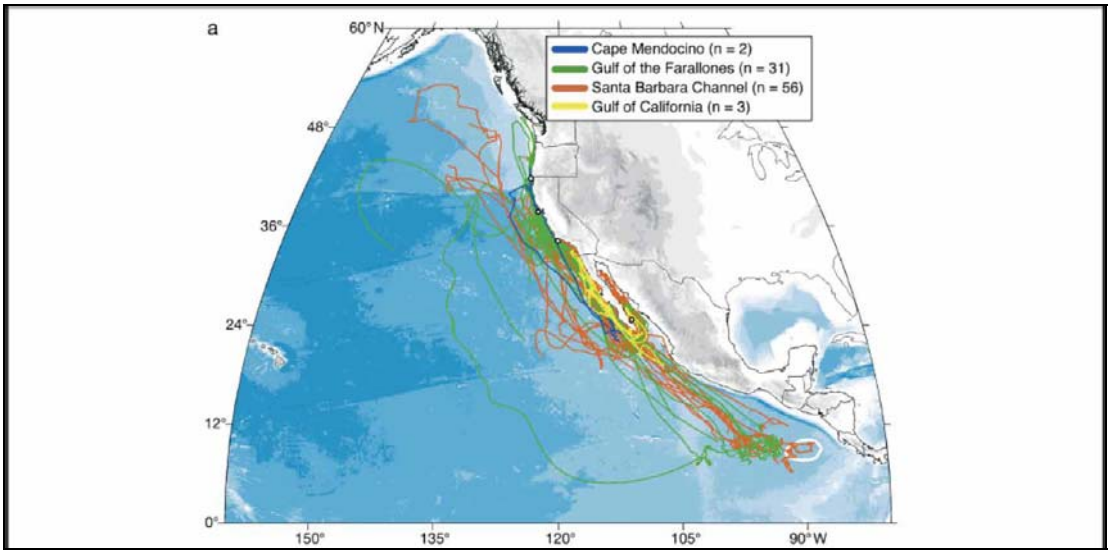
US$1,350,960, of the gross tourism revenue for the area adjacent to Las Baulas Marine National Park (Playa Grande, Costa Rica) is generated by the leatherback turtles and the natural resources of the estuary at the southern end of Playa Grande. The leatherback population alone generated two thirds of that revenue, equivalent to US$900,460 in 1993 (Gutic, 1993, 1994), a contribution that could be much higher today. In this regards, gross annual revenue to tourism operators, business owners and their employees in Las Baulas de Guanacaste National Park is estimated at US$2,113,176 (Troëng and Drews, 2004).

It must be noted however, that in order to ensure that management and conservation efforts within the CAD region are meaningful for leatherbacks, improved and sustained management of Mesoamerican nesting beaches and related habitats (ranging to ~ 100 km from the coast) must be an essential features of any putative conservation regime (Vierros et al, 2013).

In addition to tourism activities related to species that depends on the CAD, another popular and growing activity for Central American coastal communities is whale (cetacean) watching, which generates income for local communities and also contribute to the establishment of marine protected areas within the Region.

Instructively, blue whales' distribution in the Eastern Tropical Pacific has been analyzed by Reilly and Thayer (1990), and one of the main outcomes was that over 90% of the sightings were made in two locations: along Baja California and in the vicinity of the CAD.

Figure 6. Blue whales migration corridor in the Northeastern Pacific

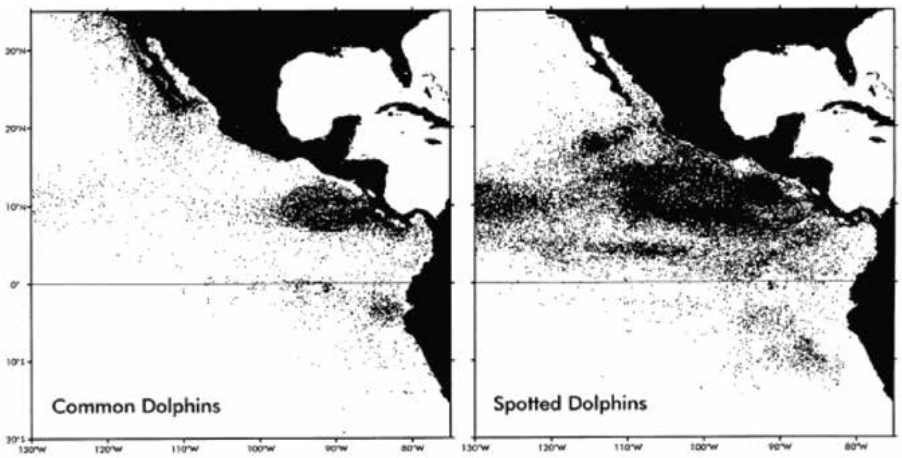


Individual tracks for 92 tags on blue whales deployed between 1994 and 2007. The Central American Dome is shown as white contour. Source: Bailey et al, 2009.

Also, another study based on extensive delphinid sighting data and modelling of dynamic environmental variables predicted that the CAD would be one of the areas

with highest delphinid densities in the eastern tropical Pacific Ocean (Ferguson et al, 2005).

Figure 7. Sighting locations of common dolphins and spotted dolphins



Sighting locations of common dolphins and spotted dolphins from research and tuna vessels in the NOAA/NMFS/SWFSC sightings database (1971–1999). Source: Fiedler, 2002.

Thus it is unsurprising to note that there are at least 1,189 boats used for whale (cetacean) watching within Latin America (Hoyt, E. and Iñíguez, M. 2008).

The number of communities involved in whale watching in Latin America as ports or destinations has climbed from 56 in 1998 to 91 in 2006. There is even greater economic benefits to local communities because of the direct nature of expenditure. (IFAW, 2005). In this regard, whale watching is effectively contributing to rural economic development because it is usually located outside of the main economic centers of Latin America (Hoyt, E. and Iñíguez, M. 2008). This particular industry is growing steadily, as noted in a specialist economic study:

> "As of 2006, there were 885,679 whale watchers (whale watch visits) in Latin America, with USD $79.4 million in direct expenditure (ticket prices) and $278.1 million in total expenditure. Based on the numbers of whale watches, this is an average rate of increase of 11.3% per year for the period 1998 to 2006. In one country, Costa Rica, with 74.5% average annual increase between 1998 and 2006. In the decade (1998-2007) an estimated 6.4 million whale watches have taken place throughout Latin America. At this rate, Latin America will see its one millionth whale watcher sometime in 2008 and by 2010 there will be 1.4 million whale watchers per year."[15]

More detailed information on the growth of the industry are shown in Box 1 below.

Box 1. Whale Watching numbers, growth rate & expenditure, in Central America					
Country	Whale	Average	USD direct	USD indirect	USD total

[15] Hoyt, E. and Iñíguez, M. 2008. The State of Whale Watching in Latin America. WDCS, Chippenham, UK; IFAW, Yarmouth Port, USA; and Global Ocean, London, 60pp.

	watchers	annual growth rate %	expenditure	expenditure	expenditure
Guatemala	800	na	104,000	48,000	152,000
El Salvador	Minimal	na	Minimal	minimal	minimal
Honduras	Minimal	na	Minimal	minimal	minimal
El Salvador	8,832	na	719,808	1,324,800	2,044,608
Costa Rica	105,617	74.5	5,318,487	15,842,550	21,161,037

Source: Hoyt, E. and Iñíguez, M. 2008. The State of Whale Watching in Latin America. WDCS, Chippenham, UK; IFAW, Yarmouth Port, USA; and Global Ocean, London, 60pp.

Finally, it is important to point out that the majority of the whale watchers are international visitors, both from within and beyond Latin America. This economic activity thus provides a much needed infusion of foreign exchange into local and regional economies. (Hoyt, E. and Iñíguez, M. 2008)

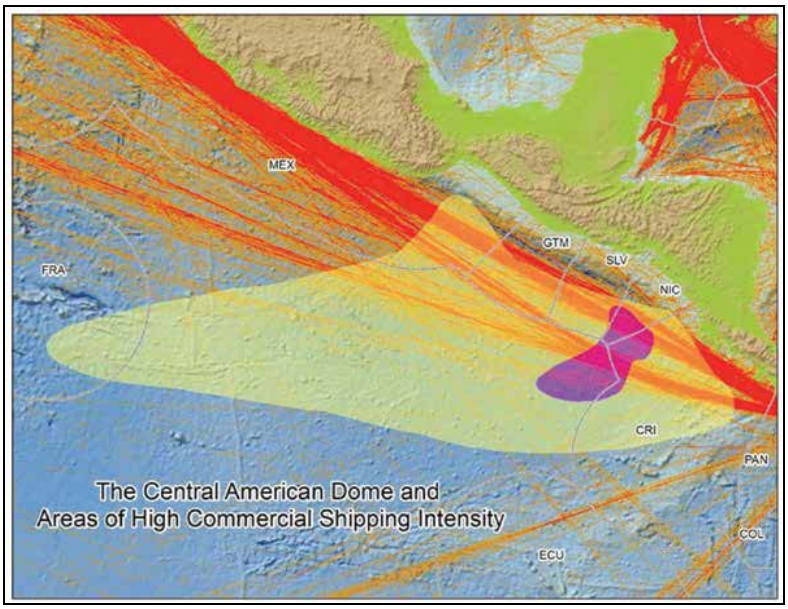
Threats to conservation

As seen above, the CAD supports biodiversity and important economic activities in the Central American Region. However, there is considerable evidence that demonstrates that it is also exposed to serious threats and pressures from a variety of anthropogenic impacts. In particular, there is support in the scientific literature for the view that the CAD ranks as an area of medium high impact under a global analysis that has been undertaken of human impacts on marine ecosystems (Halpern et al, 2008).

This consideration is principally because the CAD is located in one of the busiest shipping lanes in the world, with **shipping traffic** expected to grow in the future with the expansion of the Panama Canal. Noise pollution and collision risk with cetaceans and marine turtles from commercial shipping may lead to displacement, behavioral disturbance[16] and interference of communication. (Vierros et al, 2013).

Figure 8. High commercial shipping intensity in the CAD

[16] Marine animals that use low frequencies for hearing and communication. (Richardson et al, 1995).



Lines in red color indicate highest intensity traffic. The CAD area is highlighted in purple color. Data from the National Center for Ecological Analysis and Synthesis and the University of Santa Barbara.

Another important threat is the **over fishing** of commercially important species in the CAD. Again much of the specialist literature is unequivocal on this point. The Woods Center for the Environment at Stanford University have identified that commercial and industrial fishing are major threats in the North East Pacific as this region is extremely productive and supports economically valuable fisheries and aquaculture activities.[17] They have called for additional studies and more research to quantify the threat and they have noted that,

> "Fisheries management in Central America is generally failing to control illegal fishing. The depletion of fish stocks has a direct impact on coastal populations in that it reduces income and increases unemployment, thus weakening social stability and food security."[18]

Over exploitation is a persistent threat to fisheries carried out in the CAD. Again the scientific picture is pretty grim with respect to yellowfin tuna, in this regard the IATTC estimate that "during 2004-2009 the catch decreased substantially, and the catch during 2012, 191 thousand tons, was comparable to the lowest catches of the 2006-2008 period, and less than half the highest catches of the 2001-2003 period."[19]

An additional threat in relation to industrial and semiindustrial fisheries in the CAD, is the bycatch risks for leatherbacks, other marine turtles and cetaceans. Fisheries by-catch is cited as one of the two main reasons (the other one being egg harvest on nesting

[17] Center for Ocean Solutions. 2009. Pacific Ocean Synthesis. Pg 37
[18] Ibidem. Pg 38
[19] Inter-American Tropical Tuna Commission. Tunas and billfishes. 2012. http://www.iattc.org/PDFFiles2/FisheryStatusReports/Fishery-Status-Report-11SPN.pdf

beaches) for the more than 90% decline in leatherback turtle nesting populations in the eastern Pacific (IATTC, 2012; Santidrián Tomillo et al. 2007; Sarti Martínez et al. 2007).

One more threat that affects marine ecosystems in the Central American Region, and impacts the CAD, is **pollution from both marine and land-based sources**. The Woods Center for the Environment have summarized the overall position as follows:

> "Impact forms of pollution in the region include oil spills, antifouling chemicals, and solid waste disposal. Such pollution can create dead zones and algal blooms, alter the ecosystem structure, and jeopardize human systems. Agriculture, wastewater, and other sources contribute to the pollution problem, which is exacerbated by the lack of infrastructure in parts of Central America. Except in Costa Rica, there is a low level of sanitation coverage, so nutrient pollution from human sewage remains a prevalent threat in many Central American countries. Throughout the region, no matter the source, nutrient pollution may result in adverse impacts on the marine environment."[20]

All of the aforementioned impacts on the CAD are compounded by the effects of **climate change**, which are altering physical oceanographic processes and/or the migration and distribution patterns of species utilizing the area. (Vierros et al, 2013). In this regard, research undertaken during the last decades has confirmed the importance of ocean biology in controlling the carbon dioxide (CO2) content of the atmosphere (Williamson and Holligan, 1990). Current estimations about carbon sequestration by oceans indicates that approximately 50% of it becomes bound into the seas and oceans (Vierros et al, 2013).

Similarly, **ocean acidification** is a major concern for the CAD. Ocean acidification is the phenomenon of the oceans becoming progressively less alkaline as a result of increased CO2 levels in the atmosphere dissolving in the ocean. If allowed to continue unabated, this process may have significant impacts on marine ecosystems and livelihoods worldwide, as well as the carbon cycle. (U.N Secretary-General, 2013). The absorption of atmospheric CO2 results in changes to the chemical balance of the oceans, causing them to become more acidic since the beginning of the Industrial Revolution 250 years ago. There are some estimates that acidity has increased by the order of 30 per cent over this period. (CDB Secretariat, 2009).

Although the CAD is a geographically mobile area, the oceanographic singularity (marine upwelling) itself may be impacted by climate change and ocean acidification, affecting consequently the species that depends on it, and the regional fishery and tourism industries that benefits from the CAD.

Another climate and physical phenomenon to take into consideration are the effects of El Niño and La Niña, events that also affects the marine environment, its species and the commercial activities that depend upon the health of marine ecosystems. According to a scientific report:

[20] Center for Ocean Solutions. 2009. Pacific Ocean Synthesis. Pg 34

> "The designation of El Niño applies to large oceanic anomalies that occur from time to time off the coast of South America. El Niño phenomenon is occasional, irregular, and has socio-economic implications. Its origin is not well known and appears to be linked to the general weakening of the circulation of the southern hemisphere trade winds. El Niño phenomenon occurs with different intensities at intervals of 5-16 years and its duration is variable, presenting its greatest intensity in the months of February and March. The main events of the phenomenon were those that occurred in 1891, 1925-26, 1940-41, 1957-58, 1965, 1972-73, 1976 and 1982-83, which temporarily altered ocean conditions and climate of the coast, with an enormous impact on the fishery, agriculture and climate."[21]

As indicated above, El Niño affects marine species and the activities that different industries depend upon, for example, "tuna catches have been affected by climate perturbations, such as the major El Niño events that occurred during 1982-1983 and 1997-1998."[22]

Finally, Dossier and Donguy (1987) have reported "strong changes in the copepod community (plankton) of the Eastern Tropical Pacific during the 1982-1983 "El Niño".[23] In this regard, being a high productivity zone, the Costa Rican Dome deserves a deeper study of its zooplankton communities, regarding the primary productivity and the seasonal changes of the upwelling and its effect on the upper trophic levels, mainly because it is economically very important for the Central American region.[24]

International Conventions ratified by Central American countries

The Central American countries (Guatemala, El Salvador, Honduras, Nicaragua and Costa Rica) have ratified many international agreements that are applicable to fisheries, biodiversity conservation and maritime transportation. A brief summary of the international legal framework is provided below.

As can be seen underneath from the information in Box 2, all of the Central American countries have ratified the *United Nations Convention on the Law of the Sea*, apart from El Salvador. This Convention thus provides the overarching framework that regulates marine activities within the region.

Box 2. Date of ratification of the United Nations Convention on the Law of the Sea by Central American Countries

State	Date of ratification

[21] Bernal, Patricio A; Robles, Fernando L; Rojas, Omar Rojas. Ocean scale and regional comparison. BIOTECMAR. On line: ftp://ftp.fao.org/docrep/fao/005/x6851b/x6851b06.pdf
[22] ITTC, 2013. http://www.iattc.org/PDFFiles2/FisheryStatusReports/Fishery-Status-Report-11SPN.pdf
[23] Dossier, A. and Donguy, J.R. (1987) Modification of Copepod Population in Relation to Physical Properties During the 1982-83 El Niño. IOC Workshop Report No. 49, Annex III: 64.
[24] Suárez M, .Eduardo; Gasca S. Rebeca. Epiplanktonic calanoid copepods from the Costa Rica Dome (July - August, 1982). http://cienciasmarinas.com.mx/index.php/cmarinas/article/viewFile/624/559

Costa Rica	September 21 1992
Honduras	October 5 1993
Nicaragua	May 3 2000
Guatemala	February 11 1997
El Salvador	----------

As regards to **biodiversity conservation**, the *Convention of Biological Diversity*, has been signed by the five countries on the same date (June 13, 1992). Another international instrument related to species that depends from the CAD is the *Inter-American Convention for the Protection and Conservation of Sea Turtles*, which has been ratified by Costa Rica, Honduras and Guatemala.

Box 3. Date of ratification of the Inter-American Convention for the Protection and Conservation of Sea Turtles by Central American Countries

State	Date of ratification
Costa Rica	April 17 2000
Honduras	February 1 2001
Nicaragua	----------
Guatemala	August 15 2003
El Salvador	----------

In the national context, all countries have a Ministry of Environment to implement international and national regulations in relation to natural resources, their conservation and sustainable use. Most notably, the relevant Ministries include: the Ministry of Environment and Natural Resources of Nicaragua; the Ministry of Environment and Natural Resources of Guatemala; the Ministry of Environment and Natural Resources of El Salvador; the Ministry of Environment and Energy of Costa Rica; and the Ministry of Natural Resources of Honduras.

In relation to **fisheries management**, Guatemala, Costa Rica and El Salvador have adopted several measures related to the control of ports and landing of fish products. These include measures to implement the *Agreement on Port State Measures to prevent, deter and eliminate illegal, unreported and unregulated fishing*.[25] Significantly, Honduras and Nicaragua have not updated the FAO data base on national measures to implement this Agreement.

As is well known, the *FAO Code of Conduct for Responsible Fisheries*, sets out principles and international standards for the conservation, management of fisheries, as well as the conservation of ecosystem and biodiversity.[26] As such, it is an important voluntary code that has influenced state practice within the region on the adoption of fisheries conservation and management measures.

[25] FAO Fisheries and Aquaculture Department. Database on Port State Measures http://www.fao.org/fishery/psm/search/en

[26] R. Long (2006) "Review of the Legal Framework Applicable to Marine Protected Areas as a Tool for Ecosystem Conservation & Fisheries Management", European Union, Specific Targeted Research Project PROTECT. Review of MPAs for Ecosystem Conservation & Fisheries Management. Published by DIFRES Copenhagen, pp.10-30.

Significantly, the *Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982, relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks*, has only been ratified by Costa Rica (18 June 2000). This represents a major weakness in the regional approach to the management of migratory and straddling fish stocks, which must be resolved if an appropriate conservation regime is to be established for the CAD at a multilateral or regional level.

At a national level, the five countries have a number of specialized institutions to manage fisheries.[27]

In respect with **maritime and navigation** regulations, the Central American countries have ratified many of the IMO treaties and agreements. This study will focus on *the* following: *the International Convention for the Prevention of Pollution from Ships*, or MARPOL Convention, and the *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter*, or London Convention and its Protocol.

In this context, Costa Rica has ratified the London Convention, as well as Guatemala and Honduras. And the International Convention for the Prevention of Pollution from Ships, or MARPOL, has been ratified by El Salvador, Guatemala, Honduras and Nicaragua.

Box 4. Date of ratification of London Convention by Central American Countries

State	Date of ratification
Costa Rica	July 16 1986
Honduras	May 2 1980
Guatemala	July 14 1975

Box 5. Date of ratification of MARPOL Convention by Central American Countries

State	Date of ratification
El Salvador	September 24 2008
Honduras	June 22 2001
Guatemala	November 3 1997
Nicaragua	February 1 2001

All of the countries within the region have established specific Ministries for the management of maritime transport.[28]

In summarizing, the Central American countries are able to manage regionally the CAD, within their national institutional and legal frameworks, and also, as it will be analyzed in further sections, within the regional framework that the Central American Integration System provides.

[27] These include, *inter alia*: the Nicaraguan Institute of Fisheries and Aquaculture; the Costa Rican Institute of Fisheries and Aquaculture; the Unit of fisheries management and aquaculture of Guatemala; the Centre for Development of Fisheries and Aquaculture of El Salvador; and the Directorate General of Fisheries and Aquaculture of Honduras.

[28] Which include: Ministry of Public Works and Transport of Costa Rica. The Department of Public Works, Transport and Housing of Honduras. The Ministry of National Defense of Guatemala. The Ministry of Transportation and Infrastructure of Nicaragua. The Ministry of Public Works, Transport, Housing and Urban Development of El Salvador.

Conclusions

After a brief overview of the geographical and environmental features of the CAD, its threats and economic importance for the Central American countries, as well as the legal framework in the region, the main conclusions are the following:

The CAD has unique geographical and environmental features. Winds and currents delineate the CAD, so it is a geographically mobile area, mainly located in areas beyond national jurisdiction, but which also straddles the jurisdictional waters of the Central American countries.

The CAD is a high productivity area which supports marine mammals, seabirds and marine predators, several of them classified as endangered and vulnerable species. It also supports important pelagic fisheries, particularly tunas and squid, being a significant environment for extensive fisheries and food security in the region.

Tourism revenue contributes meaningfully to the economy of the region. Whale and turtle watching especially support local communities in the coastal regions of Central America, contributing to rural economic development. Some experiences have been quantified, being one of them related to the leatherback turtles, classified as critically endangered on the 2010 IUCN Red List of threatened species.

The CAD is exposed to serious threats and pressures from a variety of anthropogenic impacts. Its highest threats are shipping traffic (pollution, collision risk to cetaceans), overfishing (depletion of fish stocks reducing income and increasing unemployment), p*ollution from marine and land-based sources (a*griculture, wastewater), c*limate change (a*lteration of physical oceanographic processes, ocean acidification and modification in the distribution patterns of species).

The Central American countries have ratified many international agreements that are applicable to fisheries management, marine conservation and maritime transportation. It is worth noticing that only Costa Rica has ratified the 1995 Fish stocks *Agreement*, which represents a major weaknesses in the regional approach to the management of migratory and straddling fish stocks. However, the Central American countries are able to manage regionally the CAD, within their national institutional and legal frameworks, and also in within the regional framework that the Central American Integration System provides.

Chapter 1. International Legal Framework of marine resources on the high seas

The legal regime applicable to the conservation and sustainable use of marine resources in areas beyond national jurisdiction has been evolving steadily for the past few decades. Currently, the United Nations Convention on the Law of the Sea (UNCLOS) is the principal reference instrument in regards to ocean related activities. Other implementation agreements have been adopted to regulate specific conservation and sustainable use targets, such as the Agreement for the conservation and management of straddling and highly migratory fish stocks. This is complemented by instruments adopted under the auspices of the IMO including the Port State measures Agreement, and the FAO Compliance Agreement, among others.

In close relation with the development of these multilateral agreements, an institutional framework has emerged as well. Different United Nations Agencies and other organizations have worked to consolidate area based management tools, with the objective of meeting specific challenges in regard with conservation of marine resources.
In the present chapter the principal Conventions and area based management tools will be analysed in relation to their potential applicability in the CAD. This will be followed by an examination of area based management tools, namely: Ecologically or Biologically Significant Areas- CBD, Regional Seas Programme –UNEP, Vulnerable Marine Ecosystems –FAO, and Particularly Sensitive Sea Areas- IMO.

Conservation of marine living resources

Obligations stemming from UNCLOS

Many obligations stem from the Convention and is best to start by reviewing briefly the general legal framework established by the United Nations Convention on the Law of the Sea (UNCLOS hereafter), in relation with conservation and sustainable use measures on the high seas.

UNCLOS established a general obligation for States to protect and preserve the marine environment.[29] Also, it is important to point out that the States have sovereign rights to explore and exploit their natural resources pursuant to their environmental policies, and in accordance with their duty to protect and preserve the marine environment.[30]

These general obligations must be interpreted with other requirements under the Convention, which provides that all States have the duty to adopt conservation measures for the living resources of the high seas, or to cooperate with other States that are taking such measures.[31]

[29] UNCLOS. Article 192.
[30] Ibidem. Article 193.
[31] Ibidem. Article 117.

In addition, it is important to acknowledge that States shall cooperate with each other in the conservation and management of living resources in ABNJ, and those States whose nationals exploit identical living resources, or different living resources in the same area, shall enter into negotiations and take conservation measures of the living resources.[32] This particular article highlights the importance of effective coordination between the Central American countries to ensure that shared marine living resources in the CAD will be available in the future.

As is well known, UNCLOS sets down many obligations concerning the conservation and management of the living resources of the high seas[33], such as determination of the allowable catch of these resources, the use of the best scientific evidence available, the maintenance or restoration of populations of harvested species, the requirements to compile catch and fishing effort statistics, among others.

Cooperation on a global or regional basis is a fundamental obligation that UNCLOS places on States and international organisations. In this regard, cooperation is requested specifically in the formulation and elaboration of international rules[34], standards and procedures for the protection and preservation of the marine environment, taking into account characteristics of regional features.

Much study has been undertaken by scholars on the international legal regime applicable to ABNJ. In particular, Kristina Gjerde[35] has identified strengths, as well as gaps[36] and weaknesses of the regulations included in Part XII of UNCLOS, in relation to conservation and management measures for marine resources on the high seas. Some of principal strengths and weaknesses are shown in Box 6 below:

Box 6. UNCLOS Part XII

Strengths for marine conservation	Gaps and weaknesses
• An overarching obligation for marine protection and preservation (articles 192, 194, 194.5)	• The duty of protect and preserve the marine environment has been inadequately implemented, leaving the areas beyond national jurisdiction (hereafter ABNJ) subject to increasing degradation and biodiversity loss.
• Comprehensive coverage of all forms of pollution (articles 194, 195,196).	• UNCLOS zonal approach based on distance from shore, while important for allocating the rights and duties of States, fails to recognize the connectivity of ecosystems or species that straddle or migrate to ABNJ, or the

[32] Ibidem. Article 118.
[33] Ibidem. Article 119.
[34] Ibidem. Article 197.
[35] Gjerde, Kristina. Challenges to protecting the marine environment beyond national jurisdiction. The International Journal of Marine and Coastal Law, Volume 27, Number 4, 2012, pp.839-847. Pg 842, 843
[36] Ibidem. Pg 842

	vulnerability of ecosystems and species dwelling beyond national jurisdiction.[37]
• An evolutionary approach, by recognizing the competence of international and regional organizations and diplomatic conferences to adopt rules, regulations and recommendations for pollution prevention, reduction and control (articles 194, 195, 196 and 208).	• The focus in UNCLOS on marine pollution means that more recent concerns of biodiversity conservation (genetic resources, species and ecosystems) are left uncovered.
• A duty to cooperate at the global and regional level (article 197, 200, 201).	• The evolutionary approach has become more of a reactionary approach, leaving many activities with a potential to cause significant adverse impacts in ABNJ unregulated or under-regulated.
• Strong provisions for scientific and technical assistance to developing States (articles 202, 203).	• The duty of cooperation on global and regional basis has been unevenly implemented, leaving many geographic gaps. Most ABNJ lack a body to facilitate cooperation and coordination for conservation and sustainable development.
• Requirements for prior assessment of planned activities and ongoing monitoring (articles 192, 194, 204, 205, 206).	• Lacking of common rules for environmental impact assessments for activities with a potential to cause significant adverse impacts in ABNJ.
• Detailed provisions on State duties and powers of enforcement including port States, coastal States and flag States (articles 213-233).	• The emphasis in UNCLOS on the flag state as primary enforcer of marine environmental laws on the high seas, which did not address the use of flags of convenience and the lack capacity of flag States or indeed the political will to enforce international minimum standards.

Additional gaps and the challenges arise from the weak enforcement and compliance provisions in Part XII UNCLOS. That said, Verlaan has pointed out that:

> "It is now generally accepted that most, not all, of the environmental provisions of the Law of the Sea Convention, and especially those set out in Part XII, have attained the status of customary international law. As the LOSC does not exempt high seas freedom from its environmental provision, it is probable that their applicability to at least those freedoms as set out under article 87 have customary international status as well."[38]

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[37] D. Tladi, Ocean Governance: A fragmented regulatory regime. In P Jacquest, RK Pachauri. L. Tubiana (eds), Oceans: The New Frontier (TERI Press, Delhi, 2011) 99-110.

[38] Verlaan, Philomène. Marine Scientific Research: Its Potential Contribution to Achieving Responsible High Seas Governance. The International Journal of Marine and Coastal Law, Volume 27, Number 4, 2012, pp. 805-812(8). Pg 810.

The latter is an important consideration as it binds non State parties to the Convention to the aforementioned environmental provisions. In particular, they must meet the general commitments in relation to the protection of the marine environment, preservation of fragile ecosystems and the conservation of living resources.[39]

To this end, it is relevant to acknowledge that in the **United Nations General Assembly Resolution A/67/95**, many delegations indicated that the implementation of the existing legal instruments, including UNCLOS, would not be enough to achieve effective conservation and sustainable use of marine biodiversity in ABNJ.

In this regard, several initiatives have emerged on the international legal landscape, including most notably as the **Ad Hoc Open-ended Informal Working Group** to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction, established by the United Nations General Assembly (hereafter UNGA) in 2004[40], to address different tasks in relation to conservation and sustainable use of marine diversity beyond areas of national jurisdiction.

Since 2005, the group has been meeting each year to discuss specific matters about conservation and sustainable use of marine resources in ABNJ, and from each meeting a report with recommendations has been sent to the U.N. General Assembly, being the central body through which States agreed on common standards. During the sixth meeting[41] delegations noted that the Working Group had served as an outstanding forum for the exchange of views and sharing of expertise and knowledge. In this context, discussions has been focused as a whole on these specific topics: marine conservation, marine genetic resources (including sharing of benefits), area-based management tools (including MPAs), environmental impact assessments, capacity-building and the transfer of marine technology.

Currently, there is expressed support for the development of an implementing agreement under UNCLOS, which could bridge many of the gaps highlighted above by establishing a comprehensive legal, institutional and governance framework for ABNJ. In this regard, a new legal instrument should include modern governance principles, such as an ecosystem approach, the precautionary principle, transparency and participation in decision-making processes, and also address challenges such as intellectual property rights, international cooperation, capacity-building and the transfer of marine technology.[42]

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[39] UNEP-MAP-RAC/SPA. 2011. Note on the establishment of MPAs beyond national jurisdiction. By Scovazzi, T. Ed. RAC/SPA, Tunis: 47pp. Pg 26.

[40] United Nations General Assembly. Resolution 59/24 of 17 November 2004, paragraph 73.

[41] UNGA. Sixty-eighth session, Oceans and the law of the sea. A/68/399. Report of the Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction and Co-Chairs' summary of discussions. (on line): http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N13/484/70/PDF/N1348470.pdf?OpenElement Pg. 4

[42] Ibidem. Pg. 10

Convention on Biological Diversity

The Convention on Biological Diversity[43] promotes the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of benefits arising from the utilization of genetic resources. It also contains the principle of sovereignty of States to exploit their natural resources, applying their own environmental policies and considering the obligation to ensure that activities that are carried out within their jurisdiction do not cause damage to the environment of other States or in areas beyond national jurisdiction[44], bearing in mind principle 2 of the Rio Declaration on Environment and Development.[45]

In relation to conservation measures, the CBD specifies that States must develop policies, strategies or programs for the conservation and sustainable use of biological diversity. In this regard, article 8 requires Parties to establish systems of protected areas, promoting actions for the protection of ecosystems, the rehabilitation of degraded ecosystems and the recovery of endangered species. *In situ* conservation is a key element advanced by the Convention.

Many important initiatives have been undertaken within the framework of CBD, which are relevant to the protection and preservation of the biodiversity in areas that are under the sovereignty and jurisdiction of coastal States that are adjacent to the CAD. Most notably, the Aichi Biodiversity Targets[46] set a commitment for Parties to protect 10% of its coastal and marine areas by 2020, through systems of protected areas and other effective area-based conservation measures. As a first step toward this goal, the 10th Conference of Parties to the CBD recommended the organization of regional workshops to identify Ecologically or Biologically Significant Areas (EBSAs)[47] in need of protection. This particular spatial tool will be analyzed in the following section, as an option which may be useful for the CAD initiative.

Sustainable use of marine living resources

Agreement for the implementation of the provisions of the United Nations Convention on the Law of the Sea of 10 December 1982, relating to the conservation and management of straddling fish stocks and highly migratory fish stocks.

As mentioned previously, although UNCLOS makes reference to the straddling and highly migratory stocks, there was no comprehensive agreement on how best to

[43] CBD Convention. (on line): http://www.cbd.int/doc/legal/cbd-en.pdf
[44] CBD Convention. Article 4.
[45] Rio Declaration on Environment and Development. (on line): http://www.jus.uio.no/lm/environmental.development.rio.declaration.1992/portrait.a4.pdf
[46] CBD. The Aichi Biodiversity Targets. (on line): http://www.cbd.int/sp/targets/
[47] Dunn, D.C. (et. al) (2011). Ecologically or Biologically Significant Areas in the Pelagic Realm: Examples & Guidelines – Workshop Report. Gland, Switzerland: IUCN. 44pp.

regulate these fish stocks during course of the 3rd Law of the Sea Conference.[48] In this regard, articles 63, 64 and Part VII of UNCLOS provided only a few broad principles for the management of the straddling and highly migratory fish stocks, as well as, high seas fish stocks. In this context, the freedom of fishing is one of the cardinal freedoms of the high seas,[49] but whilst all States have the right to engage in fishing on the high seas, this activity must be undertaken subject to obligations, rights and duties of coastal States and other relevant provisions provided in UNCLOS.[50]

Many of the issues concerning the conservation and proper management of these stocks are addressed in the 1995 Fish Stocks Agreement,[51] which is an implementing Agreement under UNCLOS.[52] Importantly, the Agreement is applicable within areas under and beyond national jurisdiction, and provides for the effective enforcement of the conservation and management measures adopted for straddling and highly migratory fish stocks by flag States, port States and coastal States.

The Agreement codifies the precautionary principle and provides the general framework for management and conservation.[53] In this regard, Coastal States and Flag States have several responsibilities[54], and are required to fully cooperate with measures to ensure long-term sustainability of these fish stocks. Thus, for example, States whose nationals fish in the high seas area must establish cooperation mechanisms seeking for its conservation,[55] because fish move between the EEZ of different States and within ABNJ.[56]

Also important to take into consideration is the fact that if a fisheries management arrangement is going to be settled by a group of States, it must undertake specific requirements[57]. In this context, non-participant States are not discharged from the obligation to cooperate in the conservation and management of these fish stocks.[58]

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[48] Rothwell, Donald; Stephens, Tim. The International Law of the Sea. Hart Publishing. 500 pp. 2010. Pg 19

[49] UNCLOS. Article 67.

[50] Rothwell, Donald; Stephens, Tim. The International Law of the Sea. Hart Publishing. 500 pp. 2010. Pg 159

[51] Agreement for the implementation of the provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and management of straddling fish stocks and highly migratory fish stocks. New York, 4 August 1995. (on line): http://treaties.un.org/doc/Publication/MTDSG/Volume%20II/Chapter%20XXI/XXI-7.en.pdf

[52] Rothwell, Donald; Stephens, Tim. The International Law of the Sea. Hart Publishing. 500 pp. 2010. Pg 316

[53] Ibidem. Article 6.

[54] Ibidem. Article 18, 19.

[55] 1995 Fish Stocks Agreement. Article 7.

[56] Rothwell, Donald; Stephens, Tim. The International Law of the Sea. Hart Publishing. 500 pp. 2010. Pg 303

[57] 1995 Fish Stocks Agreement. Article 9, 10.

[58] Ibidem. Article 17, 33.

Part VI of the Agreement is directed to cooperation in enforcement of conservation measures[59], including the establishment by coastal, port and flag States, of procedures for boarding[60] and inspections, as well as the following investigations and enforcement[61] actions if vessels have violated management regulations, such as fishing without a valid licence, failing to maintain accurate records of catch-related data, using prohibited fishing gears, fishing in closed areas, among other activities.

As emphasised by Rothwell and Stephens, this Agreement is based upon fundamental principles contained in Part II, which require all States to adopt measures to ensure the long-term sustainability and optimum utilisation of fish stocks by taking measures according the best scientific evidence; the application of the precautionary and ecosystem approaches; the minimisation of pollution and by-catch; the protection of marine biodiversity; the elimination of overfishing and over-capacity; the collection and sharing of fisheries data; and the implementation and enforcement of conservation measures by effective monitoring, control and enforcement."[62]

In regards to developing States, the Agreement calls for assistance[63] from international agencies including cooperation with financial assistance, development of human resources, technical assistance and the transfer of technology, among other matters.

Finally, it ought to be noted that the Agreement has two Annexes. The first one indicates the standard requirements for the collection and sharing of fishery data[64], as well as vessel data provisions[65] and reporting information for Flag States.[66] Annex II establishes seven guidelines for the application of precautionary reference points in conservation and management of straddling and highly migratory fish stocks. In specific cases were information is not available, provisional reference points may be established by analogy to similar and better-known stocks. Clearly, the CAD initiative could apply such tools to improve fisheries management in ABNJ.

FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas.

The FAO Compliance Agreement[67] was developed in parallel with the 1995 Fish Stocks Agreement, and one of its purposes is to address the reflagging of fishing vessels under flags of convenience. The Compliance Agreement was negotiated under article XIV of

[59] Ibidem. Article 20, 21.
[60] Ibidem. Article 22.
[61] Ibidem. Article 23.
[62] Rothwell, Donald; Stephens, Tim. The International Law of the Sea. Hart Publishing. 500 pp. 2010. Pg 316
[63] 1995 Fish Stocks Agreement. Article 25, 26.
[64] Ibidem. Annex I. Article 3.
[65] Ibidem. Annex I. Article 4.
[66] Ibidem. Annex I. Article 5.
[67] FAO Agreement to promote compliance with international conservation and management measures by fishing vessels on the high seas. (on line): http://www.fao.org/fileadmin/user_upload/legal/docs/012t-e.pdf

the FAO Constitution, and adopted on 1993 by resolution 15/93 of the FAO Conference, and entering into force on 24 April 2003.

The Compliance Agreement apply to all fishing vessels that are fishing on the high seas, and establishes duties and responsibilities for Flag States[68]. This includes taking enforcement measures such as the refusal, suspension or withdrawal of a fishing authorization to a vessels which has contravened management measures.

Cooperation and exchange of information[69] are subjects that are regulated under this Agreement. Similar to the 1995 Fish Stocks Agreement, cooperation with developing countries[70] is regulated under the FAO Compliance Agreement, which calls for the provision of technical assistance to fulfill their international obligations. Also Parties are require to cooperate[71] in adopting conservation and compliance measures that are applicable to vessels of Non Parties.

As seen in previous paragraphs, the FAO Compliance Agreement and the UN Fish Stocks Agreement provide the legal framework for the conservation and management of fisheries on the high seas. However, they have some differences that are worth pointing out, thus, for example, FAO Compliance Agreement applies to all high seas fishing, while the 1995 Fish Stocks Agreement addresses only straddling and highly migratory fish stocks. Moreover, the UN Fish Stocks Agreement requires the establishment of a register of fishing vessels and provides for the availability of fishing vessel records. Similarly, the Compliance Agreement provides for the regular exchange of information regarding high seas fishing vessels.

FAO Agreement on port State measures to prevent, deter and eliminate illegal, unreported and unregulated fishing[72]

The overall objective of this Agreement is to prevent, deter and eliminate IUU fishing through the implementation of effective port State measures, and ensure the long-term conservation and sustainable use of living marine resources. This agreement has specific measures concerning the enforcement powers of Port States[73] as well as Flag States[74]. In a similar approach to other multilateral traties, cooperation and exchange of information[75] are regulated comprehensively in this Agreement. Also important processes regarding the entry, use and denial of ports are addressed in in Part II and III therein. Part IV is supplemented by guidelines on inspections[76] and further actions that

[68] Ibidem. Article III.
[69] Ibidem. Article V, VI.
[70] Ibidem. Article VII.
[71] Ibidem. Article VIII.
[72] FAO Agreement on port State measures to prevent, deter and eliminate illegal, unreported and unregulated fishing. (on line) http://www.fao.org/fileadmin/user_upload/legal/docs/1_037t-e.pdf
[73] Ibidem. Article 3, 5.
[74] Ibidem. Article 20.
[75] Ibidem. Article 6.
[76] Ibidem. Annex B.

should be taken by States if a vessel is proved to be engaged in IUU fishing or fishing related activities.

Code of Conduct for Responsible Fisheries[77]

This Code of Conduct, as its own name resembles, is a voluntary instrument adopted by the FAO Conference in Resolution 4-1995. However, certain provisions are based on relevant rules of international law, including UNCLOS. The Code contains requirements that may have binding effect by means of other obligatory legal instruments, such as the FAO Compliance Agreement. The key value of this Code is that it provides guidelines, principles and standards for the conservation, management and development of all fisheries, including capture, processing and to trading activities, as well as aquaculture, research and the integration of fisheries into coastal area management.

Section A. Protecting marine biodiversity in ABNJ

The following section will examine two particular area based management tools which aim to protect marine ecosystems and its biodiversity, whether if they are located in areas under national jurisdiction, or beyond it.

Rothwell and Stephens point out that,

> "The starting point for effective oceans governance is the identification of an appropriate scale of management. In this respect, the ecosystem paradigm has become the dominant frame of reference, and what has been called the ecosystem approach has been increasingly incorporated into fisheries and other law of the sea Treaties."[78]

The ecosystem approach requires managers and decision makers to regulate marine uses and activities with ecological considerations in mind.[79] Following this conceptual approach to ocean management, there are a range of ecosystem based tools that may be applies. Some of which are examined below because they are may be applied to the CAD with a view to strengthening conservation and management schemes for the marine living resources dependent on this highly productive area.

Ecologically or Biologically Significant Marine Areas

[77] FAO Code of Conduct for Responsible Fisheries (on line): http://www.fao.org/docrep/013/i1900e/i1900e.pdf

[78] Rothwell, Donald; Stephens, Tim. The International Law of the Sea. Hart Publishing. 500 pp. 2010. Pg 463

[79] Ibidem. Pg 465

The importance of establishing Ecologically or Biologically Significant Marine Areas (EBSAs), as well as MPA networks,[80] in open-ocean waters and deep-sea habitats cannot be over-emphasized and are a legal requirement under a number of multilateral instruments reviewed above.[81] Moreover, since 2004, the Conference of the Parties (CoP) to the CBD has been discussing matters related to the conservation of marine biodiversity in ABNJ. Topics like the impacts of deep seabed trawling on fragile ABNJ ecosystems and the need for international cooperation to establish MPAs in ABNJ were discussed during the 7th CoP held in 2004.

Following this discussion, the 8th CoP to the CDB in 2006 developed a set of criteria for the identification of ecologically or biologically significant areas (EBSAs)[82]; and finally at the 9th CBD CoP in 2008, the Parties to the CDB Convention adopted seven scientific criteria to identify EBSAs, which are indicated in Box 7 below:

Box 7. Criteria to identify EBSAs[83]
1. Uniqueness or rarity.
2. Special importance for life history of species.
3. Importance for threatened, endangered or declining species and/or habitats.
4. Vulnerability, fragility, sensitivity, slow recovery (fragile).
5 Biological productivity.
6. Biological diversity.
7. Naturalness.

The next remarkable step in this process was taken in 2010, when it was decided to initiate an identification process under regional workshops, in order to facilitate the description of EBSAs. This identification process was develop more precisely in Decision X/29, which reiterated that "the application of the EBSA criteria is a matter for States and competent international organizations, in accordance with international law, including the United Nations Convention on the Law of the Sea."[84] In this regard, the CDB has a facilitating role in the process. Considerable progress was achieved through the organization by the Executive Secretary of the CBD of five regional workshops, conducted for the North-East Atlantic, the Western South Pacific, the Wider Caribbean and Western Mid- Atlantic, the Southern Indian Ocean and for the Eastern Tropical and Temperate Pacific.[85] Specifically important for this study was the regional workshop held

[80] UNEP-WCMC. CBD Ecologically and Biologically Significant Areas. (on line): http://data.unep-wcmc.org/decisions/2

[81] Druel, Elisabeth. Ecologically or Biologically Significant Marine Areas (EBSAs). (on line): http://www.iddri.org/Publications/Ecologically-or-Biologically-Significant-Marine-Areas-(EBSAs)-the-identification-process-under-the-Convention-on-Biological-Dive

[82] Ibidem. Pg 8

[83] CBD Convention. 9th CoP, Bonn, 19–30 May 2008. (on line): http://www.cbd.int/doc/decisions/cop-09/cop-09-dec-20-en.pdf

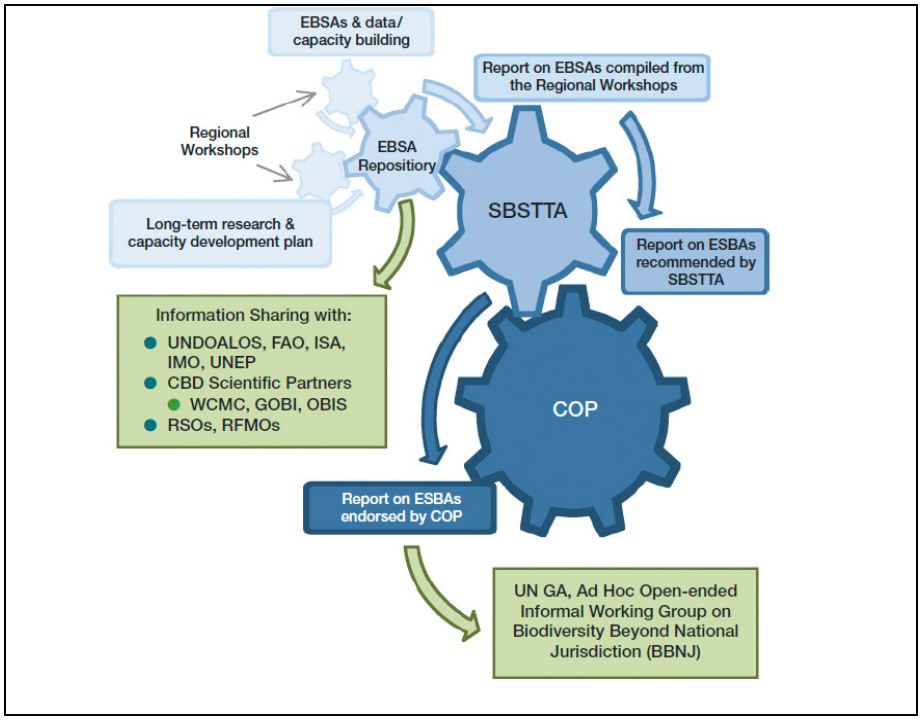
[84] CBD Convention. CoP 10, Decision X/29 on Marine and Coastal Biodiversity. (on line): http://www.cbd.int/decision/cop/default.shtml?id=12295

[85] Druel, Elisabeth. Ecologically or Biologically Significant Marine Areas. (on line): http://www.iddri.org/Publications/Ecologically-or-Biologically-Significant-Marine-Areas-(EBSAs)-the-identification-process-under-the-Convention-on-Biological-Dive. Pg 5

in the Eastern Tropical and Temperate Pacific (August 2012, Galapagos), where the CAD was presented as a candidate to be designated as an EBSA.

The results of these regional workshops were send to the CBD- Subsidiary Body on Scientific, Technical, and Technological Advice (SBSTTA), which prepared a report for consideration[86] and endorsement by the CoP to the Convention. The process for selection and designation are shown in Figure 1 below.

Figure 9. Identification and information-sharing process of EBSAs



Source: Druel, Elisabeth[87]

Once validated by the CBD CoP, the reports and recommendations will be forwarded to the United Nations General Assembly (UNGA), and to the Ad hoc working group on marine biodiversity in areas beyond national jurisdiction (BBJN). Another important element to bear in mind regarding this process is that the identification of EBSAs is a scientific exercise, which aims to provide basis for identifying areas, within and beyond national jurisdiction, in need of protection and management. In fact, the designation of an area as an EBSA would not automatically mean that it would become an MPA, and currently, "the selection of conservation and management measures is a matter for States and competent intergovernmental organizations, in accordance with international law, including UNCLOS."[88]

[86] Ibidem. Pg 9
[87] Ibidem. Pg 11.
[88] UNGA. Sixty-eighth session, Oceans and the law of the sea. A/68/399. Report of the Ad Hoc Open-ended Informal Working Group. (on line): http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N13/484/70/PDF/N1348470.pdf?OpenElement Pg. 8

In this context, policy and regulatory implications with respect to their protection will be different. In areas within national jurisdiction, States will be the competent to decide about the establishment of conservation measures, whilst in ABNJ complex processes need to be followed including the establishment of an appropriate regional organization.[89]

The EBSA process with respect to ABNJ therefore has an important political and legal dimension. Thus for example, currently neither the United Nations General Assembly (UNGA) nor the BBNJ Working Group have foreseen what role they are to play with respect to the establishment of EBSAs.[90] Nevertheless, it must be noted that within the EBSAs process, the CBD provide scientific and technical information and advice[91] to the UNGA, and the BBNJ Working Group, with respect to the protection of marine biodiversity in ABNJ. Moreover, the BBNJ Working Group agreed in 2011 that marine genetic resources and sharing of benefits, area-based management tools such as MPAs, environmental impact assessments, capacity-building and the transfer of marine technology, would be addressed as a package in the discussion of this Group.[92]

Another important aspect to be mentioned is that the EBSAs process cannot be viewed in isolation from other international initiatives carried out by the Food and Agriculture Organization (FAO), the International Maritime Organization (IMO), the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP), among other agencies. Instructively, these organizations have established similar criteria to identify vulnerable areas in need of higher levels of protection, and the application of these criteria should be seen as a complementary exercise, which could serve for different purposes[93], as it will be seen on the next subsections.

In the specific case of the CAD, it has already been submitted for designation through the EBSAs identification process, in a workshop held in Galapagos in 2012. Even if it is successful in the process outlined above, an EBSA can only be established following the decision of CBD CoP. However, this process will not necessarily mean the automatic creation of an MPA in that area. This process should therefore be viewed as a scientific exercise which informs decision-makers, enhances marine conservation and management actions, and that will ultimately lead to the establishment of a more robust governance frameworks in the Central American Pacific.

Accordingly, marine spatial planning may be an alternative to an EBSA, which could give an articulate vision of multiple uses in a specific area. Also MPAs as one authority has pointed out could "sit comfortably within EBSAs, giving protection to the most critical ecosystems. The main benefit of this system is that it appeals to many different

[89] Ibidem. Pg 5.
[90] Ibidem. Pg 5.
[91] Ibidem. Pg 5.
[92] Ibidem. Pg 19.
[93] Ibidem. Pg 13.

stakeholders: for example, it legitimizes existing fishing activities while preventing them from spreading to vulnerable ecosystems in future."[94]

Finally, the EBSAs process is a challenge with respect to their future policy implications. Currently there is not a clear and binding mandate for intergovernmental organizations to prevent adverse impacts in these areas, and once again, as has been seen in previous chapters of this study, there is an urgent need to develop an international legal framework to address conservation and sustainable use of marine resources in ABNJ. Such a process is ongoing at the United Nations and it has the support of the European Union.

Regional Seas Programme

First of all, it is important to acknowledge that UNEP's Regional Seas Programme focus on assisting countries in protecting coastal and marine environments. This programme seeks to promote and advance coastal programmes and legal agreements which could improve countries actions to address coastal degradation.

The Regional Seas Programme was launch in 1974, and is one of UNEP's most significant achievements in 30 years.[95] The work of this Programmes is coordinated by UNEP's Regional Seas Branch, aided by the Regional Coordination Units (RCUs) and the Regional Activity Centres (RACs).[96]

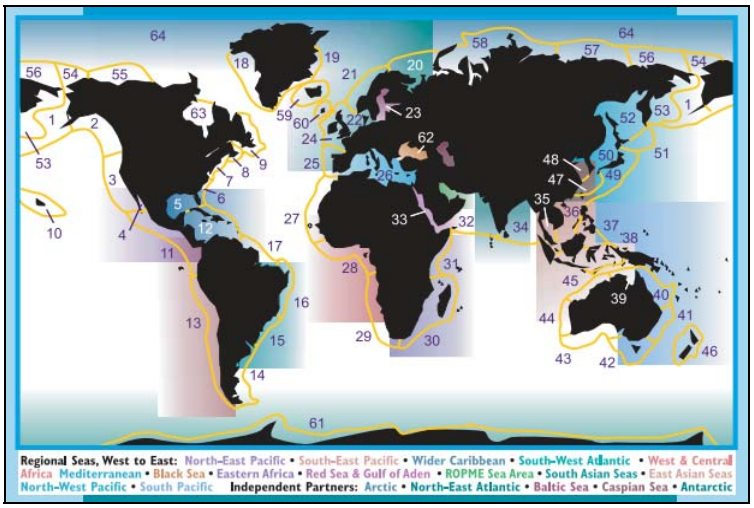
Approximately 140 countries participate in the 13 Regional Seas Programmes around the world, and one of its key elements is the engagement of neighbouring countries in comprehensive actions to protect shared marine environments and resources. In this regard, the CAD initiative could come within the scope of the Regional Seas Programme of the North-East Pacific with a view to the development and consolidation of an integral management of the shared marine area between Central American countries.

Figure 10. Regional Seas Programme areas

[94] Weaver, Phil; Johnson, David. Think big for marine conservation. Nature 2012. (on line): http://www.nature.com/nature/journal/v483/n7390/full/483399a.html

[95] UNEP. Regional Seas Programme. North West Pacific Action Plan. (on line): http://dinrac.nowpap.org/about_NOWPAP.php?page=about_regional_seas

[96] International Coral Reef Initiative. Regional Seas Programme. (on line): http://www.icriforum.org/regional_seas_programmes



Source: UNEP.[97]

Each Regional Seas Programme has an Action Plan, as its management tool, which is based on a region's particular environmental concerns, challenges, socio-economic and political situation.[98] Action plans are underpinned by a robust legal framework that address key issues and challenges in the form of a regional Convention and Protocols. Generally speaking, these are tailored according to views and needs of Governments and institutions within the region and are supplemented by programs of implementation measures, strategies and compliance mechanisms.

In the case of the Central American Region, as seen in previous paragraphs, it is comprised in the North-East Pacific Regional Seas Programme. UNEP has indicated that "over 70% of the population of Central America live on this drier Pacific side, and environmental pressures are the greatest. Forest clearance, over-exploitation of resources, expanding maritime trade, rapid development, poverty, high risk to the effects of natural events among other threats."[99] Moreover, it has also pointed out that the North-East Pacific Regional Seas Programme is not under UNEP's administration, instead, the Inter-American Tropical Tuna Commission (IATTC) provides for its Secretariat. The regional activities are part of the global Regional Seas Programme which remains the principal platform of cooperation and coordination.

Important to take into consideration that the Governments within this Regional Seas Programme have approved in 2002 the Convention for Cooperation in the Protection and Sustainable Development of the Marine and Coastal Environment of the North-East Pacific (The Antigua Convention),[100] a legal instrument that will be analyzed in detail in

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[97] UNEP. Regional Seas Programme linked with Large Marine Ecosystems assessment and management. (on line): http://www.lme.noaa.gov/LMEWeb/Publications/brochure_unep_rs.pdf

[98] For more information refer to: http://www.unep.org/regionalseas/programmes/actionplans/

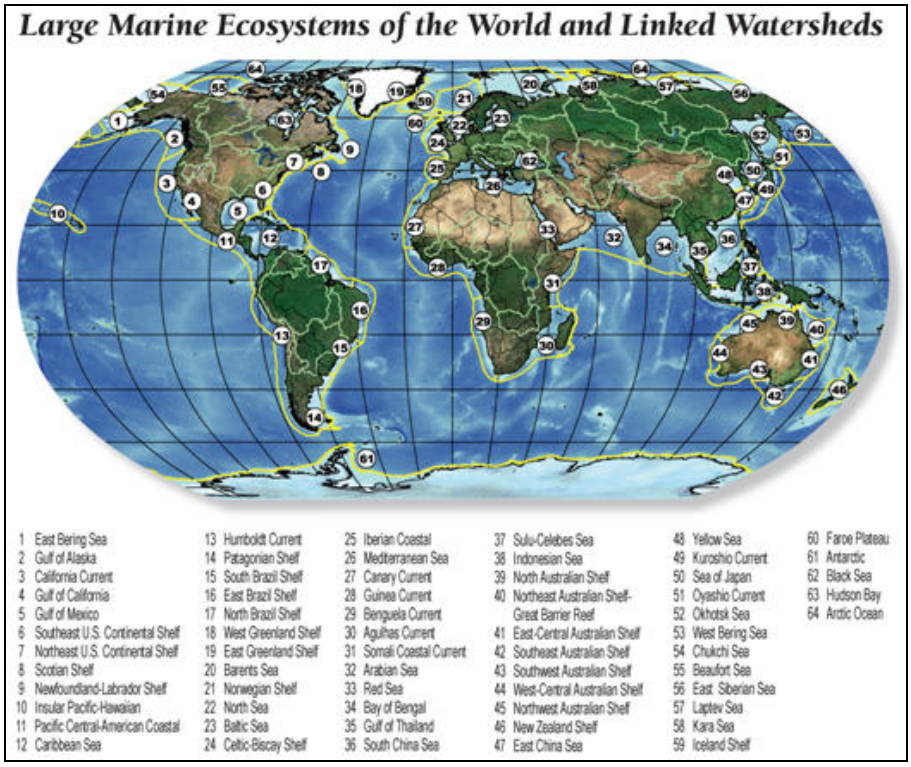
[99] UNEP. Regional Seas Programme. North-East Pacific. (on line): http://www.unep.org/regionalseas/programmes/nonunep/nepacific/default.asp

[100] Convention for cooperation in the protection and sustainable development of the marine and coastal environment of the Northeast Pacific (Antigua Convention). (on line): http://www.unep.org/regionalseas/programmes/nonunep/nepacific/instruments/nep_convention.pdf

Chapter 2, under the Regional legal framework applicable to the CAD. Likewise, it must be acknowledge a new approach that UNEP has been developing, with a more structured methodology to address coastal and marine integrated management, incorporating an ecosystem based management component. UNEP has also strengthen coordination actions with UNDP and its Large Marine Ecosystems (LME) framework.

In this regard it is important to highlight that around 80% of the world's wild fisheries catches are taken from LME's each year,[101] and that this figure provide a flexible approach to ecosystem-based adaptative management, by identifying driving forces of ecosystem change, such as coastal pollution, climate change, damaged habitats and depleted fish stocks.[102]

Figure 11. Large Marine Ecosystems



Source: NOAA.[103]

Two central features define the LME approach to managing marine areas and its resources. The first characteristic is that the LME boundaries are defined by ecological

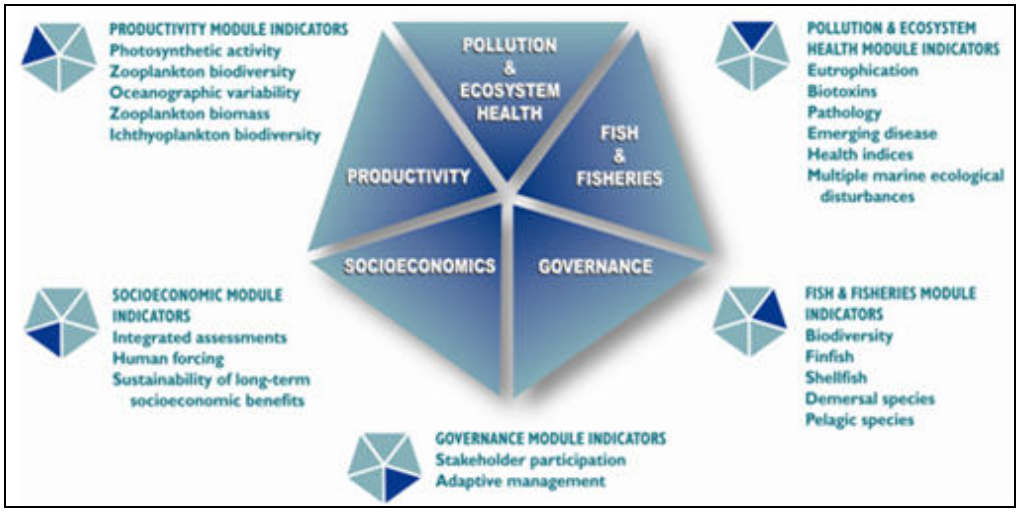
[101] Rothwell, Donald; Stephens, Tim. The International Law of the Sea. Hart Publishing. 500 pp. 2010. Pg 463

[102] UNEP. Regional Seas Programme linked with LME. (on line): http://www.lme.noaa.gov/LMEWeb/Publications/brochure_unep_rs.pdf

[103] Large Marine Ecosystem Approach to the Assessment and Management of Coastal Ocean Waters: Introduction to the LME Portal. (on line): http://www.lme.noaa.gov/index.php?option=com_content&view=article&id=47&Itemid=41

criteria, not as a political o economical delimitation.[104] And the second feature is that the LME framework has developed a five module indicator approach which considers productivity, fish and fisheries, pollution and ecosystem health, socioeconomics and governance, all of them indispensable items to analyze ecosystem-wide changes.[105]

Figure 12. LME five module indicators



Source: NOAA.[106]

The LME has been particularly influential and forms the basis of practical measures to improve marine management.[107] Bearing this in mind, it must be highlighted the success of the Benguela LME project, an example of coordination between UNDP and the Global Environment Facility (GEF), which developed an ecosystem management project of the Benguela Current, an oceanic area that produces goods and services estimated to be worth at least US $54.3 billion per year.[108] Both agencies also have supported the project with the provision of funds and technical assistance, which achieved the establishment of the Benguela Commission in 2007, and the signature of the Benguela Current Convention by the Governments of Angola, Namibia and South Africa, on April 2013.

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[104] Rothwell, Donald; Stephens, Tim. The International Law of the Sea. Hart Publishing. 500 pp. 2010. Pg 463

[105] UNEP. Regional Seas Programme linked with LME. (on line): http://www.lme.noaa.gov/LMEWeb/Publications/brochure_unep_rs.pdf

[106] Large Marine Ecosystem Approach to the Assessment and Management of Coastal Ocean Waters: Introduction to the LME Portal. (on line): http://www.lme.noaa.gov/index.php?option=com_content&view=article&id=47&Itemid=41

[107] Rothwell, Donald; Stephens, Tim. The International Law of the Sea. Hart Publishing. 500 pp. 2010. Pg 463

[108] UNDP. Angola, Namibia and South Africa sign world's first large marine ecosystem legal framework. (on line): http://www.undp.org/content/undp/en/home/presscenter/articles/2013/04/30/world-s-first-large-marine-ecosystem-legal-framework-signed-by-angola-namibia-and-south-africa/

Taking into consideration this LME example, as well as the work done within the framework of the Regional Seas Programme, it merits consideration that the CAD initiative ought to be proposed as an potential LME project for support by both U.N agencies with a view to addressing the increasing threats to this complex marine environment, and to developing an ecosystem based management scheme for the area.

Section B. Sustainable use of marine resources

As it has seen in previous sections, the high seas are governed by freedom of the high seas which is now qualified by many international agreements that circumscribe the powers and jurisdictions of flag States regarding the activities of vessels that fly their flags in ABNJ.[109] In this regard UNCLOS provides the over-arching framework and is supplemented by other Agreements that have complemented and developed the rules applicable to ABNJ.

In this regard, the following section will examine two area based management tools, one developed and implemented under the auspices of the Food and Agriculture Organization (FAO), and the other one developed by the International Maritime Organization (IMO). Both of them seeks for the protection of fragile and unique marine ecosystems, and could be applicable in specific areas of the CAD, as will be seen below.

Vulnerable Marine Ecosystems

Before explaining the scope of Vulnerable Marine Ecosystem tool, it needs to be pointed out that deep-sea fisheries are those that take place at great depths, approximately up to 1 600 metres, and many of them taking place in ABNJ.[110] Long-lines, bottom trawls, mid-water trawls, gillnets and traps/pots are used in deep-sea fisheries in the high seas.[111] Deep-sea ecosystems support vulnerable species, which have low productivity rates, thus for example, they mature at a relatively old age, are long-lived, slow growing, low natural mortality, have intermittent recruitment and may not spawn every year. In this context, as the depth of the fishery increases, the number of low productivity species encountered increases as well. [112] Bearing this in mind, high exploitation rates for these species lead to fast resource depletion, because stock

[109] Tanaka, Yoshifumi. The International Law of the Sea. . University of Copenhagen, Faculty of Law.435 pp. Pg 149

[110] FAO**.** Deep-sea fisheries in the high seas: Ensuring sustainable use of marine resources and the protection of vulnerable marine ecosystems. Rome, FAO. 2009. 11p. (on line): http://www.fao.org/docrep/014/i1064e/i1064e00.htm Pg 2.

[111] Ibidem. Pg 4

[112] FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas. (on line): http://www.fao.org/docrep/011/i0816t/i0816t00.HTM Annex

recovery is long and is not even assured.[113] Some examples of species that are considered vulnerable are cold water corals and hydroids, sponge-dominated communities and seep or vent communities comprised of unique invertebrate and microbial species.[114]

The FAO have adopted the International Guidelines for the Management of Deep-sea Fisheries in the High Seas, in August 2008.[115] According to these Guidelines, deep-sea ecosystems would be considered vulnerable when they present the characteristics shown in Box 8 below:

Box 8. Vulnerable Marine Ecosystems criteria[116]

Characteristic	*Description*
Uniqueness or rarity	Unique or endemic species, communities or habitats, whose loss could not be compensated for by similar areas or ecosystems.
Functionally significant	Contain areas or habitats that are necessary for the survival, function, spawning/reproduction or recovery of fish stocks, particular life-history stages, or of rare, threatened or endangered marine species.
Fragility	Ecosystem that is highly susceptible to degradation by anthropogenic activities.
Life-history traits of component species that make recovery difficult	Ecosystems characterized by slow growth rates; late age of maturity; low or unpredictable recruitment; or long-lived.
Structurally complex	Ecological processes are usually highly dependent on these structured systems.

These voluntary Guidelines were design to provide guidance on fisheries management factors, and sets out measures for the prevention of significant adverse impacts on Vulnerable Marine Ecosystems (VMEs), being a reference for States and Regional Fisheries Management Organizations (RFMOs) for the formulation of further regulations. In this regard, once a VME has been identified, specific management measures must be taken to ensure that the ecosystem integrity is not compromised, being most vulnerable ecosystems those that are both easily disturbed and very slow to recover, or may never recover.[117]

[113] FAO**.** Deep-sea fisheries in the high seas: Ensuring sustainable use of marine resources and the protection of vulnerable marine ecosystems. Rome, FAO. 2009. 11p. (on line): http://www.fao.org/docrep/014/i1064e/i1064e00.htm Pg 4

[114] FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas. (on line): http://www.fao.org/docrep/011/i0816t/i0816t00.HTM Annex

[115] Ibidem. Annex.

[116] Ibidem. Pg. 27.

[117] Ibidem. Pg. 22

However, challenges are present in the VME management framework, as deficient or unavailable data and inadequate systems of administration are very common.[118] In this regard, data related actions are addressed on the Guidelines, to improve collection and reporting; training programmes, stocks assessment, fishing impact assessment (gear types, fishing areas, potential bycatch species, ecosystems baseline information, VMEs mapping), assessment and review of effectiveness of measures, among other matters.
In this context, on the last meeting of the U.N Ad-Hoc Working Group on BBNJ, attention was drawn to the availability of a prototype of a VME database aimed at facilitating the sharing of information and data on spatial management measures in deep-sea fisheries in ABNJ.[119]

Moreover, precautionary conservation and management measures are essential with respect on VMEs encounters and with deep seas fisheries. Following the precautionary approach, some of these measures are set down in the Guidelines, and may include the ones outlined in Box 9 below:

Box 9. Conservation and management measures in relation with VMEs[120]
• Temporal and spatial restrictions or closures of areas to deep seas fisheries where VMEs are known or likely to occur.[121]
• Changes in gear design or deployment or operational measures: o Reduction of contact between the fishing gear and the seabed. o Use of effective bycatch reduction devices. o Use of technical measures to eliminate or minimize ghost fishing
• Comprehensive monitoring of all fishing effort, capture of species and interactions with VMEs.
• Establishment of Protocols about deep seas fishery vessels encounters with VME.

The information gathered by RFMOs play an important role the design of management measures that protect VMEs. This data could enhance conservation and management measures[122] by providing guidelines about encounter records, in both new and existing fishing areas, risk areas (temporary closures), voluntary closures. Another important element to take into consideration is a multidisciplinary stakeholder participation in the assessment and management process to ensure the effective enforcement of these measures. In this regard, it is important to keep in mind that some key recommendations have been agreed in different FAO workshops about deep-sea

[118] FAO**.** Deep-sea fisheries in the high seas: Ensuring sustainable use of marine resources and the protection of vulnerable marine ecosystems. Rome, FAO. 2009. 11p. (on line): http://www.fao.org/docrep/014/i1064e/i1064e00.htm Pg 7
[119] UNGA. Sixty-eighth session, Oceans and the law of the sea. A/68/399. Report of the Ad Hoc Open-ended Informal Working Group. (on line): http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N13/484/70/PDF/N1348470.pdf?OpenElement Pg. 9
[120] FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas. (on line): http://www.fao.org/docrep/011/i0816t/i0816t00.HTM Pg. 35
[121] Ibidem. Pg. 33
[122] Long-term conservation and sustainable use of marine living resources in the deep seas and prevent significant adverse impacts (SAIs) on VMEs, in line with UNGA Resolution 61/105.

fisheries in the high seas[123] as well as in regards the impacts of deep sea fisheries on VME[124], with a view to giving full effect to the UNGA resolutions on high seas bottom fisheries (61/105/ 2006 and 64/72/2009). Among the principal recommendations expressed in both workshops are the following:

- A science-based assessment of what constitutes a VME is required for each bioregion.
- Training and at-sea guides for identification of known VMEs by observers.
- Temporary and permanent closures. [125]
- Buffer zones for closed areas.
- High resolution bathymetric data and VME-predicting models ton produce maps that provide information for management and planning.[126]
- Need for tailored species identification guides for vulnerable deepwater species.
- Compile current management measures for other potentially vulnerable species (e.g. sharks, certain finfish).

In the particular case of the CAD, the identification of VMEs will represent the establishment of protection measures like the ones detailed in the previous paragraphs. If the VME is identified under jurisdictional waters, the specific Central American country will be the one to apply the measures, but if the VME is located in ABNJ, the Inter-American Tropical Tuna Commission, as the competent RFMO in such area, will be the competent organization to adopt and implement such conservation measures.

Particularly Sensitive Sea Areas

Nowadays, the increase in global trade has consequently augmented shipping activities around the world. In this context, environmental hazards are more common threats to vulnerable ecosystems, because shipping activities may impact negatively on the marine environment by means of operational discharges; accidental or intentional pollution; physical damage to marine habitats or organisms, the smothering of habitats, contamination by anti-fouling systems, and ship strikes of marine mammals.[127]

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[123] FAO deep-sea fisheries in the high seas, Republic of Korea, 2010. (on line): http://www.fao.org/docrep/014/i2135e/i2135e00.htm

[124] FAO VME and deep sea fisheries, Lisbon, 2011. (on line): http://www.savethehighseas.org/publicdocs/Lisbon_report_final_web.pdf

[125] Weaver, P.P.E. (et al.) Report of an international scientific workshop, National Oceanography Centre, Southampton, 45 pp. (on line): http://hdl.handle.net/10013/epic.37995. Pg 17

[126] FAO Fisheries and Aquaculture Report No. 948 FIPI/R948. FAO workshop on the implementation of the FAO International Guidelines for the management of deepsea fisheries in the high seas – challenges and ways forward. Republic of Korea, 10–12 May 2010. (on line): http://www.fao.org/docrep/014/i2135e/i2135e00.pdf Pg. 14

[127] IMO. Resolution A.982 (24). Revised guidelines for the identification and designation of Particularly Sensitive Sea Areas. (on line): http://www.imo.org/blast/blastDataHelper.asp?data_id=25322&filename=A982(24).pdf Pg 4.

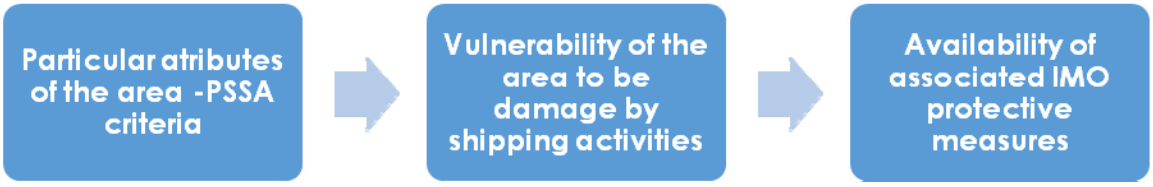
To address these problems, the Convention on the International Maritime Organization tasks the IMO's Assembly with establishing regulations on the prevention and control of marine pollution.[128]

Following this mandate, several IMO Resolutions have addressed these topics. Thus, for example, IMO's Marine Environment Protection Committee (MEPC) began[129] working with the Particularly Sensitive Sea Areas (PSSAs) concept, and culminated with the adoption of the Guidelines for the Designation of Special Areas and the Identification of Particularly Sensitive Sea Areas, by Assembly resolution A.720 (17) in 1991. Further IMO Resolutions developed this area based tool, such as Resolutions A.885 (21), A.927 (22), and A.982 (24). A good example of the application of the concept is the Great Barrier Reef (GBR), which was declared as a PSSA in 1990, and where the IMO and the Australian Government adopted a system of compulsory pilotage backed by criminal penalties. Other examples of designated PSSA are the Canary Islands, Spain (2005), the Galapagos Archipelago, Ecuador (2005), the Baltic Sea area (2005) and the Saba Bank, North-eastern Caribbean (2012).

A Particularly Sensitive Sea Area[130] (PSSA hereafter), is an area with recognized ecological, socio-economic, or scientific attributes, and which is in need for special protection through IMO actions, in light of the potential threats that are posed by international shipping. In this context, it could be said that article 211(6) of UNCLOS reflects in some sense the nature of the PSSA figure, with the primary objective of the adoption of specially measures for the prevention of pollution from vessels.

In relation to the PSSA concept, there are three components, as shown in figure 5, namely: the identification, designation of the area, and the adoption of appropriate protection measures.

Figure 13. Components for the designation of a PSSA



Source: IMO. Resolution A.982 (24).

[128] IMO Convention. Article 15.j. (on line): http://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XII-1&chapter=12&lang=en

[129] In response to a resolution[129] of the International Conference on Tanker Safety and Pollution Prevention of 1978. IMO. Resolution A.495/XIII. (on line): http://www.imo.org/blast/blastDataHelper.asp?data_id=26356&filename=A495(XII).pdf

[130] IMO. Resolution A.982 (24). Revised guidelines for the identification and designation of Particularly Sensitive Sea Areas. (on line): http://www.imo.org/blast/blastDataHelper.asp?data_id=25322&filename=A982(24).pdf Pg 3.

It is important to point out that only Member Governments of IMO are the legitimated to apply for the designation and adoption of protective measures as a PSSA. In this regard, coordinated proposals from two or more States with a common interest in a particular area to be designated as a PSSA are allowed. This opens the possibility of two Central American countries (such as Costa Rica and Guatemala), submitting to the IMO a proposal for a specific PSSA on the CAD. In such an instance, the PSSAs figure is applicable to areas beyond the territorial sea of the States, and for the designation of a PSSA, the specific area should meet at least one of the criteria listed below in Box 10:

Box. 10 Criteria for the designation of PSSA[131]

Ecological criteria	Social, cultural, and economic criteria	Scientific and educational criteria.
Uniqueness or rarity: Habitats of rare, threatened, or endangered species that occur only in one area.	*Social or economic dependency*: supports activities such as fishing, recreation, tourism, and the livelihoods of people.	*Research*: high scientific interest.
Critical habitat: essential for the survival, function, or recovery of species.	*Human dependency*: importance for traditional subsistence, food production activities or cultural resources.	*Baseline for monitoring studies*: considered to be in a natural or near-natural condition.
Dependency: ecological processes are highly dependent on biotically structured systems (coral reefs, kelp forests, mangrove forests).	*Cultural heritage*: presence of significant historical and archaeological sites.	*Education*: demonstrate particular natural phenomena.
Representativeness: example of specific biodiversity, ecosystems.		
Diversity: exceptional variety of species or genetic diversity.		
Productivity: high rate of natural biological production.		
Spawning or breeding grounds.		
Naturalness: relative lack of human-induced disturbance or degradation.		
Integrity: biologically functional unit.		
Fragility: highly susceptible to degradation.		
Bio-geographic importance: rare biogeographic qualities.		

Further information would have to be submitted in the proposal for the designation of the CAD as a PSSA. Thus for example, evidence of potential damage caused by

[131] IMO. Resolution A.982 (24). Revised guidelines for the identification and designation of Particularly Sensitive Sea Areas. (on line): http://www.imo.org/blast/blastDataHelper.asp?data_id=25322&filename=A982(24).pdf Pg 5, 6.

international shipping in the area, history of collisions or spills in the area; stresses from other environmental sources; and if any measures are already in effect in the area.[132] In addition, the application for a PSSA designation should identify the proposed area (location and threat of damage), associated protective measures, specify categories of ships to which the protective measures would apply, and actions to be taken pursuant to domestic law.[133]

After the submission by the member Government, IMO's Marine Environment Protection Committee (MEPC) informs the appropriate Sub-Committee, Committee, or the Assembly, the particular associated protective measures proposed for the area.[134] Then, the respective Committee analyses the proposal and determines if it accomplish all the requirements.[135] When a PSSA receives the final designation, the protective measures must be identified on charts and member Governments must ensure that ships flying their flag comply with the associated protective measures adopted.[136]

The designation of an area as a PSSA could lead to the adoption of the following protective measures:

- Designation of an area as a Special Area under MARPOL Annexes I, II or V, or a SOx emission control area under MARPOL Annex VI.
- Application of special discharge restrictions to vessels operating in the PSSA.
- Adoption of ships' routing and reporting systems near or in the area, under the International Convention for the Safety of Life at Sea (SOLAS).
- PSSA may be designated as an area to be avoided or it may be protected by other ships' routing or reporting systems.[137]
- Reporting requirements.
- Discharge restrictions.
- Prohibited activities.

Crucially, these measures, and additional ones could be applied to specific areas of the CAD, if it complies the requirements to be designated as a PSSA. As mentioned previously, however, the only legal basis for the establishment of the PSSA depends on the IMO Guidelines, which are not binding on States. In other words, the future designation of the CAD as a PSSA is very much dependent on the commitment of the States within the region to undertake the prescribed process for designation. A possible future solution in this regard, is the creation of a mandatory instrument which establishes PSSA as an autonomous legal concept in international law that is not dependent on States within the region.

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[132] IMO. Resolution A.982 (24). Revised guidelines for the identification and designation of Particularly Sensitive Sea Areas. (on line): http://www.imo.org/blast/blastDataHelper.asp?data_id=25322&filename=A982(24).pdf Pg 8.
[133] Ibidem. Pg 9, 10, 12.
[134] Ibidem. Pg 12.
[135] Ibidem. Pg 12.
[136] Ibidem. Pg 13.
[137] Ibidem. Pg 8.

Conclusions

After a brief overview of the international regulations, as well as the institutional framework and the area based management tools offered by different U.N agencies, the main conclusions are the following:

The conservation and sustainable use of marine resources in areas beyond national jurisdiction is not yet regulated under one specific agreement, but some legal references are contained in UNCLOS, the CBD, the 1995 FAO Fish Stocks Agreement, the FAO Compliance Agreement, the FAO Port State measures, among others. In this regard, the lack of a single and coherent institutional and legal framework for the conservation and management of the different activities in ABNJ, represents a complex governance matrix that is undermined by sectorial management approaches to different maritime activities.

The creation of the Ad Hoc BBNJ Open-ended Informal Working Group has undoubtedly raised international awareness of the importance of marine protected areas, access to genetic resources, environmental impact assessment, and other relevant topics on the ABNJ agenda.

Perhaps, the most important recent development is that the CAD has been submitted to the EBSAs identification process in 2012. If it is designated as an EBSA by CBD CoP, its ecological importance will be highlighted, and further actions may well be taken by the countries within the Region. This will not however mean the automatic creation of an MPA in the area, which is a separate scientific process to inform decision-makers to enhance marine conservation and management actions, as well as governance frameworks in the Central American Pacific.

The Regional Seas Programme and the Large Marine Ecosystems framework provide useful tools for the implementation of an ecosystem based management approach that could be applied to the CAD. In this context, it is worth proposing the CAD initiative as a project for support by both U.N agencies to address conservation and sustainable use of marine resources in the CAD, as well as to protect this complex marine environment.

The identification of VMEs in the CAD could also lead to the adoption of protection measures like the ones detailed in the previous sections. If the VME is identified under jurisdictional waters, the specific Central American country will be the one to apply the measures, but if the VME is located in ABNJ, the Inter-American Tropical Tuna Commission, being the competent RFMO in such area, will be the competent organization to adopt such conservation measures.

There is one inherent Achilles heel, which is that any proposal for the establishment of a PSSA must be submitted by two or more States with a common interest in a particular area. In practice, this means that at least two Central American countries must submit

to the IMO a proposal for the establishment of a specific PSSA applicable to the CAD, to be followed by protective measures, such as re-routing of vessels, special discharge restrictions, reporting systems, as well as the suite of other measures outlined above.

Chapter 2. Regional legal and institutional framework

The present chapter will examine the legal and institutional framework applicable to marine conservation and sustainable use of marine resources in the Central American region.

Despite of the problematic and challenging context in the region in the 1980's, the Central American countries decided to establish an integrated system to address common interests and concerns, given that coordinated agendas would likely to be more successful than isolated efforts.

In this context, the Tegucigalpa Protocol[138] amended the Charter of the Organization of Central American States (OCAS), and established the Central American Integration System (SICA, for its acronym in Spanish), including Panama in the new institutional framework of the Region. The primary objective of the Protocol was to bring the integration of Central America as a region of peace, freedom, democracy and development.[139]

Specifically on environmental issues, the Tegucigalpa Protocol seeks to carry out concerted actions to protect the environment, while ensuring balanced development and the rational exploitation of the natural resources of the area.[140]

The institutional structure of the SICA is comprised of the following:[141] the Meeting of Presidents; the Council of Ministers; the Executive Committee; and the General Secretariat. The functions of each institution are set out in the Protocol.[142] Crucially, the SICA is legally entitled to carry out its functions at the international level and in each of its Member States,[143] as well as to conclude treaties or agreements with third States or organizations.[144]

In light of the foregoing, the following sections will examine the institutional and legal framework from a regional perspective, analyzing the competences of three regional bodies within the SICA, and the Regional Fisheries Management Organization for the Eastern Pacific, with a view to evaluating their competence to regulate and improve marine conservation, fisheries management and the orderly administration of shipping in Central America.

Section A. Protection of the marine environment

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[138] Tegucigalpa Protocol. (on line): http://www.internationaldemocracywatch.org/attachments/224_Tegucigalpa_protocol.pdf
[139] Ibidem. Article 3.
[140] Ibidem. Article 3.i
[141] Ibidem. Article 12.
[142] Ibidem. Articles 13 to 28.
[143] Ibidem. Article 30.
[144] Ibidem. Article 31.

The following subsections will analyse the institutional and legal framework within the SICA, in relation to the protection of the marine environment, namely: the Central American Commission on Environment and Development (CCAD), and the Central America Commission for Maritime Transport (COCATRAM).

The Central American Commission on Environment and Development

The Central American[145] Commission on Environment and Development (CCAD, for its acronym in Spanish) is responsible for the regional environmental agenda within SICA. This body was created[146] in 1989, and its mandate is to contribute to sustainable development in the region, strengthening cooperation and integration arrangements for environmental management.[147]

To accomplish its objectives, the CCAD works on the promotion of environmental management, policy integration and regional instruments; is also implements the Regional Environmental Plan (PARCA), and establishes cross-sectoral agendas with Councils of Ministers of Health, Agriculture, Economy, Energy and Defense, Security and Governance, from the Central American countries. [148]

There are two guiding objectives under the CCAD creation Agreement. The first one relates to the identification of priority working areas, including shared ecosystems and environmental degradation affecting quality of life of the population. The second one seeks for the promotion of coordinated action between government agencies, non-governmental and international organizations, for the rational utilization of the natural resources of the Central American Region,[149] being both principles applicable to the CAD case study.

The Commission is integrated[150] by the Chair, the Secretariat and the Ad-hoc technical committees established to carry out specific functions.[151] Each one has particular functions that are detailed under the Agreement.[152] In this context, the Council of

[145] The CCAD member States are Costa Rica, El Salvador, Guatemala, Nicaragua and Honduras. Subsequently Belize, Panama and Dominican Republic incorporated as full members, and Mexico as an observer.

[146] CCAD Agreement. (on line): http://www.sica.int/busqueda/Centro%20de%20Documentaci%C3%B3n.aspx?IDItem=7590&IdCat=7&IdEnt=2&Idm=1&IdmStyle=1

[147] SICA-CCAD en breve. (on line): http://www.sica.int/ccad/ccad_breve.aspx?IdEnt=2

[148] Ibidem.

[149] CCAD Agreement. Article II.

[150] Rules of CCAD. Title III. (on line): http://www.sica.int/busqueda/Centro%20de%20Documentaci%C3%B3n.aspx?IDItem=6428&IdCat=31&IdEnt=2&Idm=1&IdmStyle=1

[151] In the operational context, CCAD has technical committees which work on protected areas, forests, climate change, biodiversity conservation and environmental legislation, among other matters. CCAD

[152] CCAD Agreement. Articles V to IX.

Ministers, composed by the seven Ministers of Environment and Natural Resources from the member countries, is the supreme authority of the CCAD.[153]

To achieve its objectives, CCAD implements the Regional Environmental Plan (PARCA) 2010-2014[154], which develops environmental objectives and the corresponding lines of action. This strategic tool works in two areas of action: policy management, to achieve interagency coordination, and technical management, to support national implementation of regional policies.[155]

In respect with marine actions, PARCA includes different guidelines, as the following summarized in Box 11:

Box 11. Marine actions in PARCA 2010-2014[156]

Strategic Area 3. Natural heritage management and prioritized ecosystems.	*Strategic Area 4. Adaptation and mitigation of climate change and integrated risk management.*
Strengthen the management of coastal and marine resources, and shared ecosystems.	Promote capacity building and knowledge management.
Establish regional conservation priorities for marine and coastal ecosystems, including the expansion of marine protected areas and the consolidation of marine corridors.	Strengthen regional and national efforts for the sustainable management of coastal and marine ecosystems, due to its importance within mitigation and adaptation to climate change.
Strengthen coordination actions with the Central America Fisheries and Aquaculture Organization (OSPESCA) in order to develop regional guidelines for responsible fisheries.	Coordinate cooperation actions with international agencies to develop monitoring systems for marine and coastal resources, and generate information for the development of adaptation plans for coastal communities, fishing activities and tourism.

Perhaps the most notable feature of the environmental regional legal framework is the **Convention for the Conservation of the Biodiversity and the Protection of Wilderness Areas in Central America,**[157] which was adopted in June 1992 and is not fully in force.

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[153] CCAD. Council of Ministers. (on line): http://www.sica.int/ccad/cm_ccad_breve.aspx?IdEnt=2

[154] CCAD- Regional Environmental Plan (PARCA). (on line): http://www.sica.int/busqueda/Centro%20de%20Documentaci%C3%B3n.aspx?IDItem=43702&IdCat=32&IdEnt=2&Idm=1&IdmStyle=1

[155] The REDD desk. CCAD. (on line): http://theredddesk.org/countries/actors/central-american-commission-environment-and-development

[156] CCAD- Regional Environmental Plan (PARCA). Pg 28, 29.

[157] Convention for the Conservation of the Biodiversity and the Protection of Wilderness Areas in Central America. (on line): http://www.ecolex.org/ecolex/ledge/view/RecordDetails;document_Convention%20for%20the%20Conservation%20of%20the%20Biodiversity%20and%20the%20Protection%20of%20Wilderness%20Areas%20in%20Central%20America.html?DIDPFDSIjsessionid=04E4CB4DDC44B7F4A02E724CE8B4BDF2?id=TRE-001162&index=treaties

The Convention develops principles and objectives to address conservation and sustainable use of biodiversity in the region, and establishes particular obligations for the States. These objectives include, for example, to ensure that activities within the jurisdiction of Contracting Parties do not cause damage to the biological diversity of neighboring countries,[158] and coordinates cooperation in regional border actions.[159] In this regard, the advancement of management measures for the Central American CAD project could become part of this mandate.

The Convention also calls for States to develop their own conservation strategies, giving priority to the establishment of protected areas[160] as an in situ management tool.

This legal instrument also sets out responsibilities for the CCAD, with a view to strengthening the Central American System of Protected Areas[161]; as well as the task to seek for support from international organizations or from other Governments, to develop updated listings on protected areas, threatened species and habitats[162], and to address conservation actions.

Another relevant legal instrument to be taken in consideration is the **Regional Convention on Climate Change**.[163] In this Convention, States are required to take conservation measures and to cooperate in relation to regional actions on climate change[164] in conjunction with the CCAD and the Central American Council on Climate Change (CCCC), the latter is a specialist regional body created under the Convention.[165] Other responsibilities are assigned to States, thus for example, to cooperate and share information in relation with the impacts of climate change.[166] In this regard, ocean acidification is an issue that must be addressed by the Central American countries, due to the negative impacts and threats that this represents to the sustainability of fisheries, marine biodiversity, tourism, as well as food security in the Region.

The Central American Commission for Maritime Transport

[158] Convention for the Conservation of the Biodiversity and the Protection of Wilderness Areas in Central America. Article 2.
[159] Ibidem. Article 10.
[160] Ibidem. Article 14.
[161] Ibidem. Article 20.
[162] Ibidem. Article 36.
[163] Regional Convention on Climate Change. (on line): http://www.sica.int/busqueda/Centro%20de%20Documentaci%C3%B3n.aspx?IDItem=1255&IdCat=7&IdEnt=2&Idm=1&IdmStyle=1
[164] Ibidem. Article 9.
[165] Ibidem. Article 19.
[166] Ibidem. Article 23.

The Central American Commission for Maritime Transport (COCATRAM, for its acronym in Spanish)[167] is a technical regional body established by Resolution 5-80 (ROMRIECA XXIII) in July 1980, by the meeting of Ministers for the Central American Economic Integration.[168]

COCATRAM is mandated to contribute to the development of maritime trade ports of Central America, identifying, promoting, and encouraging measures, policies and actions in the framework international standards. The COCATRAM is the regional focal point for technical coordination, actions and programmes with the International Maritime Organization (IMO).[169]

The principal functions[170] of COCATRAM are to coordinate with stakeholders involved in maritime transport in the region (Ministries of Transport, Maritime Authorities, Port companies, users and providers of International transport services), to identify the needs of the sector through assessments, studies, and research, as well as o act as a liaison with the International Maritime Organization (IMO).

COCATRAM is composed by the Ministers of Transport of the Central American countries, by the representatives of Port Governmental Organizations, and representatives of private associations like the Federation of the Central American Chambers of Commerce (FECAMCO) and the Federation of Exporters Chambers (FECAEXCA).[171] Important to be pointed out is that this regional body responds to the guidelines and policies of the Council of Ministers Responsible for Transport in Central America (COMITRAN).[172]

In relation to the international maritime agenda, since 2002, COCATRAM has been the Secretariat of the Regional Cooperation Network in Operational Maritime Affairs and the Dominican Republic (ROCRAM-CA). There has been considerable progress in the achievement of its core functions including the conclusion of different Memorandums of Understanding (MOU) with the IMO, regarding cooperation for the effective implementation of IMO's global maritime standards, the maritime strategies adopted by ROCRAM-CA, as well as the strengthening of maritime Authorities and Port entities at local levels.[173]
COCATRAM works under the Central American regional maritime and port Strategy, which approaches the protection of marine ecosystems in different lines of action, summarised in Box 12. These guidelines could be applied to the CAD project, given the ecological importance of that area.

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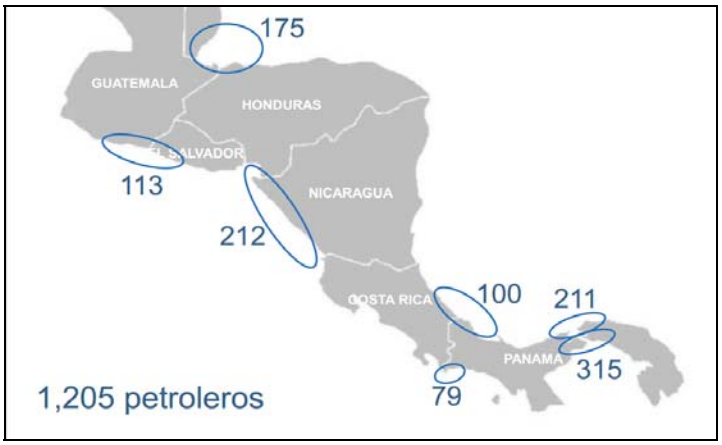
[167] The COCATRAM member States are Costa Rica, El Salvador, Guatemala, Nicaragua, Honduras and Panama.
[168] COCATRAM. Marco juridico. (on line): http://www.cocatram.org.ni/cjuridico.html
[169] COCATRAM. (on line): http://www.acs-aec.org/sites/default/files/3_eng_cet-21_rr_annex_iii_presentation_cocatram.pdf
[170] COCATRAM en breve. (on line): http://www.cocatram.org.ni/cbreve.html
[171] COCATRAM. Boletin informativo MARPORT No. 5. (on line): http://www.cocatram.org.ni/Marport_6.pdf
[172] Ibidem.
[173] Ibidem.

Box 12. Regional Maritime and Port Strategy[174] and marine protection	
VIII. MARITIME ADMINISTRATION Develop, strengthen and consolidate Maritime Administrations of Central American countries.	X. MARINE AND COASTAL AREAS Ensure the protection, preservation, conservation and sustainable exploitation of coastal areas, maritime areas and natural resources in the sea.
Expand the maritime administration's ability to effectively protect the marine environment in the region, mainly in coastal waters.	Coordinate actions with national sectors involved in the protection of the marine environment (Ministries of Environment, Universities, shipping companies, terminal operators, ship-owners, fishing industry).
Develop and implement National and Local Plans to combat pollutants and oil spills in national waters.	Facilitate international cooperation to Central America to support marine conservation efforts.
Support actions that impulse the establishment of regional cooperation Agreements to combat marine pollution.	Provide an effective system of technical advice (legal and scientific) and cooperation, regarding the protection of the marine environment from shipping pollution and related activities.
	Effectively implement MARPOL 73/78 in the region, and strengthen port facilities capacity for the adequate reception of oily and hazardous waste, and sewage from ships.
	Prevent the spread of foreign/exotic organisms in ballast water.

As pointed out previously, the possibility of spills is a latent risk in the region, due to the increased vessel traffic. In 2008, 17,127 ships navigated through the Central American region of which 1,205 were oil tankers. Given this condition, COCATRAM has identified high risk areas in relation to tanker shipping, mainly located near coastal areas, as shown in figure 14.

Figure 14. Tankers navigation in Central America

[174] COCATRAM. Central American Regional Maritime and Port Strategy. (on line): http://www.cocatram.org.ni/Estrategia_Maritima_Portuaria_Regional_Centroamericana.pdf



Source: COCATRAM.[175]

Finally, it has to be pointed out, that COCATRAM is the regional focal point to address maritime matters and therefore is the most appropriate institutional actor to coordinate measures that are the designation of the CAD as a PSSA with a view to protecting vulnerable marine ecosystems. However, the countries that would submit the proposal must have into consideration their ability to fulfil the PPSA criteria and complementary data, to tailor measures to address the shipping risk in a particular area, as well as political considerations, proper consultation processes with other affected States and stakeholders, and the domestic implementation of the submitted measures.[176]

Section B. Fisheries management

The following subsections will review the regional institutional and legal framework in relation to fisheries management. The first regional body mentioned is the Central American Fisheries and Aquaculture Organization (OSPESCA), and this will be followed with a short description of the role of the Inter-American Tropical Tuna Commission (CIAT).

The Central American Fisheries and Aquaculture Organization (OSPESCA)

The Central American Fisheries and Aquaculture Organization (OSPESCA, for its acronym in Spanish) was created by the San Salvador Act[177] in December 1995, as the responsible body for establishing the definition, implementation and monitoring of strategies, policies and projects related to sustainable fisheries and aquaculture.[178]

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[175] COCATRAM. Regímenes de indemnización. (on line): http://www.cocatram.org.ni/Regimenes%20de%20Indemnizacion%20Derrames%20de%20Hidrocarburos.pdf

[176] Mesoamerican and Caribbean Sea Hydrographic Commission. Considering Alternatives for Managing Ship Traffic. (on line): http://www.iho-machc.org/documents/ecctg1_doc.html#A

[177] San Salvador Act. (on line): http://www.sica.int/busqueda/Centro%20de%20Documentaci%C3%B3n.aspx?IDItem=4696&IdCat=24&IdEnt=47&Idm=1&IdmStyle=1

[178] San Salvador Act. Article 1.

The OSPESCA agenda aims to develop and coordinate regional fisheries management and aquaculture activities.[179] As such, its area of competence extends to the jurisdictional and inland waters of its Member States, and the species management guidelines cover marine and inland capture, as well as aquaculture fish stocks of member States.[180]

In order to promote a regional model for the development of sustainable fisheries and aquaculture, OSPESCA has the following functions:

- Promote the Integrated Fisheries and Aquaculture Policy.
- Promote the harmonization and implementation of fisheries and aquaculture legislation.
- Develop and promote strategies, programs, projects, and agreements on regional fisheries and aquaculture.
- Coordinate regional participation in fisheries and aquaculture international forums.[181]

The Council of Ministers is the highest authority in OSPESCA, which is responsible for the political decisions that have a regional dimension. The other two managing figures within OSPESCA are the Committee of Deputy Ministers, being the executive level that directs and evaluates the implementation of policies, programs and regional projects; and the Committee of Directors of Fisheries and Aquaculture, which represents the scientific and technical level.[182]

OSPESCA works through the guidelines established in the **Fisheries and Aquaculture Integration Policy for the Central American Isthmus**.[183] OSPESCA and the national fisheries authorities are responsible to develop, coordinate and execute the guidelines included in this Policy. One of its objectives is the integration of regional actions that are aimed at strengthening cooperation to ensure the biological, economic, social and environmental sustainability of the fisheries and aquaculture.[184] It also establishes different principles to guide the implementation of fisheries management in the region, such as sustainability, precautionary principle, regional integration, citizen participation, and intraregional solidarity.[185]

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[179] FAO. Regional Fishery Bodies Summary Descriptions-OSPESCA. (on line): http://www.fao.org/fishery/rfb/ospesca/en

[180] The OSPESCA member States are Belize, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua, Panama.

[181] OSPESCA. OSPESCA en breve. (on line): http://www.sica.int/ospesca/ospesca_breve.aspx?IdEnt=47

[182] Ibidem.

[183] OSPESCA. Fisheries and Aquaculture Integration Policy for the Central American Isthmus. (on line): ftp://ftp.fao.org/fi/DOCUMENT/ospesca/publications/FisheriesAquacultureIntegrationPolicyCentralAmerica.pdf

[184] Ibidem. Article 3.1.c

[185] Ibidem. Article 3.2

The Policy is applicable within the jurisdictional and inland waters of the Central American countries, and also in the international waters to fishing fleets flying a flag from these countries.[186] Thus the remit of this organization could be extended to the adoption of management measures applicable to the CAD, thus ensuring a harmonized approach to the institutional and legal setting for the management of shared fishing resources within the region.

In regards to high seas fisheries[187] and shared[188] marine resources, this Policy points out that international fleets flying Central American countries' flags have increased in relation with tuna and other highly migratory species. In this context, fleets of two or more countries are frequently operated in the same fishing areas. As it will be analyze in the next section, all Central American countries are member States of the Inter-American Tropical Tuna Commission (CIAT), where specific fisheries management regulations have been agreed as will be seen below.

The current policy, nonetheless, emphasizes the importance of a harmonized legal framework in the region, as well as the preparation and strengthen of national fisheries authorities. Of remarkable importance for the present study, the Policy states that sub-regional agreements should be promoted to formalize and manage the fishing of shared species, as well as to manage joint projects of marine reserve areas.[189] The CAD case could attract OSPESCA's support within these policy guidelines.
In regard of control and surveillance, the Policy indicates that improvement must be achieved by a collective effort with the region, and through the application of coordinated methodologies, such as for example the establishment of memorandums of understanding between the Naval Forces and Coast Guards of the countries, VMS programmes, sharing of information.[190]

Finally, in relation to fish products trade, the Policy establishes that a regional certification should be promoted to impulse responsible trade.[191]

In an operational level, OSPESCA has developed an integrated registration system[192] for fisheries and aquaculture in Central America, by gathering information from each national fisheries authority. Information about registered vessels by country, registered vessels by fishing activity/gear, registered artisanal vessels by country and schedule of closures, are all available to public scrutiny on the OSPESCA's website.

In this context, OSPESCA has also developed management measures with the national fisheries authorities of each country on certain specific topics. For instance, the

[186] Ibidem. Article 3.3
[187] Ibidem. Article 3.4.6
[188] Ibidem. Article 3.4.7
[189] Ibidem. Article 3.4.7.d
[190] Ibidem. Article 3.4.8
[191] Ibidem. Article 3.4.9
[192] OSPESCA. Integrated registration system for fisheries and aquaculture. (on line): http://www.sica.int/WSIRPAC/Default.aspx

conservation and management guidelines[193] for species like sharks, lobsters, and other pelagic species, as well as support for specific fisheries sectors.

Finally, coordination actions has also been set with other regional organizations. A Memorandum of Understanding (MoU) between CCAD[194] and OSPESCA aims to strengthen coordination and integration in environmental issues related to fisheries in the region; and the MoU between OSPESCA and the Inter-American Tropical Tuna Commission[195], addresses the exchange of scientific information, technical assistance and training. In the specific case of the CAD, these three regional organizations have formal agreements to plan working agendas in regards to conservation and management of the marine resources which depends on the CAD.

The Inter-American Tropical Tuna Commission

The Inter-American Tropical Tuna Commission (CIAT for its acronym in Spanish) is the Regional Fisheries Management Organization (RFMO) for the Eastern Pacific. The Convention[196] was signed the Republic of Costa Rica in Washington, on May 31, 1949. Today it has the following member States are Belize, Canada, Costa Rica, Colombia, Ecuador, El Salvador, United States, France, Guatemala, Japan, Kiribati, Korea, Mexico, Nicaragua, Panama, Peru, Chinese Taipei, European Union, Vanuatu, and Venezuela.

The Convention provides a framework for Contracting Parties to maintain the populations of yellowfin and skipjack tuna, as well as other fish stocks caught by tuna fishing vessels in the eastern Pacific Ocean. This joint Commission reports on compliance and proposes management recommendations.

In August of 2010, the Antigua Convention entered into force to strengthen and replaced the 1949 Convention. Currently the CIAT has 20 member States, which aim to cooperate to ensure the conservation and long-term sustainable use of fish stocks covered by the Convention,[197] shown in figure 15.

Figure 15. Antigua Convention area

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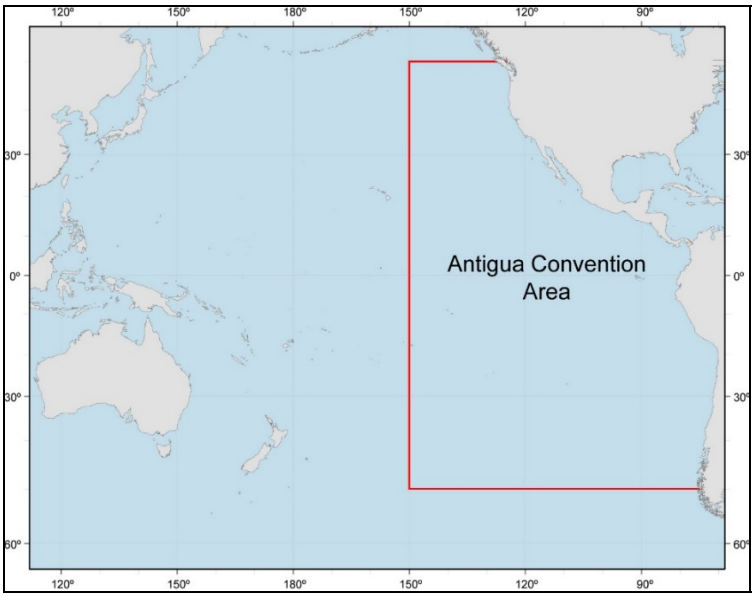
[193] OSPESCA. Harmonized fisheries management measures. (on line): http://www.sica.int/busqueda/secciones.aspx?IdItem=11297&IdCat=48&IdEnt=47

[194] CCAD-OSPESCA. MoU CCAD and OSPESCA. (on line): http://www.sica.int/busqueda/Centro%20de%20Documentaci%C3%B3n.aspx?IDItem=74729&IdCat=25&IdEnt=47&Idm=1&IdmStyle=1

[195] CIAT-OSPESCA. MoU CIAT and OSPESCA. (on line): http://www.sica.int/busqueda/Centro%20de%20Documentaci%C3%B3n.aspx?IDItem=79671&IdCat=25&IdEnt=47&Idm=1&IdmStyle=1

[196] Convention for the establishment of the Inter-American Tropical Tuna Commission. (on line): http://www.iattc.org/PDFFiles/IATTC_convention_1949.pdf

[197] Antigua Convention. Article III. (on line): http://www.iattc.org/PDFFiles2/Antigua_Convention_Jun_2003.pdf



Source: NOAA Fisheries.[198]

Some of the functions of the Commission are the following:

- Promoting, conducting and coordinating scientific research on the abundance and biology of the fish stocks covered by the Convention.
- Adopting standards for the collection, exchange and reporting of data on fisheries populations.
- Taking measures to avoid, reduce and minimize waste, discards, by-catch, lost or abandoned gear, catch of non-target species.
- Develop criteria and make decisions on the allocation of the total catch permissible, or total allowable fishing capacity (including carrying capacity, or fishing effort). [199]
- Applying the precautionary approach in relation to its decisions.[200]

CIAT's work is supported by technical Committees, like the Committee for the review of implementation of measures[201] and the Scientific Advisory Committee.[202] Also, investigations are conducted at sea, ports and laboratories[203] to develop management measures supported by the best scientific data available.

Similar to the Straddling Fish stocks agreement, the Convention calls for compatibility of conservation and management measures[204] on high seas and within national jurisdiction of the member States. It also establishes regulations for the implementation,

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198 NOAA Fisheries. Sustainable Fisheries Division. (on line): http://www.fpir.noaa.gov/Graphics/SFD/AntiguaConventionAreaENG.jpg

199 Antigua Convention. Article VII.

200 Ibidem. Article IV.

201 Ibidem. Article X.

202 Ibidem. Article XI.

203 CIAT. Annual Report 2009. (on line): http://www.iattc.org/PDFFiles2/AnnualReports/IATTC-Annual-Report-2009.pdf

204 Antigua Convention. Article V.

compliance and enforcement by the member States,[205] as well as the obligations of Flag States[206] and other fishing entities.[207]

The CIAT has the task to cooperate with regional and global fishery organizations and arrangements, avoiding duplication on working agendas.[208] In case of an overlap on the area of application of this Convention, with another area under regulation by another fisheries management organization, CIAT is required to cooperate and ensure the compatibility of conservation and management measures.[209] In this context, as seen in the previous section, OSPESCA and CIAT have already signed a MoU which allows both organizations to cooperate in regards to fisheries management in the region.

In respect to non-member States, the Convention requires Contracting Parties to encourage other States to adopt laws and regulations consistent with the Antigua Convention.[210] In this regard, Non-Party States could attain the status of a Cooperating Non-Party, and should fulfill information and compliance requirements within CIAT's framework.[211]

Finally, the Convention has 4 Annexes which develop the guidelines and criteria for the establishment of records of vessels,[212] the Principles and criteria for the participation of observers at meetings of the Commission,[213] and the functions of the Committee for the review of implementation of measures[214] and the scientific advisory Committee.[215]

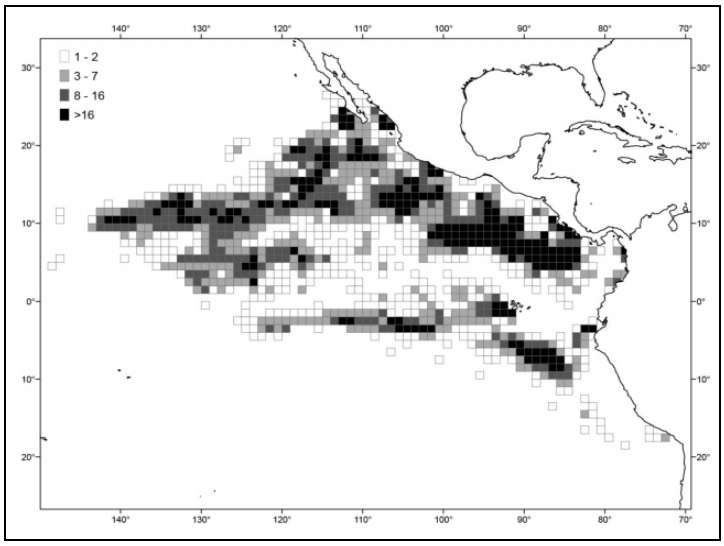
Another relevant aspect within CIAT framework, is that it guides its working agenda through the Plan for regional management of fishing capacity,[216] which addresses specific matters such as assessment and monitoring of fishing capacity; regional vessel register[217], capacity limits for purse-seine and long-line fleets; economic incentives; and compliance.

Another legal instrument that CIAT takes into consideration is the Agreement on the International Dolphin Conservation Program (AIDCP). This legally-binding agreement aims to reduce incidental dolphin mortalities in the tuna purse-seine fishery, as both

[205] Ibidem. Article XVIII.
[206] Ibidem. Article XX.
[207] Ibidem. Article XXI.
[208] Ibidem. Article XXIV.
[209] Ibidem. Article XXIV.
[210] Ibidem. Article XXVI.
[211] CIAT. Resolution A-04-08. (on line): http://www.iattc.org/PDFFiles2/Resolutions/A-04-08-Criteria-for-non-parties.pdf
[212] Antigua Convention. Annex I.
[213] Ibidem. Annex II.
[214] Ibidem. Annex III.
[215] Ibidem. Annex IV.
[216] CIAT. Plan for regional management of fishing capacity. (on line): http://www.iattc.org/PDFFiles2/IATTC-73-EPO-Capacity-Plan.pdf
[217] CIAT. Resolution C-00-06. (on line): http://www.iattc.org/PDFFiles/C-00-06%20Vessel%20register%20resolution%20Jun%2000.pdf

species are closely related (Figure 16); and ensure the long-term sustainability of the tuna stocks, as well as reducing and minimizing by-catch and discards of juvenile tunas and non-target species.[218]

Figure 16. Spatial distribution of sets on tuna associated with dolphins on the Eastern Tropical Pacific



Source: CIAT Annual Report. 2009.[219]

In regards to IUU fishing, Resolution C-05-07[220] was signed in 2005 by CIAT member States, and established the process for the publication of a list of vessels presumed to have carried out IUU fishing activities. This particular action concretized in the eastern Pacific region one of the measures established in the FAO Port State measures Agreement.

The process to include a vessel into the IUU fishing list and the measures to address the interaction with these vessels, are quite similar to the ones applicable within the CCAMLR Convention. Some of the required actions for Member States are the following:

- Ensure that vessels flying their flag do not transship with vessels on the IUU List.
- A vessel included in the IUU list that enter ports voluntarily will not be authorize to land or transship.
- Prohibit the chartering of a vessel on the IUU Vessel List.
- Refuse to grant their flag to vessels on the IUU Vessel List

[218] CIAT. International Dolphin Conservation Program (AIDCP). (on line): http://www.iattc.org/IDCPENG.htm

[219] CIAT. Annual Report 2009. (on line): http://www.iattc.org/PDFFiles2/AnnualReports/IATTC-Annual-Report-2009.pdf

[220] CIAT. Resolution C-05-07. (on line): http://www.iattc.org/PDFFiles2/Resolutions/C-05-07-IUU-Vessel-list.pdf

- Prohibit commercial transactions, imports, landings and/or transshipment of species covered by the Antigua Convention from vessels on the IATTC IUU Vessel List.

Another management tool for yellowfin, bigeye and skipjack tuna implemented by CIAT are temporary closures, in specific marine areas, for particular purse-seine and long-line vessels. Currently, Resolution C-13-01[221] establishes a closure for the fishery for yellowfin, bigeye, and skipjack tuna by purse-seine vessels within a delimited area in the Eastern Tropical Pacific (96º and 110ºW and between 4°N and 3°S). In this regard, it must be pointed out that the approximate location of the CAD (9°N, 90°W) is near CIAT's close area, being a feasible option the extension of the fishing closure to the CAD's critical areas.

Every vessel that fishes during 2014-2016 must observe the closure period, regardless of the flag under which it operates, and the only exemption to be in the closed area is due to force majeure. Said that, landings and transshipments of tuna that have been caught in contravention on this measure are prohibited.

In addition, the CIAT has also developed conservation measures in relation to sea turtles (Resolution C-04-07[222] and Resolution C-07-03[223]), seabirds (Resolution C-05-01)[224], and sharks (Resolution C-05-03[225] and Resolution C-11-10)[226].
In a similar way than the CCAMLR Convention, the CIAT has established a vessel monitoring system[227] (VMS), applicable to tuna-fishing vessels which are 24 meters or more in length and which operates in the Convention's area. The Parties must ensure that the information collected by the VMS for each vessel include the vessel's identification, position, date and time. This data must then be submitted every six hours to the authority designated by each Party. CIAT also strongly encourages Non Parties whose flag vessels fish in the Convention's area to participate in the VMS program.

Finally, the establishment of observer programme is another important feature of both CCAMLR and CIAT. The programme[228]under CIAT's framework was created in 1999, to

[221] CIAT. Resolution C-13-01. (on line): http://www.iattc.org/PDFFiles2/Resolutions/C-13-01-Tuna-conservation-in-the-EPO-2014-2016.pdf
[222] CIAT. Resolution C-04-07. (on line): http://www.iattc.org/PDFFiles2/Resolutions/C-04-07-Sea-turtle-program.pdf
[223] CIAT. Resolution C-07-03. (on line): http://www.iattc.org/PDFFiles2/Resolutions/C-07-03-Sea-turtles.pdf
[224] CIAT. Resolution C-11-02. (on line): http://www.iattc.org/PDFFiles2/Resolutions/C-11-02-Seabirds.pdf
[225] CIAT. Resolution C-05-03. (on line): http://www.iattc.org/PDFFiles2/Resolutions/C-05-03-Sharks.pdf
[226] CIAT. Resolution C-11-10. (on line): http://www.iattc.org/PDFFiles2/Resolutions/C-11-10-Conservation-of-oceanic-whitetip-sharks.pdf
[227] CIAT. Resolution C-04-06. (on line): http://www.iattc.org/PDFFiles2/Resolutions/C-04-06-Vessel-monitoring-system.pdf
[228] CIAT. Agreement on the International dolphin conservation program. Resolution to support the on-board observer program. (on line): http://www.iattc.org/PDFFiles/A-99-01%20Observer%20Program%20resolution%20Oct%2099.pdf

improve efforts to reduce the incidental mortality of dolphins in the purse-seine tuna fishery. Parties are required to ensure that infractions pertaining to observer harassment and interference are addressed in accordance with national legislation.

The programme was strengthen by an additional Resolution[229], which required that Members and cooperating non-Member ensure that at least 5% of the fishing effort made by its long-line fishing vessels (greater than 20 meters length) carry a scientific observer. Scientific observers must record biological information, catches of targeted fish species, interaction with non-target species such as sea turtles, seabirds and sharks, among other data. The reports are submitted the flag authorities and to the Scientific Advisory Committee.

Conclusions

The present chapter presents four key conclusions.

Firstly, it ought to be noted that the Central American Integration System (SICA) was established to address common interests and concerns in the region. Three regional bodies, CCAD, OSPESCA and COCATRAM, are developing their work programmes in relation to marine conservation and the sustainable use of offshore resources. Accordingly, there are appropriate institutional structures in place for the management of the marine environment, fisheries and shipping on a transnational basis, which is crucial for the sustainable management of anthropogenic impacts on the CAD.

The second point is that the legal framework for environmental management is fairly well developed from a terrestrial perspective. In particular, the Central American Commission on Environment and Development (CCAD) establishes environmental and cross-sectoral regional agendas. In this context, two regional Conventions addresses environmental protection: the Convention for the Conservation of the Biodiversity and the Protection of Wilderness Areas in Central America and the Regional Convention on Climate Change. There is however an urgent need to negotiate and adopt a regional agreement with a specific focus on marine environmental protection as well as the application of an ecosystem based approach to the management of activities in and at the CAD.

Thirdly in relation to maritime transport and spatial designation of the marine environment for specific purposes, the Central American Commission for Maritime Transport (COCATRAM) is the regional focal point to address maritime matters and is therefore the most appropriate institutional body to coordinate and discuss possible designations of discrete parts of the CAD as an IMO designated PSSA. However, countries that are eligible to submit such a proposal must have the ability to fulfil the PPSA criteria and to collect the complementary scientific and socio-economic data, as well as the capacity to fulfil the stakeholder consultation processes and to ensure domestic implementation of the management measures.

[229] CIAT. Resolution C-11-08. (on line): http://www.iattc.org/PDFFiles2/Resolutions/C-11-08-Observers-on-longline-vessels.pdf

Fourthly, the Central American Fisheries and Aquaculture Organization (OSPESCA) is the responsible body for the establishment and implementation of regional fisheries strategies and policies. In this regards, the Fisheries and Aquaculture Integration Policy for the Central American Isthmus guides fisheries management, and uses sub-regional agreements to formalize and manage shared fishing stocks, as well as to propose the designation of marine reserve areas for fisheries management purposes. In addition, the Inter-American Tropical Tuna Commission is the RFMO for the Eastern Tropical Pacific. Similar to CCAMLR it has adopted many measures pertaining to IUU fishing vessel list, the vessel monitoring system, and an on-board observer programme. Another management measure used by CIAT are fishing closures. The specific area that is closed (96º and 110ºW and between 4°N and 3°S), is very close to the approximate location of the CAD (9°N, 90°W). Therefore this may be a feasible option for the extension of the fishing closure to the CAD's critical areas in light of scientific findings. In general, there is a relatively well developed and functioning institutional structures for the management of straddling and highly migratory fish stocks in line with the scheme set down by the UN Fish Stocks Agreement. However, there is a pressing need for greater coordination of measures and actions in relation to the CAD. In particular, all three regional organizations (CCAD, OSPESCA, CIAT) should further advance their formal working agreements and working arrangements to ensure the conservation and management of all marine resources and ecosystems pertaining to the CAD.

PART II. Regional conservation and management approaches to ABNJ

Part II of the present study will analyse in two chapters the legal and institutional framework, as well as the lessons learned and challenges in four case studies. Chapter 1 will approach the OSPAR and the Barcelona Convention case studies, as regional examples which have established MPA in ABNJ. Each case study will be focused in three main elements: marine conservation, fisheries management and climate change. Subsequently, Chapter 2 will analyse the CCAMLR experience and the Sargasso Sea case study, addressing the same items in relation to marine conservation, fisheries management and climate change within these cases.

Chapter 1. Marine conservation in ABNJ

The aim of the present chapter is to evaluate two case studies of regional frameworks in which States by means of regional organizations seek to promote conservation of marine resources in ABNJ. More specifically, the regime that applies to the OSPAR experience and the Barcelona Convention case study will be examined. For reasons of space, these case studies will focus on two aspects of the regulatory framework, namely: (1) the legal and institutional framework that applies in both ocean regions, and (2) the challenges and the lessons that may be derived in relation to conservation measures, fisheries management and climate change. These particular topics are selected, as they are clearly germane to the establishment of a regional scheme for the CAD.

Section A. The OSPAR experience

The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention) is aimed at protecting and preserving the marine environment and thus touches all aspects of the management and conservation schemes of marine resources.

OSPAR Convention is a valuable, sophisticated and stable framework that can trace it roots back to 1972, when the first conservation goals were set down under the Oslo Convention, and the Paris Convention (1974), both precedents of OSPAR. This historic context will be address in the following section.

The OSPAR experience is worth replicating elsewhere in the world, in so far as it sets an example for other States on how best to adopt and implement a legally binding regulatory framework backed by relative robust enforcement schemes.

This section will analyse several aspects of the OSPAR Convention. In particular, it will examine the regulatory and institutional framework that is aimed at addressing biodiversity, in close relation to MPAs, fisheries management, and ocean acidification in ABNJ. Also, it aims to identify the challenges and lessons that can be deduced from ABNJ management initiatives that have been undertaken in the North-East Atlantic.

First, however, it is proposed to take a brief look at the legal and institutional framework that is utilised by OSPAR. And secondly, to present an overview of the lessons learned and the challenges that must now be addressed going forward.

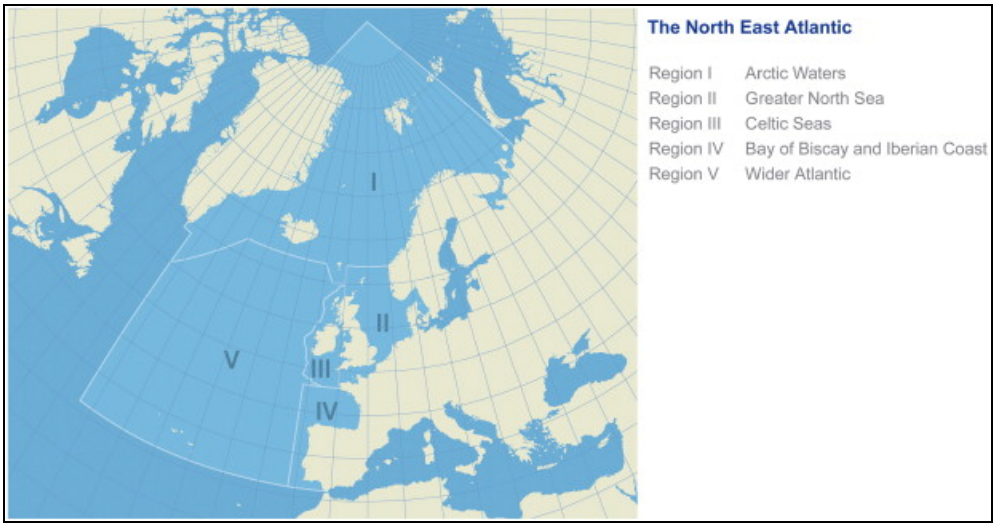
OSPAR legal and institutional framework

OSPAR Convention is a mechanism integrated by 15 Governments[230] of Western Europe, together with the European Community, with a view to cooperating in the protection of the marine environment of the North-East Atlantic.

OSPAR's precedent is the Oslo Convention against dumping (1972), which was extended to cover land-based sources and offshore industry by the Paris Convention (1974). These two Conventions were unified and actualized by the OSPAR Convention (1992).[231] In this regard, the new Annex on biodiversity and ecosystems was adopted in 1998 to cover non-polluting human activities that can adversely affect the sea.

The OSPAR Maritime Area encompasses areas in the Wider Atlantic (Region V) and the Arctic Waters (Region I) that are beyond the national jurisdiction of the Contracting Parties. These areas cover approximately 40% of the OSPAR Maritime Area, as shown in figure 17.

Figure 17. OSPAR Regions



Source: http://www.ospar.org

[230] The 15 Governments are: Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

[231] OSPAR Commission. On line: http://www.ospar.org/content/content.asp?menu=00010100000000_000000_000000

A remarkable element of the Convention is the establishment of a framework of principles. [232] In this context, Contracting Parties shall apply the precautionary principle, as well as work on programmes and measures applying the best available techniques and environmental practices. In this context, authors have pointed out this principles basis, as Ronan Long explains,

> "The OSPAR Convention codifies a number of principles and approaches to environmental protection, including the precautionary principle, the *polluter pays* principle, the *best available technology* principle, and the best environmental practice; including where appropriate the use of clean technology."[233]

On the operational basis, the Convention works through the good offices of the OSPAR Commission, which executes the decisions taken by the Contracting Parties, and works towards the harmonization of policies, programmes and measures, for the protection of the marine environment.[234] The Commission's ordinary meetings are once a year, and extraordinary meetings can be requested by at least 3 Parties.

The Convention is a highly sophisticated international agreement and is supplemented by several Annexes (Box 13) which deal with the following areas:

Box 13. OSPAR Annexes

Annex I	Prevention and elimination of pollution from land-based sources.
Annex II	Prevention and elimination of pollution by dumping or incineration.
Annex III	Prevention and elimination of pollution from offshore sources.
Annex IV	Assessment of the quality of the marine environment.
Annex V	Protection and conservation of the ecosystems and biological diversity of the maritime area.

Besides the Annexes, OSPAR's work is organized under six strategies: biodiversity and ecosystem, eutrophication, hazardous substances, offshore industry, radioactive substances, joint assessment and monitoring programme. In this framework of action, Committees and Working Groups were establish to address the different topics that the Convention encloses. Each working group has a work programme, which is designated and implemented annually.

a. Marine protected areas and biodiversity

Bearing in mind that the establishment of protected areas is an in-situ conservation tool under the CBD, it is significant that OSPAR has developed a network of marine protected areas. Including MPAs in ABNJ.

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[232] CCAMLR Convention. (on line): http://www.ccamlr.org/en/organisation/camlr-convention-text#II Article 2.

[233] Long, Ronan. Marine Resource Law. Thomas Round Hall. Dublin. 2007. 840pp. Pg 601

[234] Convention for the Protection of the Marine Environment of the North-East Atlantic. Strategy of the OSPAR Commission for the Protection of the Marine Environment 2010–2020 http://www.ospar.org/html_documents/ospar/html/10-03e_nea_environment_strategy.pdf

At the outset, it is important to point out that the Sintra Ministerial Statement[235] established that OSPAR Commission had the political commitment to promote the creation of a network[236] of marine protected areas to ensure the sustainable use, protection and conservation of marine biological diversity and its ecosystems.[237]

This requirement for the Commission was formalised in Recommendation 2003/3 on a Network of Marine Protected Areas, which stipulated a schedule to accomplish specific goals. This ambitious objective was not achieved by 2010 in line with the original schedule. Subsequently, however, the OSPAR Ministerial Meeting in Bergen (September 2010) adopted a renewed[238] Recommendation 2003/3, including revised targets for the establishment of the OSPAR Network of Marine Protected Areas in the North-East Atlantic and to ensure that:

"a. by 2012 it is ecologically coherent, includes sites representative of all biogeographic regions in the OSPAR maritime area, and is consistent with the CBD target for effectively conserved marine and coastal ecological regions.
b. by 2016 it is well managed (i.e. coherent management measures have been set up and are being implemented for such MPAs that have been designated up to 2010)."[239]

Progress on these targets has been rapid and has been greatly facilitated by the development of a coherent ecological network by the EU under the Habitats and Birds Directives. Today, the OSPAR MPA Network comprises 282 sites[240], "including 276 MPAs situated within national waters of Contracting Parties, four MPAs under split jurisdiction with the seabed under a submission made by Portugal to the U.N, and two MPAs situated entirely in Areas beyond National Jurisdiction (ABNJ). Collectively, these sites cover 476 198 km² or 3,5% of the OSPAR Maritime Area in the North-East Atlantic."[241]

Significantly, the majority of OSPAR MPAs are situated in the coastal zone, and there also appears to be a major geographical imbalance, regarding the distribution of the MPAs across the different OSPAR Regions. [242] In 2010 to address this shortcoming, six MPAs were establish on the high seas, increasing the total MPA coverage in OSPAR Region V to 302 100 km².[243]

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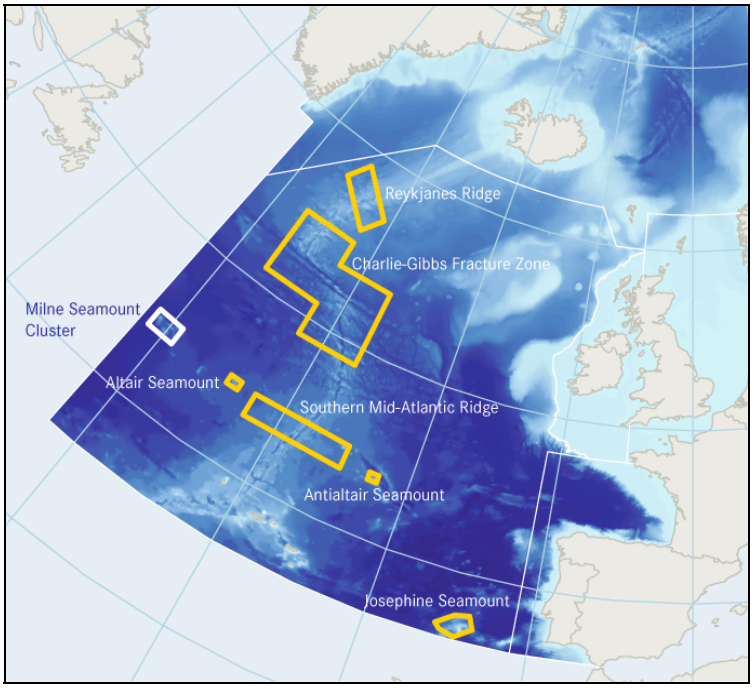
[235] Adopted at the meeting of the OSPAR Commission at Sintra, Portugal, 22-23 July 1998.
[236] For more information refer to OSPAR Commission. 2011 Status Report on the OSPAR Network of Marine Protected Areas. On line: http://www.ospar.org/documents/dbase/publications/p00577_2011%20status%20report%20on%20the%20network%20of%20mpas.pdf
[237] Ibidem.
[238] Recommendation 2010/2 on amending Recommendation 2003/3 on a network of Marine Protected Areas.
[239] OSPAR Commission. 2011 Status Report on OSPAR Network of MPAs. Pg 6.
[240] For more information refer to the 2011 Status Report on OSPAR Network of MPAs. Pg 4.
[241] Ibidem. Pg 7.
[242] Ibidem. Pg 7.
[243] Ibidem. Pg 14

As mentioned above, two of these MPAs are situated entirely in ABNJ: the Charlie-Gibbs South MPA and the Milne Seamount Complex MPA (Box 14). The remaining four are in areas that come within the Portuguese submission to the Commission on the Limits of the Continental Shelf (CLCS) on the establishment of the outer limits of its extended continental shelf under article 76 UNCLOS. They thus may come within coastal State jurisdiction as soon as the CLCS issues a recommendation on the Portuguese submission. In all likelihood that may lead to the conclusion that if Portugal's submission is accepted by the CLCS, OSPAR will just have 2 MPAs in ABNJ.

Figure 18. OSPAR Marine Protected Areas in ABNJ



Source: http://www.ospar.org

Box 14.OSPAR Marine Protected Areas in areas beyond national jurisdiction

MPA	Location
Charlie-Gibbs South	ABNJ
Milne Seamount Complex	ABNJ
Mid-Atlantic Ridge north of the Azores High Seas MPA	Under Portuguese submission
Altair Seamount High Seas MPA	Under Portuguese submission
Antialtair High Seas MPA	Under Portuguese submission
Josephine Seamount Complex High Seas MPA	Under Portuguese submission

OSPAR Commission. 2011 Status Report on the OSPAR Network of Marine Protected Areas.

On the other hand, there are a number of points that can be made about the OSPAR approach to the designation of MPAs in ABNJ. Instructively and in line with their Treaty commitments, the designation of an MPA on the high seas requires the collective agreement, by consensus, of all of the OSPAR Contracting Parties.

Moreover, a concrete proposal to establish one of this areas needs to be considered by all Contracting Parties in considerable detail. In principle, it could also be elaborated by nongovernmental organizations, taking into account information on ecological considerations and conservation objectives. The designation process itself is of course undertaken by OSPAR as a separate entity with legal personality under their Treaty mechanisms.

The second aspect that needs to be flagged at this point in time is that there is a complex situation regarding the jurisdiction over these areas, as a result of the processes for the establishment of the outer limits of the Contracting Parties continental shelf beyond 200 nautical miles under Article 76 of UNCLOS. The management approach adopted by OSPAR also merits separate consideration here.

Crucially, one country (Costa Rica) in the Central American region may have an extended continental shelf in this part of the Pacific, so the issues that have been addressed by Portugal and the experience in OSPAR is directly relevant to the future designation of MPAs in or adjacent to the CAD.

Finally, it is important to acknowledge what has been stated in the Report of the BBNJ Ad Hoc Open-ended Informal Working Group No. A/67/95[244], in relation to designation of MPAs in ABNJ. In this context, delegations from different countries noted that there is no multilaterally agreed legal regime to back up the establishment of MPAs in ABNJ. Another important point flagged in the Resolution was that these conservation tools should not be established by regional bodies of States,

> "It was observed that marine protected areas could not be established unilaterally or by a group of States. Some delegations suggested considering a process for the identification of marine protected areas in areas beyond national jurisdiction, as well as the criteria to be used and the respective roles of States, the General Assembly and sectoral and regional bodies in the designation and management of marine protected areas." (Report No. A/67/95 paragraph 22).

In this scenario, OSPAR, as well as other regional bodies including any putative body established for the management of the CAD face a considerable challenge in the creation of MPAs in ABNJ. In other words, there are impediments to such an approach while the international community is engaged in diplomatic law-making processes and until clear rules have been established.

Instructively, there does not appear to be any difficulty regarding definitions and within the OSPAR framework, MPAs are understood as meaning: "areas for which protective, conservation, restorative or precautionary measures have been instituted for the purpose of protecting and conserving species, habitats, ecosystems or ecological processes of the marine environment."[245]

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[244] Report of the BBNJ Ad Hoc Open-ended Informal Working Group No. A/67/95. Oceans and the law of the sea. 2012. (on line): http://www.un.org/ga/search/view_doc.asp?symbol=A/67/95&referer=/english/&Lang=E

[245] OSPAR Commission. 2011 Status Report on OSPAR Network of MPAs. Pg 33

The OSPAR Commission has adopted some recommendations[246], as well as accountability measures, to guide OSPAR Contracting Parties regarding the management of these areas. These include, inter alia: guidance to develop management plans for MPAs; evaluation tools; management plans; requirement for annual reports from States to the OSPAR Commission about actions taken to implement recommendations; and the application of international, regional and national legislation to assist with the implementation of management measures.

In parallel, it also needs to be emphasised that progress with the OSPAR network has been facilitated by the implementation of the Birds and Habitats Directives by EU-member States. This has strengthened the Joint OSPAR and HELCOM Network of marine protected areas, as well as the NATURA 2000 network. In regards to accomplishing the goal of developing an ecologically coherent Network of OSPAR MPAs, the Commission has developed specific criteria[247] to assess this process, for example MPAs will require to meet the following characteristics: adequacy/viability; representativity; replication; connectivity, resilience, distribution of MPAs across biogeographic regions among others.

One major feature of the OSPAR regime, which acknowledges that there are multiple activities and uses that take place in marine areas, is that the OSPAR Commission cooperates with other authorities involved in the management of these activities. One of the best examples is the cooperative structures for fisheries with the EU, the North East Atlantic Fisheries Commission/NEAFC, the International Commission for the Conservation of Atlantic Tunas/ICCAT, the North Atlantic Salmon Conservation Organization/NASCO, the North Atlantic Marine Mammal Commission/NAMMCO, the International Whaling Commission/IWC); in relation to shipping (International Maritime Organization/IMO), and for the exploration and extraction of mineral resources with the International Seabed Authority/ISA."[248]

In this context, OSPAR has established Memorandums of Understanding with the International Council for exploration of the sea (ICES), the International Atomic Energy Agency, the European Environment Agency, the International Seabed Authority, the International Maritime Organization, the North Atlantic Salmon Conservation Organization, and the North East Atlantic Fisheries Commission, among others. This could be relevant for the future development of a similar approach that is applicable to the CAD, and as it was noted (Part I, chapter 2 of this study) different MoU has been established within the institutional framework in the Central American region.

In respect to fisheries matter, OSPAR's Annex V on the protection and conservation of the ecosystems and biological diversity of the maritime area, states that no programme

[246] Recommendation 2003-17. Guidelines for the Identification and Selection of MPAs in the OSPAR Maritime Area.
[247] OSPAR Commission. Background Document to support the assessment of OSPAR Network of MPAs and its ecologically coherent. On line: http://www.ospar.org/documents/dbase/publications/p00320_ecological%20coherence.pdf
[248] OSPAR Commission. 2011 Status Report on OSPAR Network of MPAs. Pg 23

or measure concerning fisheries should be adopted under the Convention[249], but it gives the possibility to the Commission to point out important issues to the competent bodies and cooperate with them. As mentioned in previous paragraphs on this section, measures concerning the management of European fisheries are adopted within the framework of the Common Fisheries Policy.

On this particular issue, the MoU between OSPAR and the NEAFC states that both regional bodies have complementary competences, for fisheries management and environmental protection in the North-East Atlantic, including ABNJ. Also, both recognized that there is an interest in conserving the marine resources, and agreed to promote mutual cooperation through free flow of information; management of human activities that impact on the marine environment; develop a common understanding of the application of the precautionary approach; cooperate regarding marine spatial planning; conduct of marine science; establish reciprocal observer arrangements; between other matters.

Another example is the cooperation between OSPAR and the IMO, in relation to regulate maritime transport and the possible designation of special areas, such as the particular sensitive sea areas (PSSA).

Also, it is worth pointing out the MoU between OSPAR and ICES, which established that ICES will provide scientific information and advice to OSPAR; also that they will strengthen cooperation; ensure access to significant data; the development of cross-organizational data standardization; and that ICES Secretariat will serve as data centre, among the main items.

Finally, in relation to consider the extent and nature of other human activities and their impacts on marine ecosystems, it is useful to ponder article 5 of Annex V, which details the criteria for identifying this kind of activities through a conservation vision, as seen in Box 15 below.

Box 15. Criteria for identifying human activities
• The extent, intensity and duration of the human activity under consideration.
• Actual and potential adverse effects of the human activity on specific species, communities, and habitats.
• Actual and potential adverse effects of the human activity on specific ecological processes.
• Irreversibility or durability of these effects.

These criteria could be use as well by the decision makers and technicians involved in the CAD initiative to narrow the scope of action in this area, and could be useful for proposing guidelines and regulations about the different activities that could take place in the CAD. Overall, the OSPAR measures are remarkable prescriptive and sophisticated.

[249] OSPAR Convention. Annex V. Article 4.

b. Fisheries management in the OSPAR area

All fishing regimes in the OSPAR regions are underpinned by UNCLOS[250], which address the rights and duties of coastal States with regard to the conservation and exploitation of living resources, as the management of straddling and highly migratory stocks, as well as regulations applicable to fishing on the high seas.[251]

OSPAR Contracting Parties have significant commercial fisheries activities, as a source of employment and income to their economies. Significantly, "fishing is the most extensive and most historic human activity in the OSPAR area which contributes around 10% of global fisheries yield."[252] This figure is entirely understandable when it is considered that the European Union represents the world's second biggest fishing power, after China. In 2005, EU Member States caught around 5.6 Mtonnes of fish, 75% of which were caught in the OSPAR Maritime Area, with a fleet comprising more than 88,000 vessels. Within the EU, Denmark, Spain, France and the UK are responsible for nearly 60% of total EU commercial fisheries production.[253]

Thus it is unsurprising to note that the OSPAR Quality Status Report 2010 identified fisheries as an activity with large and multiple impacts on the marine environment, such as "continued exploitation of stocks beyond sustainable levels; depletion of key predator and prey species and disruption to food webs; damage to sea bed communities and habitats by fishing gears; by-catch of non-target fish, seabirds and marine mammals."[254] However, as noticed in previous sections, OSPAR Convention states that fisheries management is regulated by the Regional Fisheries Management Organizations and the specific Agreements[255] that each of the Contracting Parties have with other States.

In this context, general fisheries management policies look for the reduction of over-exploitation, the establishment of catch limits for commercial stocks; effort management measures; fleet reduction programmes[256] among other measures.

In a similar trend, the EU's Common Fisheries Policy (CFP) contains provisions on stock management, fleet reduction including the removal of subsidies to increase capacity; enforcement rules and measures aimed at increasing stakeholder involvement in the policy process.[257] In relation to the financial component that fisheries management has

[250] UNCLOS. Articles 61 to 64.
[251] UNCLOS. Articles 116 to 119.
[252] OSPAR Commission. Assessment of the environmental impact of fishing. 2009. On line: http://qsr2010.ospar.org/media/assessments/p00465_JAMP_QSR_fisheries_assessment.pdf Pg 16
[253] Ibidem. Pg 16
[254] Ibidem. Pg 16
[255] Ibidem. Pg 16
[256] Ibidem. Pg 25
[257] Ibidem. Pg 28

to consider, the Common Fisheries Policy is supported by the European Fisheries Fund[258] (EFF).

Also, important to point out from the management perspective, there has been created 7 Regional Advisory Committees (management units based on biological criteria), established by Council Decision 2004/858/EC under the Common Fisheries Policy. Through these forums, parties concerned cooperate in the development and implementation of the CFP.[259]

It is important to remark that for some stocks that straddles over several EEZs, coastal States have made ad-hoc arrangements about catch levels, and they seek for collaboration of the North East Atlantic Fisheries Commission in relation with catch levels in ABNJ. In this regard, the regulation of fisheries in the OSPAR Maritime Area, is also undertaken by the Faroese, Greenlandic, Icelandic, Norwegian and Russian national policies and regulations.[260]

Finally, it has to be said that fisheries management measures taken under OSPAR, and marine protected areas, are vital tools to conserve and use marine resources in a sustainable way. Both complement each other, MPAs being areas where fish stocks can reproduce, grow and feed with minimal human threats, and then the spillover effect will benefit the fishermen. In this context, efficient management measures release pressure from the fish stocks, making them less vulnerable to depletion, and available in the long term for different stakeholders.

c. OSPAR measures addressing ocean acidification and climate change

For practical purposes, this section considers the topic of ocean acidification and climate change in relation to biodiversity, because of the major threat that both represent to marine ecosystems and species.

The OSPAR approach to addressing climate change has to be seen within the overall context of the findings of the IPPC panel in part 1 of the Fifth Assessment Report (2013).

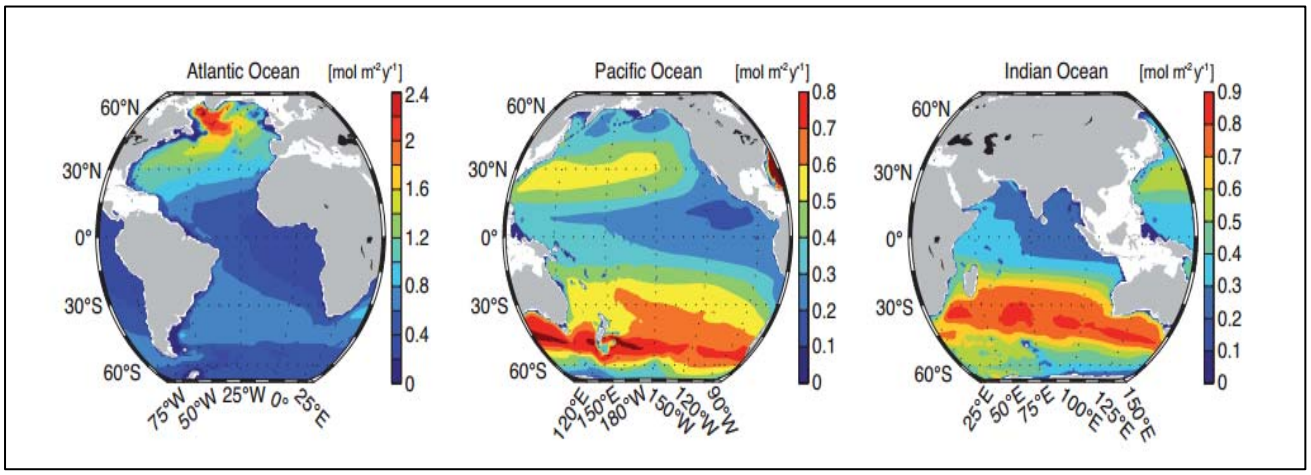
In this context, the Report has pointed out important changes happening in the North Atlantic, for example, in respect to temperature changes, it states that the warming is more prominent in the northern hemisphere, especially the North Atlantic, and the net evaporative North Atlantic has become saltier as a whole over the past 50 years.[261] Other substantial evidence was given in relation to increasing and more intense tropical

[258] For more information refer to OSPAR Commission. Assessment of the environmental impact of fishing. Pg 29
[259] Ibidem. Pg 16
[260] Ibidem. Pg 22
[261] Intergovernmental Panel on Climate Change. Working group I - Contribution to the IPCC fifth assessment report. Chapter 3 - Observations: Ocean. 2013. (on line): http://www.climatechange2013.org/images/uploads/WGIAR5_WGI-12Doc2b_FinalDraft_Chapter03.pdf

cyclones in the North Atlantic basin since the 1970s, remarking that the magnitude and frequency of extreme events can still increase.

Specifically about ocean acidification, the report explained that calculations made in the North Atlantic and North Pacific, revealed that carbon dioxide both in the atmosphere and ocean has increased, while pH have decreased in the oceans.

Figure 19. Maps of storage rate distribution of anthropogenic carbon for the three ocean



basins (Atlantic, Pacific, and Indian Ocean) averaged over 1980–2005

Source: Intergovernmental Panel on Climate Change.[262]

In this context, the advent of climate change brings many challenges for scientists and decision makers globally. More specifically, one authority has pointed out that:

> "Global warming, ocean acidification and increased low or no oxygen 'dead zones' (...) these three stressors act synergistically to change primary production patterns, alter species distribution and abundance, and impair reproduction and development. This can simplify and destabilize ecosystems, disrupt food supplies, and undermine resilience to further impacts[263]."[264]

In 2010, the OSPAR Commission reported that as a result of this phenomenon "all Regions have experienced range shifts and changes in fish distribution and abundance, consistent with what is expected as a result of climate change, with

[262] Ibidem.

[263] AD Rogers, DA Laffoley, International Earth System Expert Workshop on Ocean Stresses and Impacts. Summary Report (IPSO, Oxford, 2011).

[264] Gjerde, Kristina. Challenges to protecting the marine environment beyond national jurisdiction. The International Journal of Marine and Coastal Law, Volume 27, Number 4, 2012, pp.839-847. Pg 841

northward shifts in distribution and lower levels of abundance in the southern part of the range."[265]

In this context, the OSPAR Commission has established a Strategy for the protection of the marine environment of the North-East Atlantic, with specific objectives to address ocean acidification and other impacts of climate change.

The Strategy aims to ensure integrated management of human activities and seeks to reduce impacts on the marine environment, taking into account the impacts of climate change and ocean acidification.[266] This goal sets out the framework for action, which includes regional and coordinated development of monitoring and assessment of marine biodiversity and ecosystem functioning.

An assessment about the impacts that climate change and ocean acidification will have on marine ecosystems and species is essential for the decision makers. In this context, the establishment of timescales for such impacts, and the consideration of management measures (mitigation and adaptation) to address these challenges is a crucial point in the Strategy.

Under the scheme advanced by the Strategy, Contracting Parties must cooperate to reduce existing pressures and are obliged to manage and regulate renewable energy production and carbon capture. In addition, they are compelled to adapt OSPAR's policies and objectives for the protection of the marine environment.[267]

Finally is important to point out that that there is scientific agreement that mitigation and adaptation regarding climate change will modify either the distribution of species in the natural environment as well as human activities regarding uses of marine living resources. The challenge for OSPAR is to offer a framework to well manage the new and changing demands for marine ecosystems.

Challenges and lessons learned.

The following section will overview the challenges and lessons learned in the three main aspects explained in the previous section: biodiversity, in close relation to marine protected, as well as fisheries and ocean acidification, in the OSPAR experience.

[265] OSPAR Convention. Quality Status Report (QSR) 2010. Climate change. On line: http://qsr2010.ospar.org/en/ch03_03.html

[266] Convention for the Protection of the Marine Environment of the North-East Atlantic. Strategy of the OSPAR Commission 2010–2020. (on line): http://www.ospar.org/html_documents/ospar/html/10-03e_nea_environment_strategy.pdf

[267] OSPAR Convention. QSR 2010. Climate change. http://qsr2010.ospar.org/en/ch03_03.html

a. Marine protected areas and biodiversity

The OSPAR Convention work is a key regional process for the implementation of the Convention on Biological Diversity. However, this regional framework faces major challenges, as noted in the OSPAR Quality Status Report 2010,

> "Loss and damage to habitats; introduction of indigenous species; poor water quality; Interruption of ecological processes (spawning, migration, biological communication); severe decline in some species and habitats; national management plans pay too little attention to impacts on species and habitats."[268]

In order to address these challenges, the OSPAR Commission has worked in different fields to identify threatened species (OSPAR List of Threatened and/or Declining Species and Habitats), protection of breeding sites, restoration of habitats and protection of migration corridors, monitoring of species, raise awareness with key fisheries management authorities, sharing of information, actions to reduce by-catch, establishment of MPAs, seasonal closures, zoning, among others.[269]

In regards to MPAs in ABNJ, as seen above, various ecologically significant and vulnerable areas have been identified. However, progress on the protection of certain species and habitats has been slow (diadromous fish species, elasmobranchs, pelagic and demersal sharks, among others).[270]

Other important feature of the OSPAR framework is that, a preliminary spatial assessment of the distribution of OSPAR MPAs, has indicated that the ecological coherence has not been reached across the entire OSPAR area, "due to the limited availability of ecological data, in particular on the distribution of species populations and habitats in the North-East Atlantic, and detailed information on the effectiveness of these measures has not been made available to OSPAR by Contracting Parties" [271]

Significantly, there also appears to be scientific consensus that further areas need to be designated for protection to accomplish this goal, especially offshore and in the deep seas.[272]

Other needs has been identified to improve the MPA network and the conservation measures in the OSPAR area, such as monitoring methods for species and habitats, and to provide better information on the distribution, extent and condition of habitats and species in the assessments.

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[268] Ibidem. Pg 2.
[269] Ibidem.
[270] Ibidem. Pg. 10
[271] OSPAR Commission. 2011 Status Report on OSPAR Network of MPAs. http://www.ospar.org/documents/dbase/publications/p00577_2011%20status%20report%20on%20the%20network%20of%20mpas.pdf Pg 26
[272] OSPAR Convention. QSR 2010. Protection and conservation of biodiversity and ecosystems. http://qsr2010.ospar.org/en/ch10.html

The OSPAR Commission is firmly focused on reducing the rate of biodiversity loss, by the effective protection and conservation of the threatened and/or declining species and habitats on OSPAR's List; the effective monitoring of biodiversity; as well as to move forward to accomplish the goal of an ecologically coherent network of well-managed MPAs.[273]

b. Fisheries management on the OSPAR area

In relation to the challenges that OSPAR has to address in the fisheries field, the following paragraphs will identify, first the lessons learned and accomplishments that OSPAR has achieved, and secondly, the challenges that must be addressed henceforth.

The Quality Status Report 2010 identified some of OSPAR's main developments in fisheries management since the year 2000. These are summarised in Box 16 below:

Box. 16 Fisheries management measures on the OSPAR area
The management of fisheries through quota-based systems allocating (total allowable catch or fishing days).
Increased use of closed areas for stock recovery and protection of VMEs.
Abolition of some financial subsidies that promoted excess fishing capacity.
Increased attention to the management of deep-sea fish species (controls on deep-sea fishing effort managed by the EU and NEAFC, quotas and temporary and seasonal closure of some fisheries).
Policy on discards to reduce by-catch, including a ban on high-grading and the utilization of driftnets.
Closure of fishing areas on the high seas to bottom fishing by NEAFC for the purpose of protecting VMEs.
Introduction of area-based measures (closed areas, MPAs and gear management).
Targeting of IUU fishing by sharing of blacklists between regional fisheries management authorities and port States, and improved port State control.
Emergence of ecolabelling and certification for sustainable fisheries as market-driven initiatives.
Surveillance programmes aimed at monitoring the proportion of undersized fish in catches.

All of these actions achieved on the OSPAR area are worth being replicated in the CAD case. The regulations on fishing gears, the implementation of management area-based tools such as the MPAs and VMEs, as well as the elimination of subsidies on fishing capacities, the enforcement of laws, strengthen of port controls, and the responsible consumption approaches shows a variety of measures that together improve the fisheries management in the North East region. In this context, almost all of the actions taken by OSPAR in relation to fisheries management should be consider to improve the administration of fisheries in the CAD.

[273] Ibidem.

On the other hand, despite the advances made to support fisheries management by OSPAR, significant challenges still remain. For example, work towards materializing a multi-species assessments[274] within an ecosystem-based approach; support research actions to improve management practices of marine resources and obtain more scientific information about deep sea species.[275]

Contracting Parties should also promote consistency between fisheries legislation and long-term management plans, and specific actions such as reductions in fishing pressure, development of supportive measures on selective gears and new fishing techniques; effective minimisation of by-catch, among others.[276]

These issues should be addressed by the OSPAR Commission to continue improving its work in support of marine management in the North East Atlantic. Overall, what this proves is that the OSPAR framework is dynamic and continuously evolving in light of new challenges to support fisheries management.

c. Climate change and ocean acidification

According to the Quality Status Report 2010 of the OSPAR Convention,

> "Current changes in ocean carbon chemistry are at least 100 times more rapid than any over the last 100 000 years. Little is known about the ecological and economic impacts of marine acidification but they could be severe, affecting the many biologically mediated processes that transport carbon from the ocean surface to the depths."[277]

A present-day concern for the OSPAR Commission is that pressures on the marine environment will be set to grow with climate change and ocean acidification. For example, the rising sea temperature and increasing acidification represent major threats to marine ecosystems in the OSPAR area. In this context, the MPA network has an important purpose to improve future resilience of marine ecosystems and species.

It is important to acknowledge that OSPAR will have to adapt its policies and objectives for the protection of the marine environment, considering that the rate and impacts of climate change will be different across the OSPAR area. For example, it has been identified that northern areas will be more affected than southern areas.[278]

In this context, particular action within OSPAR to address climate change and ocean acidification are:

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[274] OSPAR Commission. Assessment of the environmental impact of fishing. 2009. http://qsr2010.ospar.org/media/assessments/p00465_JAMP_QSR_fisheries_assessment.pdf
[275] Ibidem. Pg 27.
[276] OSPAR Commission. QSR 2010. Use of living marine resources. http://qsr2010.ospar.org/en/ch08_01_05.html
[277] OSPAR Convention. QSR 2010. Climate change. http://qsr2010.ospar.org/en/ch03_03.html
[278] Ibidem.

- "Enhance knowledge about the vulnerability of species, habitats and ecological processes and their interaction with pressures from human activities.
- Work with partner organisations to work on scenarios of potential impacts, methods and indicators to monitor and assess the progression of climate change impacts particularly at regional scales.
- Give priority to monitoring and assessment of ocean acidification and its effects on marine ecosystems."[279]

Creative management schemes are needed to improve the way human activities on the oceans are practiced. In this respect, many of the measures adopted by OSPAR are based on the precautionary principle and best available science.

Conclusions

To conclude this section, it has to be said that the OSPAR experience in fisheries management and conservation of marine resources has so far been proactive and innovative in many respects. These regional actions have acknowledge adaptation measures throughout decades, creating cooperation mechanisms that are in the process of delivering an improvement to the status quo.

However, it has to be said that even though the OSPAR experience has been successful in the North East Atlantic, it couldn't be completely replicated in the Central American Region and fully apply to the CAD, but it gives a sophisticated and broad scenario about how to manage and conserve marine resources, worth taking into account by Central American countries.

In respect with the analysis of the OSPAR experience, the overall conclusions of the previous section are the following:

Biodiversity and Marine Protected Areas

The BBNJ Ad Hoc Working Group Report No. A/67/95 points against any MPA designation ABNJ prior to international agreement on a new multilateral treaty to address such matters. However, OSPAR has designated marine protected areas in ABNJ, and developed guidelines to address its efficient management. Though, ecological coherence has not been reached across the entire OSPAR area yet.

Multiple activities take place in the OSPAR marine areas, which challenges the consolidation of a marine governance process. Nevertheless, OSPAR has established Memorandums of Understanding to coordinate with several organizations, which have the competence to regulate different uses in the area, such as maritime navigation, fisheries, scientific research, among others.

Fisheries management

[279] Ibidem.

Fisheries management in the OSPAR region is under the regimes of UNCLOS regulations, as well as the FAO 1995 Fish Stocks Agreement, and the specific management measures established by the North East Atlantic Fisheries Commission (NEAFC), as well as the EU. Specifically in decision making processes, the Regional Advisory Committees seeks to involve stakeholders of the fisheries sector, looking for the dialogue and cooperation in the development and implementation of conservation and management measures.

Fisheries management actions achieved on the OSPAR region are worth being replicated in CAD case, for example regulations on fishing gears, the implementation of management area-based tools such as the MPAs and VMEs, the elimination of subsidies on fishing capacities, the enforcement of laws, strengthen of port controls, and the responsible consumption programmes.

Climate change and Ocean acidification

OSPAR technical reports have agreed that mitigation and adaptation regarding climate change will modify either the distribution of species in the natural environment as well as human activities regarding uses of marine living resources. In this context, coordination is crucial between OSPAR and partner organisations to work on scenarios of potential impacts, methodologies and indicators to monitor and assess the progression of climate change impacts.

Section B. The Barcelona Convention case study

This section will analyse the case study of the Barcelona Convention. It will examine the regulatory and institutional framework in relation to marine conservation, fisheries and climate change, as well as identify the challenges and lessons learned in this particular case study.

The Mediterranean Sea poses a particular challenge due to the tense geo-political situation in the eastern side of the basin, as well as the absence of uniformity in relation to the maritime zones claimed by the littoral States, that could jeopardize the conservation of marine resources.

Nonetheless, there is a solid regional treaty foundation and many initiatives have been taken to advance the protection and preservation of the marine environment in this area.

The legal and institutional framework of the Barcelona Convention

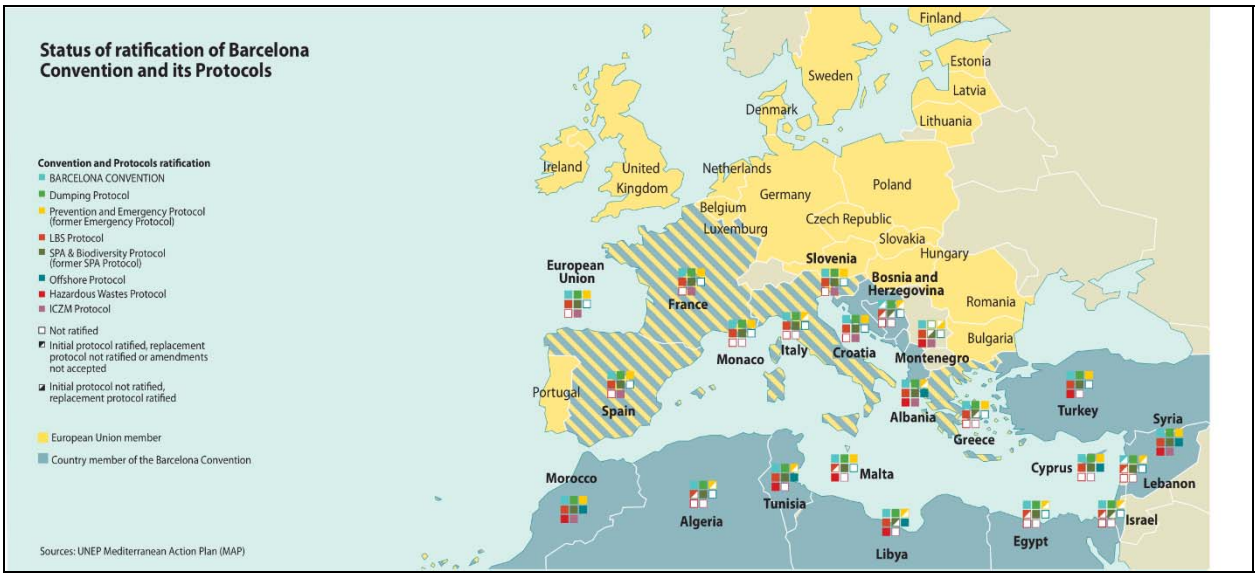
The Barcelona Convention aims to prevent and control marine pollution; ensure sustainable management of natural marine and coastal resources, protect the marine environment and coastal zones, and contribute to the improvement of the quality of life.

The Convention entered into force on 1978, and established a system of cooperation for the protection of a semi-enclosed sea. Significantly, it is the first Regional Seas Agreement concluded under the sponsorship of the United Nations Environment Programme (UNEP).

The Convention has seven Protocols[280] to address different items related to prevention of pollution, protected areas and marine conservation in the Mediterranean Sea, hazardous wastes, integrated coastal zone management. Among others, the Specially Protected Areas and Biological Diversity Protocol is very relevant to the subject matter of this study and will thus be examined in greater detail below.

Figure 20. Status of Ratification of the Barcelona Convention and its Protocols

[280] For more information refer to: http://www.unepmap.org/index.php?module=content2&catid=001001001.



Source: GRID-Arendal. Status of Ratification of the Barcelona Convention and its Protocols. 2013.[281]

In this context, the **Mediterranean Action Plan** (MAP) is a key tool that facilitates the implementation of the Barcelona Convention. The first Action Plan was adopted by sixteen Mediterranean countries and the European Community under the auspices of UNEP's Regional Seas Programme.

Twenty years later, the Action Plan of 1975 was replace by the Action Plan for the Protection of the Marine Environment and the Sustainable Development of the Coastal Areas of the Mediterranean (MAP Phase II), which provides a framework for action that is much broader and addresses more items than pollution. Currently 21countries are Party to this Action Plan. There have been a number of important studies of the utility of the plan, and UNEP concluded in 2011 the following:

> "The updating and the additions to the Barcelona Convention legal system show that the Parties consider it as a dynamic body capable of being subject to re-examination and improvement, whenever appropriate. The protocols even display a certain degree of legal imagination in finding constructive ways to address complex environmental problems."[282]

The Contracting Parties, at a Ministerial level meetings, decide on the Action Plan's strategies, budget and programmes. Focal Points have been established as part of the institutional structure and their main function is to review the progress of work and ensure the enforcement of recommendations at the national level. At the Administrative level, the Mediterranean Action Plan has a Secretariat, based in Athens.

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[281] GRID-Arendal. Status of Ratification of the Barcelona Convention and its Protocols. 2013. (on line): http://www.grida.no/graphicslib/detail/status-of-ratification-of-the-barcelona-convention-and-its-protocols_bdd5

[282] UNEP-MAP-RAC/SPA. 2011. Note on the establishment of MPAs in ABNJ. By Scovazzi, T. Ed. RAC/SPA, Tunis: 47pp. Pg 30

In the financial aspect, the MAP's activities are financed mainly by the Contracting Parties through their contributions to the Mediterranean Trust Fund, and also other economic contributions are made by the European Union, United Nations agencies and the Global Environment Facility (GEF).

The Action Plan is operationalized by the work of six Regional Activity Centres (RAC), based in different countries. In this context, the role and mandate of the Specially Protected Areas Regional Activity Centre (SPA/RAC) is particularly germane to this study and will be examined in greater detail below. At this point, it is sufficient to note that this specific RAC focuses on biodiversity and is involved in the protection of Mediterranean species, their habitats and ecosystems, and it develops management plans, monitoring tools, and promotes awareness campaigns.[283]

a. Marine protected areas and biodiversity

The United Nations Environment Programme (UNEP) has pointed out that, "the establishment of MPAs is a key element of marine environmental protection, linked to the most advanced concepts of environmental policy, such as sustainable development, precautionary approach, integrated coastal zone management, marine spatial planning, ecosystem approach and transboundary cooperation."[284]

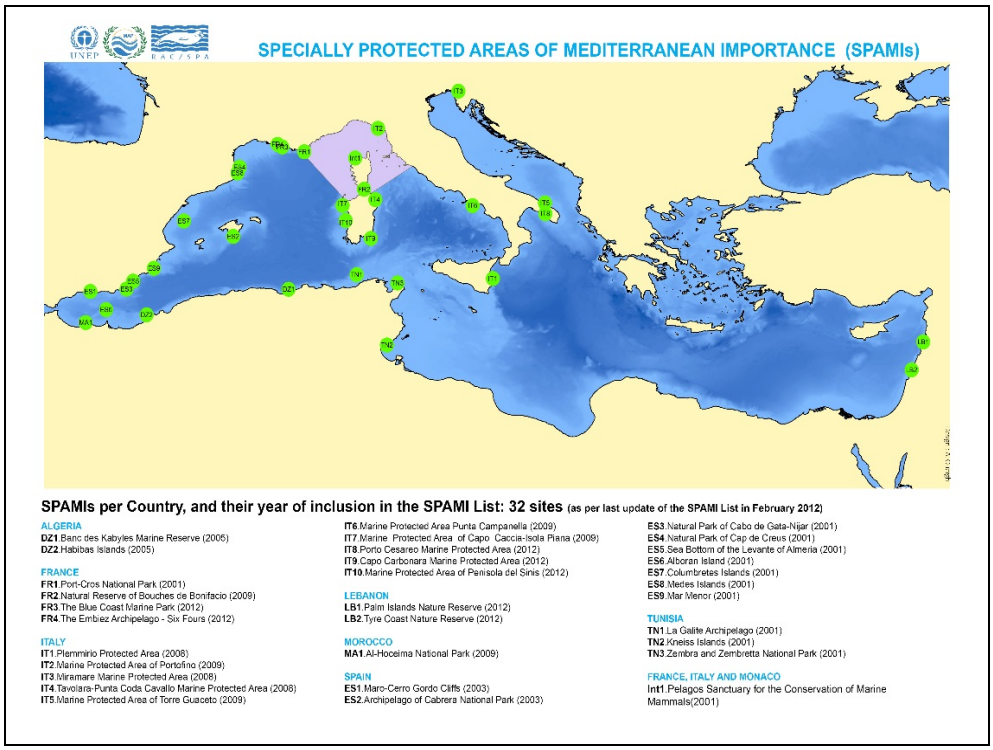
In this regard, and as mentioned above, one of the strategic mechanisms under the Barcelona Convention is the Protocol of Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol).

Under the framework of this Protocol, the Contracting Parties have the possibility to establish a List of Specially Protected Areas of Mediterranean Importance (SPAMI's List), which is aimed at improving the conservation of natural heritage.

Figure 21. Specially Protected Areas of Mediterranean importance (SPAMIs)

[283] UNEP. Mediterranean Action Plan for the Barcelona Convention. On line: http://www.unepmap.org/index.php?module=content2&catid=001017004

[284] UNEP-MAP-RAC/SPA. 2011. Note on the establishment of MPAs in ABNJ. By Scovazzi, T. Ed. RAC/SPA, Tunis: 47pp. Pg 13



Source: Regional Activity Centre for Specially Protected Areas. http://rac-spa.org/spami

An important feature of this Protocol, is that it provides the criteria for the selection of MPAs that should be included in the SPAMI's List, as well as setting down the procedure for designation. Crucially, once an area is included into the List, the Contracting Parties have to respect the conservation measures defined for the MPA.

In this context, of the 32 sites included in the SPAMI List, one has a particular relevance to the present study, the Pelagos Sanctuary for marine mammals, as this MPA encompasses areas beyond national jurisdiction.

Keeping this in mind, proposals for the inclusion of a protected area that is situated on the high seas, may be submitted by:

"(ii) Two or more neighbouring Parties concerned if the area is situated, partly or wholly, on the high sea.
(iii) The neighbouring Parties concerned in areas where the limits of national sovereignty or jurisdiction have not yet been defined." (Article 9, SPA/BD Protocol).

The proposal is then submitted to the National Focal Points and to the Regional Activity Centres and after this review the proposal is transmitted to the Secretariat, which informs the meeting of the Parties. The Parties, strictly by consensus, will decide whether or not to include the high seas MPA on the SPAMI List, as well as making a decision regarding the most appropriate management measures.

Currently, the Protocol applies to all the maritime[285] waters of the Mediterranean. There are many factors that are influencing the whole designation process. In particular, consideration is frequently given to the fact that a variety of national coastal zones have been established[286] and that several maritime boundaries have yet to be agreed upon by the Mediterranean States.[287]

However, in this regard, and as explained by author Ronan Long,

> "Although EU policies on such matters (fisheries and marine environmental) continue to be a source of controversy, they have helped deflate some of the inherent tensions that exist between Member States (as well as between EU Member States and third countries) regarding unsettled marine limits and boundaries by shifting the political focus towards the adoption of regional solutions to shared problems at an EU or regional seas level"[288]

With this in mind, third Parties are invited to cooperate in the implementation of the Protocol and adopt measures to avoid activities contrary to the regulatory objectives of conservation.[289]

Today, the Pelagos Marine Sanctuary for marine mammals remains the only MPA situated on the high seas in the Mediterranean. Initially, it was establish under an Agreement signed by France, Italy and Monaco (Rome, 1999), and which subsequently entered into force in 2002. Significantly, the sanctuary is large and extends to approximately 87,500 km^2, which encompasses waters with different legal status, such as internal waters, territorial sea, ecological protection zone and high seas.

Figure 22. Pelagos Sanctuary for Mediterranean Marine Mammals

[285] For more information refer to UNEP-MAP-RAC/SPA. 2011. Note on the establishment of MPAs in ABNJ. By Scovazzi, T. Ed. RAC/SPA, Tunis: 47pp. Pg 46

[286] The Protocol (article 2 paragraph 2 and 3) includes two disclaimer provisions about rights to present and future claims or legal views of any State relating to the law of the sea.

[287] UNEP-MAP-RAC/SPA. 2011. Note on the establishment of MPAs in ABNJ. By Scovazzi, T. Ed. RAC/SPA, Tunis: 47pp. Pg 30

[288] Long, Ronan. *Stepping over maritime boundaries to apply new normative tools in EU Law and Policy*. Maritime Border Diplomacy. Center for Oceans Law and Policy. Volume 16. Pg 216

[289] Protocol of Specially Protected Areas and Biological Diversity in the Mediterranean. Article 28.

Source: Cetacean alliance. http://www.cetaceanalliance.org/cons_Pelagos.htm

These waters are the habitat of different cetacean[290] species, regularly found in the Mediterranean. Similar to the oceanic feature of the CAD, in this marine area, the water currents create optimum conditions favoring phytoplankton growth and abundance of krill, ideal for pelagic species. In this regard, and as explained by author Giuseppe Notarbartolo,

> "Compared to the rest of the Mediterranean, this marine area is characterized by very high levels of offshore primary productivity, caused by the interplay of oceanographic, climatic and geomorphological factors." [291]

Bearing in mind that this special area coexists with high levels of human pressure (coastal cities, commercial and military ports, and industrial areas), the Parties to the Agreement mentioned above, adopted measures to ensure the conservation of these species and its habitat.

In this regard, Pelagos Sanctuary has shown positive outcomes, for example by raising public awareness; catalyzing voluntary measures by three governments to minimize environmental impacts on the area; the utility of regional seas agreements, the use of "umbrellas" species to protect ecological communities; the adoption codes of conduct to regulate whale watching,[292] among others.

Finally, the Sanctuary has a management plan which is dependent upon the ratification of laws at the national level by Contracting Parties.

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[290] For more information refer to the Cetacean Alliance. The Pelagos Sanctuary. On line: http://www.cetaceanalliance.org/cons_Pelagos.htm

[291] Ibidem.

[292] Notarbartolo di Sciaraa, Giuseppe; Agardy, Tundi; Hyrenbach. The Pelagos Sanctuary for Mediterranean Marine Mammals. Lessons in conservation. On line: ncep.amnh.org/linc/linc_download.php?component_id=27

b. Fisheries management within the Barcelona Convention

Commercial fishing is an important economic activity near the Pelagos Sanctuary, with an estimate potential value of over €60 million. The predominate vessels belongs to the Italian fleet, as well as a number of North African countries.[293]

Authors have pointed out the particularities of the fisheries industry in the Mediterranean, like the description made by Ronan Long,

> "The European fishing fleet operating in the Mediterranean Sea is predominantly artisanal and most fishing activity is undertaken close to the coast in territorial waters due to the narrowness of the continental shelf and the relatively small size of individual vessels."[294]

In the Mediterranean, the General Fisheries Commission for the Mediterranean (hereafter GFCM), is the regional fisheries management organization (RFMO). This body was established by international agreement[295] under the provisions of Article XIV of the FAO Constitution (approved by FAO Conference in 1949). Currently, it has 23 Contracting Parties including the European Union.

The GFCM, in coordination with other RFMO's, aims to successfully manage fisheries at regional level. It has the authority to adopt binding recommendations for fisheries conservation and management in its Convention Area[296]. Its legal framework is comprised by the Agreement, rules of procedure, financial regulations and various other instruments.

The administrative structure of the GFCM is comprised by a Commission, a Secretariat, a Committee on Aquaculture, a Scientific Advisory Committee, a Compliance Committee, and a Committee on Administration and Finance. Also, the Commission could establish temporary and special Committees to study and report on specific matters.

In this institutional scheme, the Commission seeks to promote the conservation and rational management of marine resources through, inter alia, regulation of fishing

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[293] Anaï Mangos, Sophie André. Analysis of Mediterranean marine environment protection: the case of the Pelagos Sanctuary. On line: http://planbleu.org/sites/default/files/publications/4p20_pelagosen.pdf

[294] Long, Ronan. *Stepping over maritime boundaries to apply new normative tools in EU Law and Policy*. Maritime Border Diplomacy. Center for Oceans Law and Policy. Volume 16. Pg 447.

[295] Agreement for the establishment of the General Fisheries Commission for the Mediterranean. On line: ftp://ftp.fao.org/FI/DOCUMENT/gfcm/web/GFCM_Agreement.pdf

[296] Mediterranean, Black Sea and connecting waters. General Fisheries Commission for the Mediterranean. On line: http://www.gfcm.org/gfcm/about/en#Org-GeoCoverage

methods and gears, minimum landing sizes, the establishment of closed fishing seasons and areas, the regulation of catch and fishing effort,[297] among others.

Complementary actions has been taken with other organizations, such as the signature of a Memorandum of Understanding (MoU-2008) on cooperation on fisheries and biodiversity preservation in the Mediterranean region, between the Regional Activity Centre for Specially Protected Areas and the FAO.

This MoU aims to develop the participation of both organizations in the implementation of the ecosystem approach to fisheries in the Mediterranean region; also it seeks to identify marine sensitive ecosystems; to formulate guidelines for coastal areas management; strengthen scientific research; among other important lines of action.

Bearing this in mind, the Barcelona Convention Parties are required to implement an ecosystem-based management approach. This approach includes,

> "Regulation of marine resource use and activities, control of land-based and maritime sources of pollution, integrated coastal zone/ocean management, and an adaptive management approach that would deal with rapidly changing patterns of use as well as with technological, socio-economic, political and natural change."[298]

Likewise, the OSPAR experience aims to apply this approach, and it is the desirable methodology that should lead the CAD's initiative. In this later one, it is worth taking into account that the ecosystem approach will facilitate marine resources management where Central American countries have unclear delimitations of their maritime boundaries, and in this regard, management and conservation schemes shouldn't be delayed due to political discussions on the region.

The ecosystem based management for fisheries in the EU is regulated by the Marine Strategy Framework Directive[299] (MFSD), which requires that EU Member States achieve

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[297] General Fisheries Commission for the Mediterranean. On line: http://www.gfcm.org/gfcm/about/en

[298] Notarbartolo di Sciara, Giuseppe. The Pelagos Sanctuary for the conservation of Mediterranean marine mammals: an iconic High Seas MPA in dire straits. Tethys Research Institute. On line: http://www.disciara.net/documents/NotarbartolodiSciara_2009b.pdf

[299] Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008. (On line): http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:164:0019:0040:EN:PDF

a good environmental status of marine waters by 2020.[300] Also it calls for these States to develop a marine strategy for its marine region.[301] In this context, author Ronan Long has clarified that,

> "This regional framework fully accords with the ecosystem approach in so far as it provides for the management of maritime activities on the basis of the natural hydrological, oceanographic and bio-geographic features of the regional sea basins, and not on the basis of maritime limits claimed or established by EU Member States."[302]

Nevertheless, one specific problem in the Region that came to international attention is the pelagic driftnet fishing for swordfish, which developed in Italy in the late 1980s. Over 700 vessels were licensed to use driftnets, which were known to cause high levels of accidental mortality in at least six cetacean species found in the area (Notarbartolo di Sciara, 1990).[303]

As a result of EU legislation prohibiting driftnet fishing, the Italian government established a driftnet-free zone in a portion of the Ligurian Sea in 1990. There have been a number of specialist publications on the success of this initiative, one of which concluded that, the zone failed to include most of the cetacean habitat to be protected, but it was legally significant because it discouraged distant vessels from fishing there, and it was significant politically, given that it introduced for the first time the notion of closing a fishing area with the aim of protecting cetaceans in the Mediterranean.[304]

In addition, it ensured that the significant by-catch of cetaceans captured by tuna vessels was meaningfully reduced and this was part of a global moratorium on large-scale pelagic driftnet fishing on the high seas, called for by a number of UN Resolutions including United Nations Resolution 44/225, in 1989. This of course was also an important element of the European Commission ban for all European vessels.

Another important fisheries management tool is the Common Fisheries Policy[305] (CFP). The objective of this Policy is to ensure exploitation of living aquatic resources that provides sustainable economic, environmental and social conditions, applying the precautionary and the eco-system-based approach to fisheries management; in a similar trend than the OSPAR experience. The CFP establishes measures concerning conservation, management and exploitation of aquatic resources, control and

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[300] For more information refer to Long, Ronan. *Stepping over maritime boundaries to apply new normative tools in EU Law and Policy*. Maritime Border Diplomacy. Center for Oceans Law and Policy. Volume 16. Pg 238.

[301] Article 5, Directive 2008/56/EC

[302] Long, Ronan. *Stepping over maritime boundaries to apply new normative tools in EU Law and Policy*. Maritime Border Diplomacy. Center for Oceans Law and Policy. Volume 16. Pg 259

[303] Notarbartolo di Sciaraa (et. al) The Pelagos Sanctuary for Mediterranean marine mammals**.** July 2007. On line: http://www.cetaceanalliance.org/download/literature/NotarbartolodiSciara_etal_2008.pdf

[304] Ibidem.

[305] Council Regulation (EC) No 2371/2002 of 20 December 2002. (on line): http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:358:0059:0080:EN:PDF

enforcement; limitation of the environmental impact of fishing; organization of the markets, among others.[306]

In this context, author Ronan Long explains that,

> "The CFP also addresses the management of straddling species, providing for a common area of jurisdiction for the adoption of EU fishery management and conservation measures. Essentially, stocks are managed on the basis of the International Council for the Exploration of the Sea (ICES) statistical areas, or by means of the management zones adopted by regional fisheries management organizations."[307]

Some important measures[308] that the CFP establishes and that the CAD experience should take into consideration, are the following:

- Adopting recovery plans.
- Adopting management plans to maintain stocks within safe biological limits.
- Establishing targets for the sustainable exploitation of stocks.
- Limiting catches.
- Establishing incentives to promote more selective or low impact fishing.
- Limiting fishing effort.
- Measures regarding the structure of fishing gear.
- Zones and/or periods in which fishing activities are prohibited or restricted.

Another similarity with the OSPAR experience, is that the CFP seeks to involve stakeholders at all stages of the policy. Consequently, the Regional Advisory Councils' support to the fishermen and other interested parties.

Specifically about enforcement actions in the EU Region, the task is shared by coastal States, flag States (when vessels fish on the high seas) and by the RFMOs in the area, as indicated by Ronan Long,

> "In general, fishery law enforcement agencies appear to work relatively well and considerable efforts have been used to improve their effectiveness on a cross-boundary basis."[309]

In this context, the CFP establishes different measures, such as the requirement for vessels to carry out a license or authorization; installation of remote monitoring systems on fishing vessels; reports of information on fishing activities, including landings and transshipments, inspectors on board.

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[306] Article 1, Council Regulation No. 2371/2002.

[307] Long, Ronan. *Stepping over maritime boundaries to apply new normative tools in EU Law and Policy*. Maritime Border Diplomacy. Center for Oceans Law and Policy. Volume 16. Pg 235

[308] Article 4, Council Regulation No. 2371/2002.

[309] Long, Ronan. *Stepping over maritime boundaries to apply new normative tools in EU Law and Policy*. Maritime Border Diplomacy. Center for Oceans Law and Policy. Volume 16. Pg 243.

Other important measures to flag out are in close relation to responsible consumption of fish products and a market perspective, in particular interesting to apply in a future to the CAD case, are the ones related to marketing of fisheries products, thus for example the ones summarized below:

- Fisheries products shall only be sold from a fishing vessel to registered buyers or at registered auctions.
- The buyer of fisheries products at first sale shall submit invoices or sales notes to the authorities.
- All fisheries products landed in or imported into the Community shall be accompanied by a document drawn up by the transporter until the first sale has taken place.
- Where a minimum size has been fixed for a given species, operators responsible for selling, stocking or transporting must be able to prove the geographical origin of the products.[310]

In this context, Member States shall take inspection and enforcement measures to ensure compliance with the rules of the Common Fisheries Policy in their territory, or in their jurisdictional waters.

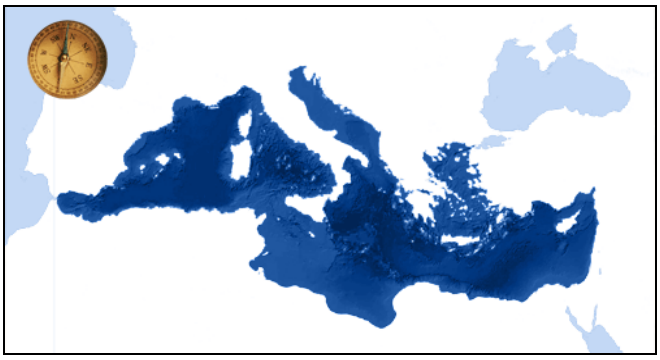
Another important institutional scheme, created under the CFP framework, are the 8 Regional Advisory Councils[311], as management units based on biological criteria. These Councils have a General Assembly and an Executive Committee, and are composed by representatives from the fisheries sector and other interested groups affected by the Common Fisheries Policy.[312] In this regard, representatives of the fisheries sector and other interest groups from third countries, including RFMOs, could participate as observers if a particular topic of their interest will be discuss by the Council.

Each Regional Advisory Council presents an annual report of its activities to the European Commission, to the Member States concerned and the Advisory Committee on Fisheries and Aquaculture.[313]

The Mediterranean Sea has its own Regional Advisory Council (RAC MED), which aims to improve the formulation and implementation of fisheries management measures, taking into consideration the experience of stakeholders, such as the fishing industry, producer organizations, ship owners, small-scale fishermen, processors and women networks, environmental organizations, and consumers. This Council is composed by seven Member States, to know Italy, France, Spain, Slovenia, Greece, Malta and Cyprus.

Figure 23. Area of the Regional Advisory Council for the Mediterranean Sea

[310] Article 22, Council Regulation No. 2371/2002.
[311] Council Decision No. 585/2004, July 19th of 2004). Establishing Regional Advisory Councils under the Common Fisheries Policy. (on line): http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:256:0017:0022:EN:PDF
[312] Ibidem. Article 5.
[313] Ibidem. Article 10.



Source: RAC-MED[314]

In regards to coordination and fisheries management, it is worth mentioning the Memorandum of Understanding[315] between the RAC MED and the General Fisheries Commission for the Mediterranean (GFCM). This MoU aims to provide a framework of cooperation and understanding to strengthen conservation actions for marine biodiversity. The Parties agreed on sharing fisheries information, the identification of areas of common interest, reciprocal communication and consultations about relevant topics, development of a joint forum, designation of focal points for coordination between both organizations, among other measures.

Finally, it is important to consider that coordination is a goal to be accomplished in the region, and that stakeholders are invited to participate in the formulation of fisheries regulations, under the ecosystem based approach and the precautionary principle guidance.

c. Measures addressing ocean acidification and climate change under the Barcelona Convention

The Mediterranean Sea is considered a small-scale ocean, with high environmental variability and steep physicochemical gradients within a relatively restricted region.[316] In this context, the Fifth Assessment on Climate Change presented by the Intergovernmental Panel on Climate Change in 2013 explained that,

> "There has been identified a salinity increase following the circulation pathway of Mediterranean Outflow Water. This increase can be traced back to the western basin of the Mediterranean, where salinity of the deep water increased during the period from 1943 to the mid-2000s (Smith et al., 2008; Vargas-Yáñez et al., 2010)."

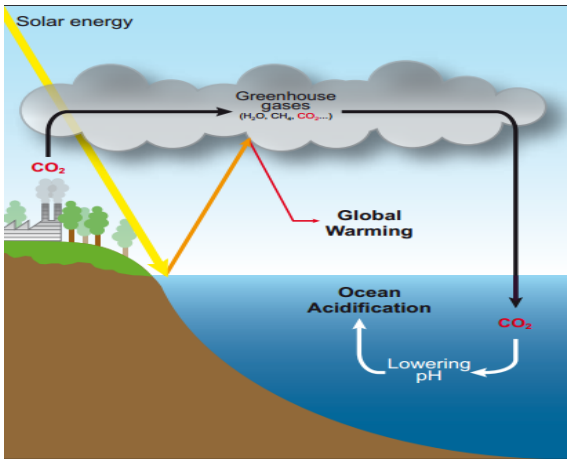
[314] *RAC-MED. (on line): http://www.racmed.eu/index.php?option=com_content&view=article&id=11&Itemid=11*

[315] MoU between the Regional Advisory Council for the Mediterranean and the GFCM. (on line): http://www.racmed.eu/images/stories/communique_presse/2012/148_CGPM_MoU.pdf

[316] European Mediterranean Sea Acidification Project. Med Sea acidification. (on line): http://medsea-project.eu/med-sea-acidification/

Nowadays, climate change represent a major challenge for all countries' agendas. In the particular example of the Mediterranean, a recent project, the European Mediterranean Sea Acidification (MedSeA)[317] has identified three iconic ecosystems in the Mediterranean which are likely to experience environmental changes and which are particularly vulnerable to modifications in ocean chemistry, thus for example, the Seagrass meadows, the Vermetid reefs (structures built by living organisms such as marine snails) and the Coralligenous reefs (accumulation of calcareous encrusting algae); and species like the red coral, the coccolithophorids (plankton) and the part intertidal community.[318]

Figure 24. Ocean acidification process



Source: European Mediterranean Sea Acidification.[319]

Meanwhile, the Regional Activity Centre for Specially Protected Areas of the Barcelona Convention has established a bibliographic database and has a working group to analyze the vulnerability and impacts of climate change on the Mediterranean biodiversity. In this context, a positive outcome of this institutional and scientific approach is that national experts acknowledged the vulnerability of marine and coastal biodiversity due to climate change, as a result of increasing sea water temperature, sea level rise, acidification, change of hydrodynamic and hydrological parameters (currents, upwelling, frequency of storms and extreme events, salinity, nutrient supply[320], among other factors.

[317] This project is funded by the European Commission under Framework Program 7, a research-related EU initiative. http://cordis.europa.eu/fp7/home_en.html

[318] European Mediterranean Sea Acidification. Tipping the balance: CO2 and the Mediterranean Sea. (on line): http://medsea-project.eu/wp-content/uploads/2011/08/MRUG-leaflet_lowresolut_def.pdf

[319] European Mediterranean Sea Acidification. *http://medsea-project.eu/wp-content/uploads/2011/08/MRUG-leaflet_lowresolut_def.pdf*

[320] UNEP. Mediterranean Action Plan. Proposal for updating the Strategic Action Programme for the Conservation of Biological Diversity in the Mediterranean Region on Climate Change. 2009. On line: http://195.97.36.231/acrobatfiles/09WG331_13_Eng.pdf

In this context, effects on the short, medium and long term have been identified in the Region, like the ones summarized in Box 17 below:

Box 17. Climate change effects forecasted for the Mediterranean Region		
Short term[321]	**Medium term**[322]	**Long term**[323]
Changes in spatio-temporal patterns of biodiversity.	Changes in larval dispersal and recruitment.	Socio-economical effects.
Changes in migratory paths and abundance of species.	Modifications in resource availability (food, habitat)	Effects forecasted by current scenaria might be mitigated by the reduction of GHG emissions and other appropriate measures.
Changes in eco-physiological processes: reproduction; immunological response affecting the individual performance of sensible species at various stages of their life history and possible adaptive selection pressure on species traits.	Changes in responses at the community / ecosystem level, likely leading to regime shifts and local extirpation of species and habitat losses.	
	Simultaneous effects of other human-driven stressors (e.g. over-fishing, pollution, habitat degradation, alien species).	

Despite this, currently not enough regional research has been done; monitoring programmes are still rare and mostly within short term international projects, and there are gaps in knowledge and high uncertainty level about the concrete impacts of climate change on marine biodiversity.

Challenges and lessons learned

The following section will overview the challenges and lessons learned in the three main aspects explained in the previous section: marine conservation, in close relation to marine protected areas, as well as fisheries and climate change, in the Barcelona Convention experience.

a. Marine conservation

The Mediterranean Sea covers 0.8% of the global oceans' surface. This complex region has multiple human activities, such as urban, tourist, industrial, and agricultural

[321] Ibidem.
[322] Ibidem.
[323] Ibidem.

development; shipping, fishing, military activities, oil and gas exploration, among others.[324]

In light of these considerations, the Mediterranean Action Plan is faced by many challenges in relation to various issues, including the conservation of biodiversity; reducing pollution from land-based sources; protecting marine and coastal habitats and threatened species; intensifying integrated planning of coastal areas; monitoring the spread of invasive species; and limiting vessels source pollution from shipping.

In this context, challenges in respect to MPAs has been identified by the Status of Marine Protected Areas in the Mediterranean 2012, which has indicated that there is still a geographical imbalance in MPAs between the southern eastern and northern shores of the Mediterranean, and MPAs are mainly on the coast, therefor, the MPA network is currently not representative of all the Mediterranean ecoregions. [325]

Furthermore, keeping in mind the multiple anthropogenic impacts within the region, a network of MPAs in ABNJ is undoubtedly an important tool to improve the conditions of marine ecosystems and the conservation of species on the high seas. In this context, there are three main conditions needed to achieve this network: scientific foundations, a legal framework and political goodwill.[326]

Another challenging element in the Mediterranean region is the accomplishment of an effective management of MPAs, bearing in mind that over half of the MPAs within Natura 2000 still don't have a management plan.[327] Also, surveillance, as well as applying infraction penalties for gaps in regulations, are recognized as essential elements in the improvement of marine conservation in the Region.

In the particular case of the Barcelona Convention, there are a number of policy options which could be taken to improve the status and future prospects of conservation of marine environment. For instance, Contracting Parties could sign an additional Treaty for the establishment of this network of MPAs. Moreover, Member States could advance the use of the Specially Protected Areas and Biological Diversity Protocol provisions that pertain to the designation of a MPA on the high seas and its inclusion on the SPAMI List by two or more Contracting Parties. In this regards, a specific Treaty may be required if the MPA requires the support of a State which is not a party to the SPA/BD Protocol.

In general, the experience in the Mediterranean Sea is little different from initiatives elsewhere. Most notably, different initiatives around the world have faced similar

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[324] Cetacean Alliance. The Pelagos Sanctuary. On line: http://www.cetaceanalliance.org/cons_Pelagos.htm

[325] Gabrié C. (et. al). The Status of MPAs in the Mediterranean Sea. MedPAN & RAC/SPA. Ed: MedPAN Collection. 256 pp. Pg 15

[326] UNEP-MAP-RAC/SPA. 2011. Note on the establishment of MPAs in ABNJ. By Scovazzi, T. Ed. RAC/SPA, Tunis: 47pp. Pg 36.

[327] Gabrié C. (et. al). The Status of MPAs in the Mediterranean Sea. Pg 15

challenges regarding the establishment of MPAs on ABNJ. The problems encountered have been highlighted in the literature by UNEP in the following terms,

> "Insufficient legal regime, a confusion of competences and fragmentation or overlapping of responsibilities between different authorities, lack of effective scientific monitoring or enforcement measures, and lack of sufficient economic resources to achieve the protection measures, limited experience of the people administrating the MPAs"[328], among others.

One of the critical items that is evident from the experience in the Mediterranean Sea that are relevant to the CAD is the need for a secure legal basis in an international Treaty. In the particular case of an MPA situated beyond national jurisdiction, a Treaty or a joint proposal would set out the role and functions of a governance body, as well as the obligations placed on national authorities regarding the enforcement of management measures. It also should guarantee the participation of each neighboring Party concerned in decision-making related to the management.[329]

A word of caution, however, in so far as there is some evidence that supports the view that the "Pelagos Sanctuary has failed to fulfil its main goal of significantly improving the conservation status of the area's marine mammal populations, which are threatened by intense human pressures (fisheries, maritime traffic, military exercises, climate change, coastal construction, down-stream effects of land use, and whale watching)." [330] Other failures related to the incapacity to implement the management plan and the lack of enforcement of its measures, could give the impression that this marine protected area is a 'paper park'.

Also, the complications to accomplish a continued monitoring of the ecological and anthropogenic is critical in the Pelagos Sanctuary, given the dynamic nature of this habitat and the highly migratory habits of cetaceans.[331] There also has been a management deficiency stemming from the Sanctuary's unusual governance regime and some misunderstandings about the competences of the Secretariat and the management body. In addition, the Pelagos Sanctuary is faced with many other specific challenges including the ones summarized in Box 18 below:

Box 18. Challenges of the Pelagos Sanctuary

[328] UNEP-MAP-RAC/SPA. 2011. Note on the establishment of MPAs in ABNJ. By Scovazzi, T. Ed. RAC/SPA, Tunis: 47pp. Pg 40.

[329] UNEP. Mediterranean Action Plan. Draft approach to facilitate proposals for inclusion in the SPAMI List of areas located on the high seas. On line: http://www.rac-spa.org/sites/default/files/meetings/nfp10/wg_359_6_en.pdf

[330] Notarbartolo di Sciara, Giuseppe. The Pelagos Sanctuary: an iconic High Seas MPA. 2009. Tethys Research Institute. On line: http://www.disciara.net/documents/NotarbartolodiSciara_2009b.pdf

[331] Notarbartolo di Sciaraa, Giuseppe; Agardy, Tundi; Hyrenbach. The Pelagos Sanctuary. Lessons in conservation. On line: ncep.amnh.org/linc/linc_download.php?component_id=27

• Curbing illegal driftnet practices[332]	• Improve integrated coastal zone[333] management into national planning and management practices
• Streamlining bureaucratic obstacles to effective management	• Efficient and timely actions in national policy agendas
• Identifying clear ecosystem-level objectives	• Inventory of hot-spots
• Filling gaps in knowledge	• Raising public awareness and influencing decision makers

In this regard, the CAD case study will have to acknowledge the problematic elements that the Pelagos Sanctuary MPA has encountered in its process of consolidation. Keeping in mind that most Central American countries lack from strong enforcement mechanisms and efficient monitoring systems.

Moreover, a strong political impulse is needed, a clear management mandate, and the necessary human and financial resources to meet the objectives of the Sanctuary. As mentioned previously, other main challenges in the Mediterranean Region which impedes the establishment of a successful MPA network on the high seas, is the hesitancy of some Mediterranean riparian states to establish 200 nautical miles exclusive economic zones. This is not a problem for coastal States in Central America who have all established such zones on their Pacific coasts.

In this overall review of the Pelagos Sanctuary experience, some recommendations were given by experts to improve the management of this marine protected area. These include, the establishment of regional and national databases; inventories of hot-spots in coastal and marine areas; incorporating climate change and biodiversity in national planning practices; strengthen ecosystem resilience (increasing MPAs connectivity; adapting legislation on coastal land use to predictions of climate change impacts); reinforcement of legal and institutional frameworks; permanent monitoring systems,[334] among others.

On the regional scope, other recommendations given by experts in the Status of Marine Protected Areas in the Mediterranean Sea to improve the management of marine resources are summarized in Box 19:

Box 19. Recommendations for the MPAs network in the Mediterranean region

[332] Notarbartolo di Sciaraa (et. al) The Pelagos Sanctuary for Mediterranean marine mammals. 2007. Wiley InterScience. On line: http://www.cetaceanalliance.org/download/literature/NotarbartolodiSciara_etal_2008.pdf

[333] UNEP. Mediterranean Action Plan. Synthesis of National Overviews on Vulnerability and Impacts of Climate Change. On line: http://rac-spa.org/sites/default/files/doc_climate_change/ccd_synthesis.pdf

[334] Ibidem.

- Reinforce the development of the MPA network to achieve the 10% target of the Mediterranean's surface area.
- Create large MPAs in open seas.
- Reinforce representativity and ecological coherence.
- Reinforce effectiveness of protection, management and evaluation measures in MPAs.
- Reinforce evaluation of the management's effectiveness on a regional scale.
- Ensure a better management of threats to MPAs, consider creating MPAs within a broader ecosystem-based and integrated management.
- Developing marine spatial planning.[335]

These recommendations should be taken in consideration within the CAD experience, for example the implementation of the ecosystem based approach to manage the area, the promotion of marine spatial planning to organize activities and uses on the CAD's region, as well as the development of an MPA network trying to link the conservation goals in the existent marine protected areas in the Central American countries with the CAD.

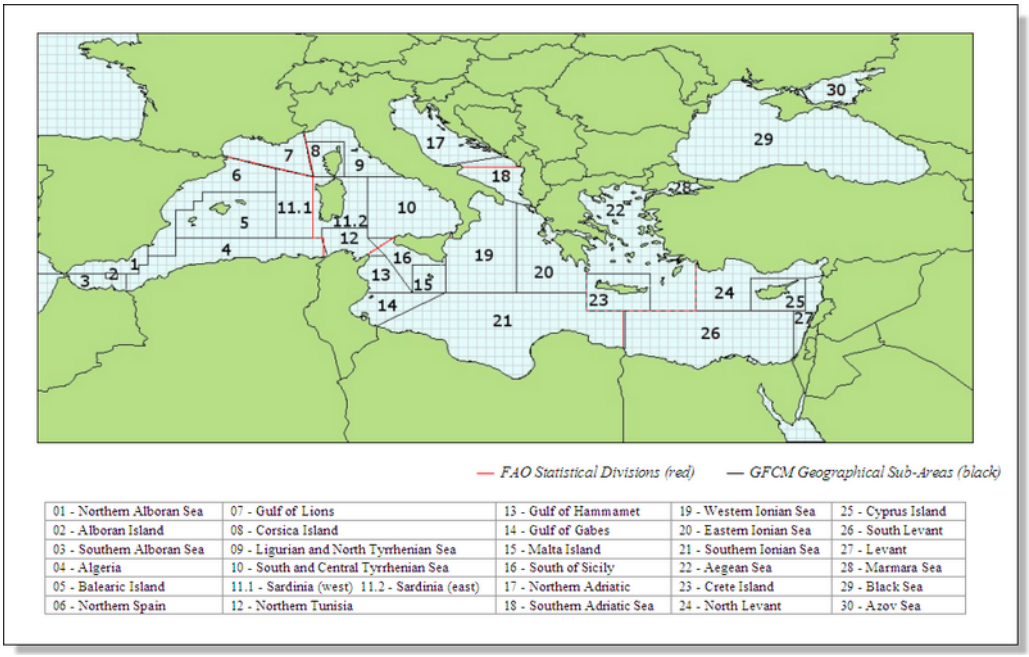
b. Fisheries

The regulation of fishing activities in the Pelagos Sanctuary rests with the regional fisheries management organizations, in this particular case, as seen in the previous section, the General Fisheries Commission for the Mediterranean (GFCM). In this regard, the GFCM has adopted the recommendations[336] on the establishment of closed or specially regulated fishing areas with a view to the favorable reconstitution of marine fish stocks.

Figure 25. Geographical Sub-Areas in the GFCM area

[335] Gabrié C. (et. al). Status of MPAs in the Mediterranean Sea. Pg 18.

[336] GFCM/31/2007/2[336] and GFCM/33/2009/2. FAO General Fisheries Commission for the Mediterranean. Report of the thirty-first session. 2007. GFCM Report. No. 31. On line: ftp://ftp.fao.org/docrep/fao/010/a1135e/a1135e00.pdf



Source: General Fisheries Commission for the Mediterranean. Geographical Sub-Areas (GSAs). http://www.gfcm.org/gfcm/topic/16162/en

Also important to highlight is that the Parties in the Intergovernmental Agreement that created the Sanctuary, stated that they will comply with regulations regarding the use and the keeping of pelagic drift net; as well as to the adoption of regulations relating to the use of new fishing equipment that could result in the indirect capture of marine mammals.[337]

In this regards, the GFCM Secretariat cooperates with the Pelagos Secretariat on the exchange of data, and both report on the satisfactory implementation of the rules to their respective Governing Bodies. The challenge going forward is to accomplish efficient coordination mechanisms among these organizational structures.

Finally, is important to point out the constructive work process that has been established with fisheries operators and stakeholders, which is essential to achieve management goals. There is little doubt that more efficient and clear decision-making may reduce noncompliance in the area.

c. Climate change and Ocean acidification

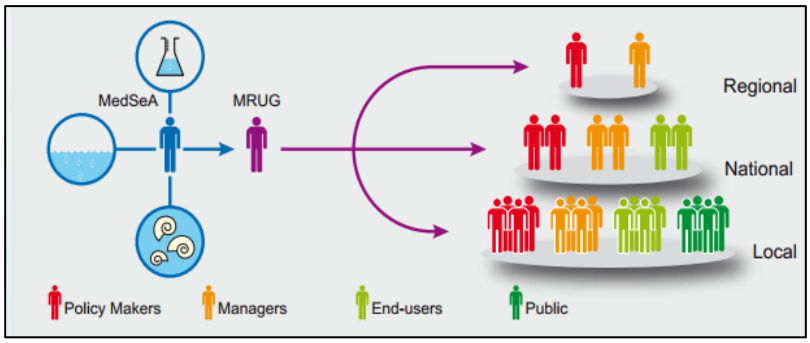
As seen in previous sections, three iconic ecosystems have been identified in the Mediterranean which will be affected by climate change and that are vulnerable to changes in ocean chemistry.

[337] International Agreement on the creation of a marine mammal sanctuary in the Mediterranean. Article 7.

Bearing this in mind, different projects are working to address climate change challenges in the Mediterranean Region, for example the Regional Activity Centre for Specially Protected Areas of the Barcelona Convention, as well as the Mediterranean Sea Acidification (MedSea) project. Bibliographic databases and working groups to analyze and propose recommendations to address the vulnerability and impacts of climate change on the Mediterranean biodiversity are main activities of these initiatives.

It must be noted that the Mediterranean Sea Acidification project has established the Mediterranean Reference User Group (MRUG), as an advisory body in which scientists, marine and coastal managers, industry representatives, policy makers, and other stakeholders, participate and work on the promotion and dissemination of information to the end-users audiences in the Mediterranean Region.

Figure 26. Mediterranean Reference User Group structure



Source: European Mediterranean Sea Acidification Project.[338]

This advisory group could be a useful proposal for the CAD case study. The diagram shows how the information is focused and adapted to different audiences. In this context, parallel structures to promote projects and awareness could be a valuable strategy to impulse the CAD's management scheme consolidation.

Also, the MedSeA project has proposed some recommendations for the decision makers and technical advisors in the Mediterranean region, in relation to climate change and ocean acidification, such as the following:

Box 20. Recommendations to address climate change in the Mediterranean region
• Reduce environmental stresses (pollution, over fishing, habitat destruction) to build resilience into the marine environment.
• Create effective MPAs to cope with global stressors.
• Use marine spatial planning.
• Adopt reductions in greenhouse gas emissions.

[338] European Mediterranean Sea Acidification Project. (on line): http://medsea-project.eu/med-sea-acidification/

- Integrate Blue Carbon initiatives into the global policy and financing processes.[339]

These overall recommendations are broad enough to be applied to the CAD initiative, but will have to be adapted to the reality of the Region. For example, the Blue Carbon concept is being discussed in the Central American Region, but it will take time, effort and financial investment from the public and private sectors to consolidate incentives or payment schemes for ecosystem services related to carbon sequestration.

Conclusions

The Barcelona Convention is a regional framework that works under the sponsorship of UNEP's Regional Seas Programme. In respect with the analysis of its legal and institutional framework, as well as the main topics of marine conservation, fisheries and climate change, the overall conclusions of the previous section are the following:

The Protocol of Specially Protected Areas and Biological Diversity in the Mediterranean provides the criteria for the selection of marine protected areas situated on the high seas. In the Mediterranean context, the Pelagos Sanctuary is an MPA situated in ABNJ, which coexists with high levels of human pressure, but it has shown positive outcomes, for example raising public awareness; the utility of regional seas agreements; the use of "umbrellas" species to protect ecological communities, among others.

The CAD case study should acknowledge the problematic elements that the Pelagos Sanctuary MPA has encountered in its process of consolidation, thus for example, insufficient legal regime, a confusion of competences and fragmentation or overlapping of responsibilities between different authorities, lack of effective scientific monitoring, bearing in mind that most Central American countries lack from strong enforcement mechanisms and efficient monitoring systems.

Fisheries management

Fisheries management in the Mediterranean region is regulated by different legal instruments and institutional frameworks, such as the EU, the GFCM and ICCAT frameworks. In this regard, the implementation of the ecosystem approach to fisheries is a similar trend to the OSPAR experience, and should be the one followed by the CAD project.

In this context, regulations on fishing gears, the implementation of management area-based tools, law enforcement, and responsible consumption approaches show a variety of measures which improve fisheries management in the Barcelona Convention region.

Climate change and Ocean acidification

[339] Ibidem.

Different initiatives are working to address climate change challenges in the Mediterranean Region, for example the Regional Activity Centre for Specially Protected Areas of the Barcelona Convention and the Mediterranean Sea Acidification (MedSea) project. In this context, there has been identified three iconic ecosystems, and various species in the Mediterranean Sea which will be affected by climate change, and that are vulnerable to changes in ocean chemistry.

The Mediterranean Reference User Group is an advisory body where stakeholders participate and work on the promotion and dissemination of information to the end-users audiences in the Mediterranean Region. The role of this advisory group could be replicated within the Central American Integrated System (SICA), where CCAD could focus and adapt information to different audiences, and improve negotiation processes and agreements between different sectors.

Chapter 2. Sustainable use of marine resources in ABNJ

The aim of the present chapter is to evaluate two case studies of regional frameworks in which States by means of regional organizations seek to promote the sustainable use of marine resources in ABNJ. More specifically, the regime that applies to Antarctic Marine Living Resources is examined in some detail as this is a well established management scheme that has a number of features that are applicable to the CAD. This is followed by a brief analysis of the putative regime that is slowly evolving at a regional and multilateral level in relation to the management of environmental matters in the Sargasso Sea.

For reasons of space, these case studies will focus on two aspects of the regulatory framework, namely: (1) the legal and institutional framework that applies in both ocean regions, and (2) the challenges and the lessons that may be derived in relation to the management of biodiversity fisheries and ocean acidification. These particular topics are selected, as they are clearly germane to the establishment of a regional scheme for the CAD in the eastern Pacific.

Section A. The CCAMLR experience

The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) is a well-established scheme that provides for the conservation and management of marine resources in the Antarctic. However, before analysing the CCAMLR Convention it is important to provide a brief overview of the 1959 Antarctic Treaty, as this provides the overall setting for CCAMLR and the various management and conservation measures adopted thereunder.

As is well known, the **Antarctic Treaty** was signed in Washington by 12 countries,[340] and nowadays it has 50 Parties. It aims to ensure the use of Antarctica for peaceful purposes, international scientific cooperation, and continuance of international harmony in relation to human uses of Antarctica. For reasons of space only a few key features can be highlighted here.

Most significantly, in relation to jurisdictional claims, the Treaty states that no acts or activities should constitute a basis for asserting, supporting or denying a claim to territorial sovereignty in Antarctica[341]. As can be seen from Figure 27 below, the geographical scope of this Treaty is extensive and it applies to the area south of 60° South Latitude, including all ice shelves. Significantly, the Treaty does not affect the rights of any State under international law with regard to the high seas within that area[342].

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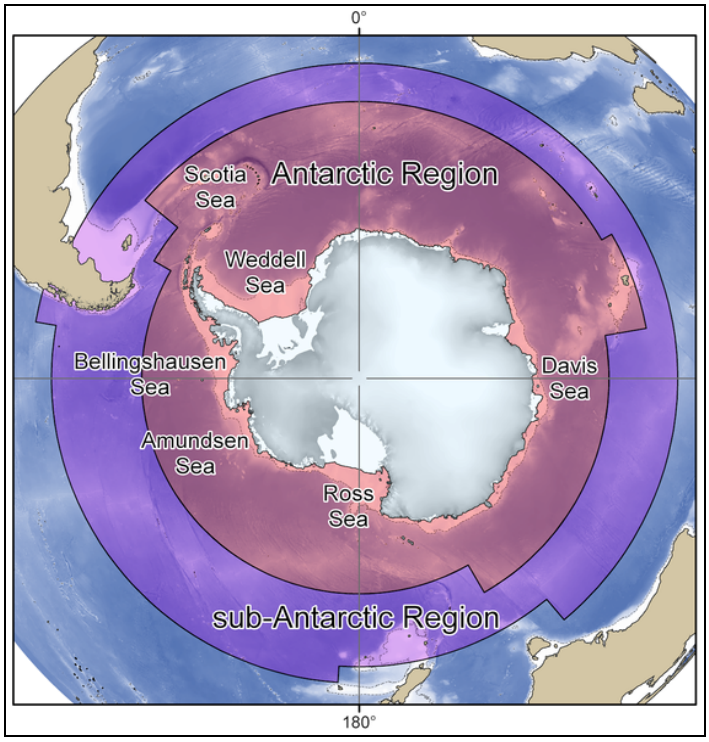
[340] Argentina, Poland, Australia, Union of South Africa, Belgium, Chile, Union of Soviet Socialist Republics, France, United Kingdom of Great Britain and Northern Ireland, New Zealand, Japan, Norway and the United States of America.
[341] Antarctic Treaty. Article 4
[342] Ibidem. Article 6.

Figure 27. The Antarctic Region



Source: Griffiths HJ (2010) Antarctic Marine Biodiversity. [343]

Other interesting scheme established under the Treaty include the inspection system that apply to research stations, installations and equipment located in the Antarctic. The designated observers by the Parties have complete freedom of access at any time to all areas of Antarctica. In this context, the observers are subject only to the jurisdiction of the Contracting Party of which they are nationals.

In the general framework, representatives of the Contracting Parties meet to exchange information, consult common interest topics to Antarctica, and formulate recommendations to their Governments, for example, facilitation and cooperation on scientific research; facilitation of the exercise of the rights of inspection; analysis of the reports from the observers; preservation and conservation of living resources in Antarctica, among other matters.

The Antarctic Treaty is complemented by the **Protocol on environmental protection**, where the Parties commit to the comprehensive protection of the Antarctic environment and its associated ecosystems. The Protocol established various environmental principles including the ones indicated in Box 21 below:

[343] Griffiths HJ (2010). Antarctic Marine Biodiversity. PLoS ONE. (on line) http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0011683#s2

Box 21. Principles of the Protocol on Environmental Protection
• Activities shall be planned and conducted to avoid adverse effects on climate; air or water quality; changes in the terrestrial, glacial or marine environments; and detrimental changes in the distribution and abundance of species.
• Activities shall be planned and conducted to allow prior assessments of possible impacts on the Antarctic environment.
• Scientific research should consider the scope of the activity (area, duration and intensity); cumulative impacts; capacity to monitor key environmental parameters; capacity to respond to accidents.
• Activities undertaken in the Antarctic Treaty could be modified, suspended or cancelled if they result in or threaten to result in impacts upon the Antarctic environment.[344]

The Protocol also calls on Parties to cooperate in the planning of and programmes of scientific, technical and educational value; share information; provide assistance in the preparation of environmental impact assessments; provide information of environmental risk; and to undertake joint expeditions, among others.

On the institutional framework, the Protocol established the *Committee for Environmental Protection*, in which each Party is represented.[345] The Committee's main objective is to provide advice and formulate recommendations to the Parties in the implementation of the Protocol, for example in the application of the environmental impact assessment procedures; the operation of the Antarctic Protected Area system; inspection procedures;[346] and the exchange and evaluation of information.

Both the Protocol and the Antarctic Treaty are legally binding. This means that the Parties must adopt national measures, including laws and regulations, administrative actions and enforcement measures to give effect to the Treaty provisions. In this regard, each Party has to report annually its implementation achievements to the rest of the Parties and to the Committee.

Another important aspect of the regulatory framework that is worth noting is the requirement for coordination between the Committee on Environmental Protection, the President of the Scientific Committee on Antarctic Research and the Chairman of the Scientific Committee for the Conservation of Antarctic Marine Living Resources. These are the main figures in Antarctica's institutional framework.

The Protocol is supplemented by several Annexes including Annex I: environmental impact assessment; Annex II: conservation of Antarctic fauna and flora; Annex III: waste disposal and waste management; Annex IV: prevention of marine pollution; Annex V: area protection and management; Annex VI: liability arising from environmental emergencies. For the purpose of this research, **Annex II: Conservation of Antarctic fauna and flora**, and **Annex V: Area protection and management**, will be examined in further detail below.

[344] Protocol on environmental protection. Article 3.
[345] Ibidem. Article 11.
[346] Ibidem. Article 14.

Annex II requires Contracting Parties to provide detailed information about permissions in relation to the protection of native fauna and flora. Specifically, it establishes that the authorizations/licenses are required for the taking of specimens for scientific study. This is aimed at ensuring that only the strictly necessary specimens are removed from the Convention Area. Also, it addresses the designation of a list of specially protected species, the prohibition for the introduction of non-native species, and the exchange of information.

This is complemented by Annex V, which sets down a framework for the spatial management of protected areas. In particular, it provides for the establishment of the Antarctic Specially Protected Areas and the Antarctic Specially Managed Areas, where certain activities are prohibited or managed in accordance with Management Plans.

In this context, the **Antarctic Specially Protected Areas** are established to protect outstanding environmental, scientific, historic, aesthetic or wilderness values. The Annex identifies the criteria (Box 22) to guide the creation of this kind of areas, which will have to meet some of the following characteristics:

Box 22. Criteria for the creation of Antarctic Specially Protected Areas
• Areas kept inviolate from human interference.
• Representative examples of major terrestrial, glacial, aquatic, and marine ecosystems.
• Areas with important or unusual assemblages of species.
• Be the only known habitat of any species.
• Areas of particular interest to ongoing or planned scientific research.
• Areas of outstanding aesthetic and wilderness value. (article 3)

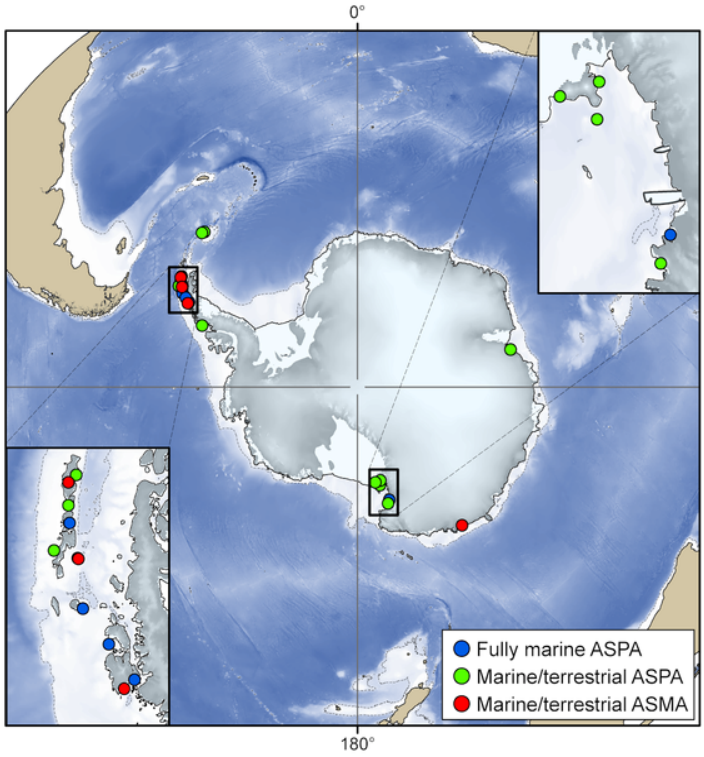
Most notably, prima facia, entry into such areas is prohibited. There are however some exceptions for the Parties that have specific permits that allow them to undertake a specific activity in such areas.

On the other hand, the **Antarctic Specially Managed Areas** may include areas where activities pose risks or cumulative environmental impacts on sites or monuments of recognized historic value.[347] One major difference from the specially protected areas scheme, is that the entry into an Antarctic Specially Managed Area does not require a permit. This aspect may represent a substantial difference in practical matters for Contracting Parties. Accordingly, it will be explored in further detail below, as there are several legal and administrative hurdles that must be overcome in the establishment of specially protected areas.

As such, Antarctic Specially Managed Area may contain one or more Antarctic Specially Protected Areas, entry into which shall be prohibited except in accordance with the terms and conditions set out in the requisite permit.

[347] Annex V: Area protection and management. Article 4.

Figure 28. Marine conservation areas in the Antarctic



Source: Griffiths HJ (2010) Antarctic Marine Biodiversity. [348]

It must be noted that the establishment of a management plan is essential for both features.[349] In this regard, any Party, the Committee, the Scientific Committee for Antarctic Research or CCAMLAR Commission may propose the designation of either types of areas, by submitting a Management Plan to the Antarctic Treaty Consultative Meeting.

The management plan has to include a description of the conservation values for which special protection or management is required; objectives; management activities; description of the area; identification of zones within activities are to be prohibited, restricted or managed; maps; supporting documentation; permissions; requirements for reports; among other matters.

In respect of an area proposed to be designated as an Antarctic Specially Protected Area, a clear description is required of the conditions under which permits may be granted; and if an Antarctic Specially Managed Area is going to be designated, it is necessary to establish a code of conduct that is applicable to such area.

[348] Griffiths HJ (2010). Antarctic Marine Biodiversity. PLoS ONE. (on line) http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0011683#s2

[349] Annex V: Area protection and management. Article 5.

In such instances, the Management Plan proposal has to be analyzed by the Committee for Environmental Protection, the Scientific Committee on Antarctic Research and the CCAMLR Commission. The next step is the discussion for the approval of the Plan, which is undertaken by the Parties in the Antarctic Treaty Consultative Meeting as part of their work programme. Significantly, the designation of an Antarctic Specially Protected Area or an Antarctic Specially Managed Area has to have the prior approval of CCAMLR,[350] which also undertakes additional coordination with the various bodies with a management role in Antarctica.

Also it ought to be noted in regard to the permissions granted in designated areas, that each Party is obliged to appoint an authority to issue permits to enter and engage in activities in accordance with the scheme set down in the Management Plan.

CCAMLR legal and institutional framework.

The following section will analyse the CCAMLR experience, and will examine the regulatory and institutional framework that aims to address substantial elements in relation to marine conservation, fisheries management, and ocean acidification in the Antarctic region. The second subsection will flag the main challenges and lessons learned from ABNJ management initiatives that have been undertaken in the Antarctic.

At the outset, it has to be pointed out that the Southern Ocean has been severely harvested since the 19th century. The scale of activities have been identified by the CCMLR Commission in the following terms:

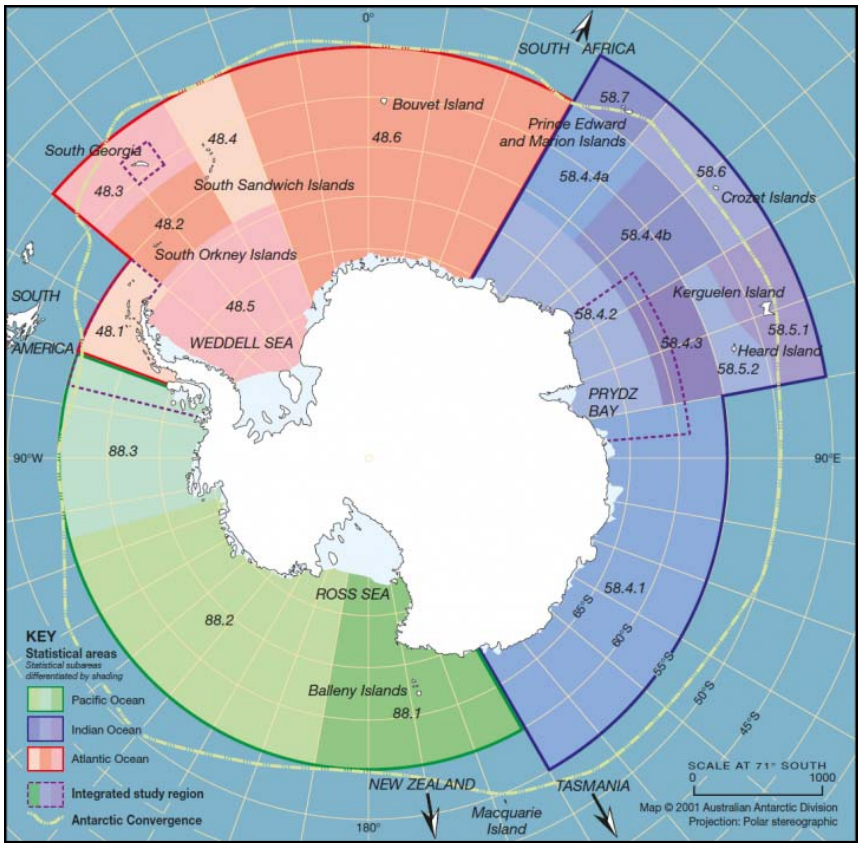
> "By 1825, some populations of fur seal were hunted close to extinction, and sealers began hunting elephant seals and some species of penguins for their oil. Whaling in this area began in 1904 and all seven species of whales found in the Southern Ocean were extensively exploited. Antarctic finfish, crabs, squid and krill, a keystone component of the Antarctic ecosystem, have also been exploited at various levels since the early 1960s."[351]

In response to this catastrophic situation, the Antarctic Treaty Consultative Meeting Recommendation IX-2 (London, 1977) called on the Antarctic Treaty Parties to set up a conservation and management regime for the marine resources. This became the first step towards the establishment of CCAMLR.

The CCAMLR Convention was adopted at the Conference on the Conservation of Antarctic Marine Living Resources in Canberra, Australia, in1980.

Figure 29. CCAMLR key statistical areas

[350] Annex V: Area protection and management. Article 6.
[351] Commission for the Conservation of Antarctic Marine Living Resources. (on line). http://www.ccamlr.org/en/organisation/history



Source: *Australian Antarctic Magazine. Australian Antarctic Division. 2001*[352]

This Convention aims to conserve Antarctic marine living resources, and explicitly provides that conservation includes a rational use; meaning that harvesting and associated activities with a view to achieving the following objectives:

1. Prevention of decrease in the size of any harvested population to levels below those which ensure its stable recruitment.
2. Maintenance of the ecological relationships between harvested, dependent and related populations of Antarctic marine living resources and the restoration of depleted populations.
3. Prevention of changes or minimization of the risk of changes in the marine ecosystem which are not potentially reversible.[353]

Clearly the aforementioned objectives are relevant to the establishment of a putative management scheme for the CAD. Also relevant is that, the Antarctic Treaty and the CCAMLR Convention both specify that they will not affect the rights or claims of any State under international law with regard to sovereignty matters in the Antarctic area.

[352] Australian Antarctic Magazine. *Southerly prospects: Antarctic science meets new challenges.* (on line) http://www.antarctica.gov.au/__data/assets/pdf_file/0012/21171/aam-issue01.pdf
[353] CCAMLR Convention. Article II.3

Each Contracting Party of the Convention, as well as regional economic integration organizations can participate in the work of the CCAMLR Commission. Decisions on substantive matters are taken by consensus.[354] Some of the principal functions of the Commission are shown below in Box 23:

Box 23. Functions of CCAMLR Commission
• Facilitate research and comprehensive studies of Antarctic marine living resources.
• Compile data on the status and changes in species populations, and factors affecting the distribution, abundance and productivity of harvested or related species.
• Ensure the acquisition of catch and effort statistics on harvested populations.
• Identify conservation needs and analyze the effectiveness of conservation measures.
• Implement a system of observation and inspection.
• Formulate, adopt and revise conservation measures on the basis of the best scientific evidence available.[355]

Some of these aspects will be further reviewed below in the context of fisheries management (see section b).

The Convention provides for the establishment of a *Scientific Committee* which is a consultative body to the Commission. The work of the Committee is supported and undertaken by scientific and technical representatives of the Parties. In this regard, it is a relatively open body that strives to be a forum for consultation and cooperation for study and exchange of information of the Antarctic marine living resources. Some of its functions are the establishment of criteria and methods underpinning conservation measures; assessing the status of the populations of marine resources; evaluating the impacts of harvesting on marine resources; presenting reports and recommendations to the Commission; among many other matters.

Also, relevant to take into account is that CCAMLR excludes some species, like whales and seals, because there are specific Treaties for the conservation and management of these species, such as the International Convention for the Regulation of Whaling and the Convention for the conservation of Antarctic Seals.

In our overall analysis it is important to note that both CCAMLR and the Antarctic Treaty are separate international agreements that are closely related and aligned at a regional level. This feature adds value to CCAMLR as a regulatory framework with specific policy objectives. As noted by the CCAMLR Commission, the relationship between the CCAMLR Convention, the Antarctic Treaty and the Treaty's Protocol on Environmental Protection, as well as the conservation principles embedded in the Convention itself, are among the key features that distinguish CCAMLR from regional fisheries management organizations.[356]

[354] CCAMLR Convention. Article XII
[355] Ibidem. Article IX.
[356] Commission for the Conservation of Antarctic Marine Living Resources. (on line). http://www.ccamlr.org/en/organisation/history

Significantly, this close relationship is also evident in three articles in the CCAMLR Convention which refers directly to the Antarctic Treaty, namely:

- Article III which establishes that Contracting Parties, whether or not they are Parties to the Antarctic Treaty, agree that they will not engage in activities that are contrary to that Treaty.
- Article IV.1 of CCAMLR binds its Contracting Parties to Articles IV and VI of the Antarctic Treaty, with regard to Antarctic territorial claims.
- Article V provides that Contracting Parties which are not Parties to the Antarctic Treaty acknowledge the special conservation measures, obligations and responsibilities of the Antarctic Treaty Consultative Parties.

According to this background and to provide additional context to our discussion, the following subsections examine three topics: marine conservation, fisheries management and climate change.

a. Marine conservation

As pointed out at the beginning of this chapter, the CCAMLR Convention recognizes that conservation embraces the sustainable use of marine resources. With this in mind, article 9 of the Convention provides for a range of conservation measures and tools including the ones summarized in Box 24:

Box 24. CCAMLR Convention conservation measures
• Quantity of any species which may be harvested.
• Regions based on the distribution of populations of species.
• Protected species.
• Size, age and sex of species which may be harvested.
• Open and closed seasons for harvesting.
• Opening and closing of areas scientific study or conservation.

In practice, the Commission publishes the measure to be adopted and once this notification has been made, the measure becomes binding 180 days later. Members may reject the measure within 90 days of publication provided that they have adequate reasons justifying their decision, which must also be notified to the Commission.

Another important management tool in the Antarctic area are MPAs. In this regard, the establishment of a network of MPAs is essential to ensure the protection and preservation of the Antarctic unique ecosystem and the species it supports. One of CCAMLR Commission's goals is to develop a representative and comprehensive network of MPAs, including pelagic regions, rare features, VMEs and biological

features.[357] The first step in the designation process is the identification of candidate MPAs and the submission of proposals to the CCAMLR Scientific Committee. As seen in previous sections, marine protected area provisions are under Annex V of the Protocol on Environmental Protection, and the creation of an MPA requires prior approval by the CCAMLR Commission.

There have been two proposals to establish MPAs that have been submitted to CCAMLR Commission. The first one supported by Australia, France and the European Union, which seeks to designate a cluster of seven marine protected areas in East Antarctica.[358] The second proposal that has been analyzed to become an MPA is the Ross Sea Region, which will cover approximately1.34 million km^2, of which 1.25 million km^2 will be a no-take area. This proposal has been submitted by the United States and New Zealand, and its core elements include:

- The no-take General Protection Zone including the Ross Sea shelf and slope, and the Balleny Islands.
- The boundary of a Special Research Zone.
- The Spawning Protection Zone in the northwest to provide representative protection for seamounts and other habitats.[359]

Instructively, the Pew Environmental Group has pointed out that the Ross Sea is one of the least altered marine ecosystem on Earth, with unusually large and closely interacting populations of several marine bird and mammal species.[360]

On a similar vein, one eminent scientific authority has concluded that the Ross Sea ecosystem is still largely intact, and it "provides a chance to investigate the sorts of phenomena and other factors that once structured marine ecosystems elsewhere but which can now usually be investigated only indirectly."[361]

In order to ensure adequate follow-up on conservation measures, a special intercessional CCMALR's meeting took place in July 2013, in which the 25 members of the Commission were specifically tasked with considering the two above mentioned proposals concerning the establishment of protected areas of the Ross Sea and the East Antarctica. Afterwards, a revised proposal, which took into account formal advice from the CCAMLR Scientific Committee, and reflected the various views of CCAMLR

[357] L.L. Douglass, D. Beaver, J. Turner and R. Nicoll. *An identification of areas within the high seas of the Southern Ocean that would contribute to a representative system of MPAs*. (on line): http://203.13.22.3/en/ws-mpa-11/16

[358] Australian Government. A proposal for a representative system of MPAs in the East Antarctic. (on line): http://www.antarctica.gov.au/law-and-treaty/ccamlr/marine-protected-areas

[359] New Zealand foreign affairs and trade. Ross Sea Region MPA. (on line): http://www.mfat.govt.nz/ross-sea-mpa/tabs/proposal.php

[360] Pew Charitable Trusts. 10 Reasons to Create Marine Reserves around Antarctica. (on line) http://www.pewenvironment.org/news-room/other-resources/10-reasons-to-create-marine-reserves-around-antarctica-85899485582#sthash.usrXTHKL.U1UHJQVO.dpuf

[361] Österblom et al., 2007 and Christensen and Richardson, 2008

Members who engaged with the proposal during the July special meeting, was discussed in October 2013, at CCAMLR's meeting in Hobart.[362]

Regrettably, despite the great ecological importance of these regions, the meeting failed to reach agreement in relation to the Ross Sea MPA, mainly due to Russia questioning the legality of the organization's ability to establish marine protected areas in ABNJ. As a result, CCAMLR does not appear to have seized the opportunity to improve large-scale ocean protection in the Antarctica area. This is all the more disappointing as marine protected areas in the Antarctic and in other regions are essential to improving resilience in marine ecosystems, and to respond to overfishing, pollution, climate change and ocean acidification.

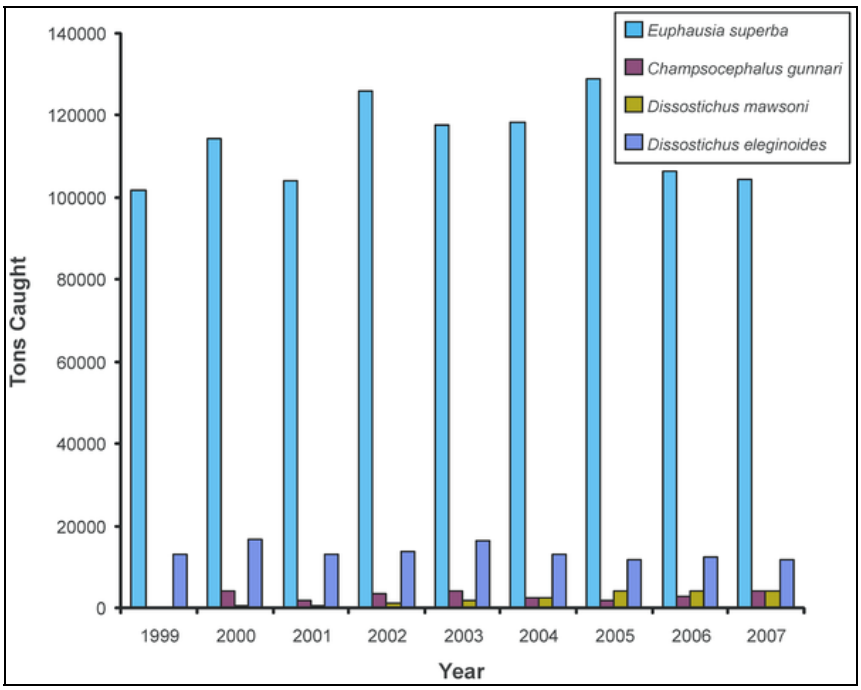
b. CCAMLR fisheries management

At the outset, it ought to be pointed out that CCAMLR has developed fisheries management measures based on an ecosystem approach. In this context, the Convention establishes regulations on fishing effort, harvesting methods, fishing gears,[363] and other relevant measures recommended by the Consultative Meetings.[364]

To fully comprehend the dimension and importance of the fishing industry in the CCAMLR region it is useful to study figure 30 below, which shows the major species and catch in the region.

Figure 30. CCAMLR catch statistics (in tons) for the major commercially caught species

[362] New Zealand Foreign Affairs & Trade. Ross Sea region MPA. (on line): http://www.mfat.govt.nz/ross-sea-mpa/
[363] Article IX CCAMLR Convention.
[364] Ibidem.



CCAMLR catch statistics (in tons) for the major commercially caught species in the Southern Ocean from 1999 to 2007. Source: ***Griffiths HJ (2010) Antarctic Marine Biodiversity.*** [365]

The CCAMLR Commission works with Contracting Parties with jurisdiction in marine areas adjacent to the Convention's area, to harmonize conservation and management measures[366] in respect of stocks or associated species. In this respect, CCAMLR has a broad management scheme, "designed so that fishing does not expand faster than the acquisition of information necessary to ensure that each fishery meets the Commission's long-term management objectives."[367] Lee Kimball has pointed out that,

> "CCAMLR pioneered the concept of new and exploratory fisheries. The goal is to carefully design and monitor these fisheries so that they develop gradually and only as sufficient information becomes available to make well-founded judgments about potential sustainable yield and the potential impacts of the fishery on other ecosystem components."[368]

Instructively, CCAMLR classifies fisheries in five categories as shown in Box 25 below:

Box 25. CCAMLR fisheries categories

[365] Griffiths HJ (2010). Antarctic Marine Biodiversity. PLoS ONE. (on line) http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0011683#s2

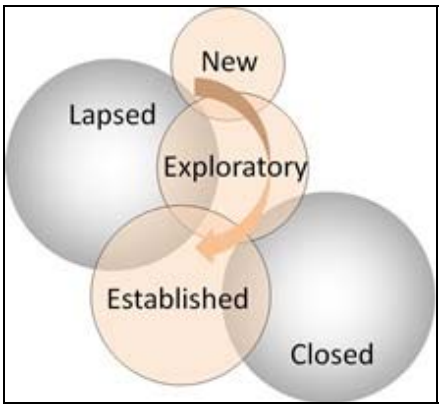
[366] CCAMLR Convention. Article XI.

[367] CCAMLR Commission. (on line): http://www.ccamlr.org/en/fisheries/regulatory-framework

[368] Kimball, Lee A. (2005). The International Legal Regime of the High Seas and the Seabed in ABNJ and options for cooperation. Secretariat of the CBD. Technical Series no. 19, 64 pages.

Type of fishery	Main characteristics
New fishery	• Biological and fishery data are not available. • Notification is required prior to fishing. • After 1 year it becomes an exploratory fishery.
Exploratory fishery	• Not allowed to expand faster than the acquisition of information for managing the fishery. • Notification and permission are required prior to fishing.
Established fishery	• Appropriate data to support a comprehensive stock assessment and evaluation. • Notification and permission are required.
Lapsed fishery	• Fishing operations have ceased due to commercial considerations.
Closed fishery	• Fishing on specific species is prohibited.

Figure 31. Types of fisheries within CCAMLR Convention



Source: CCAMLR Commission.[369]

In the design of the management regime that will apply to the CAD, there is clearly scope to take into consideration this fishery classification system, as it is aimed at improving stock management and supporting a more integral and comprehensive framework for decision-making regarding specific fisheries. Again we can see some similarity between the different management measures that have been adopted for specific fisheries that may also be applicable to the CAD.

There are multiple fisheries management measures within the CCAMLR framework that could be adapted and replicated in the CAD, thus for example the following:

- ***Illegal, Unreported and Unregulated Fishing (IUU Fishing)***

[369] CCAMLR Commission. (on line): http://www.ccamlr.org/en/fisheries/regulatory-framework

One of the principal concerns in the CCAMLR Region is to control illegal fishing. In this respect, one particular feature of the CCAMLR fisheries management regime is that it reflects a number of global initiatives such as the FAO Agreement on IUU fishing (discussed above) and the FAO Compliance Agreement for Fishing Vessels on the High Seas, as well as a number of other high seas fisheries management schemes.[370] In this context, Conservation measure 10-07 (2009)[371] establishes a scheme to promote compliance by non-Contracting Party vessels with CCAMLR conservation measures. The main actions that are taken under this measure are the following:

- The Commission identifies the non-Contracting Parties whose vessels are engaged in IUU fishing activities and establishes a list (NCP-IUU Vessel List).
- When a presumed IUU fishing non-Contracting Party vessel enters a port of a Contracting Party, it shall be inspected, and not be allowed to land or transship any fish species subject to CCAMLR.
- Information about IUU fishing activities (sightings or denial of port access, landings or transshipments, result of inspections) have to be distributed to the Executive Secretary, Contracting Parties and the Flag State of the vessel. [372]

The precise mechanisms for ensuring compliance are linked with paragraph 9 of this Conservation measure, which prescribes different conducts or behavior that results in a vessel of a non-Contracting Party being included in the NCP-IUU Vessel List, including:

- Been sighted engaging in IUU fishing activities in the CCAMLR Convention Area, and also been denied port access, landing or transshipment.
- Transshipped or participated in joint fishing operations with, supported or resupplied other IUU vessels identified by CCAMLR.
- Failed to provide a valid catch document.
- Engaged in fishing activities contrary to CCAMLR conservation measures.[373]

The Executive Secretary has the responsibility for drawing up a draft list (NCP-IUU Vessel List), including all non-Contracting Party vessels that are presumed to have engaged IUU activities. The Draft NCP-IUU Vessel List is distributed to the non-Contracting Parties involved and to all Contracting Parties. At this stage of the process, non-Contracting Parties have the opportunity to transmit information to the Executive Secretary about incidents concerning their vessels, or resulting on the inclusion on the list. After analyzing the data submitted by non-Contracting Parties, the Executive Secretary draws a Provisional NCP-IUU Vessel List. Contracting Parties are then formally requested to take measures in order not to register vessels that have been placed on that Provisional list.

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[370] Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas.

[371] CCAMLR Commission. Conservation measure 10-07 (2009) - Scheme to promote compliance by non-Contracting Party vessels with CCAMLR conservation measures. (on line): http://www.ccamlr.org/sites/drupal.ccamlr.org/files//10-07.pdf

[372] Ibidem.

[373] Ibidem.

In order to facilitate the orderly administration and management of fisheries, Contracting Parties must provide information to include a vessel in the NCP-IUU Vessel List at least 30 days before CCAMLR annual meeting. Then, at each CCAMLR annual meeting, the Standing Committee on Implementation and Compliance, by consensus, adopts the proposed NCP-IUU Vessel List[374], and submit it to CCAMLR Commission for approval. The various steps that must be taken once the Commission approves the final NCP-IUU Vessel List are shown in Box 26 below:

Box 26. NCP-IUU Vessel List and compliance measures

Non-Contracting Parties	Contracting Parties
Application of regulations to ensure that vessels desists from IUU fishing activities.	Prohibit the issuance of a license to vessels on the NCP-IUU Vessel List.
Withdrawal of registration or fishing licenses.	Not assist vessels on the NCP-IUU Vessel List.
Nullification of catch documents.	Deny access to ports to the vessels enlisted (unless for the purpose of enforcement action or for reasons of force majeure).
Inform the Commission of measures taken.	Prohibit chartering of vessels on the list.
	Prohibit imports, exports and re-exports of *Dissostichus* spp. from vessels from the list.
	Importers, transporters and other sectors are encouraged to desist from dealing with transshipping of fish caught by vessels on the NCP-IUU Vessel List.

As part of the naming and shaming process, the Executive Secretary is responsible for placing the NCP-IUU Vessel List approved by the Commission on the public section of the CCAMLR website, and communicate it to the FAO and other regional fisheries organizations.

The scheme for fishery protection in CCAMLR has worked relatively well in relation to deterring IUU fishing. There are however, a number of concerns including paragraph 26 of the aforementioned conservation measure, which provides that Contracting Parties should not take any trade measures or other sanctions against vessels have been included in the Draft NCP-IUU Vessel List drawn up by the Executive Secretary. The absence of this power to invoke trade measures has the potential to undermine the strict implementation of conservation measures.

- **Other fisheries conservation measures**

[374] The list shall contain the current and previous name of vessel; flag; owners; operator; call sign; Lloyds/IMO number; photographs of the vessel; date vessel was first included on the NCP-IUU Vessel List; summary of activities which justify inclusion of the vessel in the List; indication of inspections.

CCAMLR has developed different management measures to improve sustainable use of marine living resources, and several of them refer to monitoring and enforcement systems which aim to ensure the efficient application of the conservation measures. In this regard, the following ones are relevant to any putative management scheme that is established for the CAD.

Conservation measure 10-02 (2011) - Licensing and inspection obligations of Contracting Parties with regard to their flag vessels operating in the Convention Area. This regulation establishes that fishing licenses have to specify areas, species and time periods for which fishing is authorized. Also it details the requirements that are placed on the Contracting Party regarding the vessels that fly their flag, including the obligation to provide to the Secretariat the information about the licenses that are issued. The Executive Secretary then in turn is required to place the vessel on the list of the licensed vessels on the CCAMLR website.

To facilitate control and monitoring, the license must be carried by the fishing vessel and must be available for inspection at any time by a designated CCAMLR inspector. Each Contracting Party has to include on its annual report to the CCAMLR System of Inspection, the implementation steps taken in relation to its flag vessels to promote the effectiveness of CCAMLR conservation measures.

Another management measure to be consider in regard to the present investigation is **Conservation measure 10-04 (2011) - Automated satellite-linked Vessel Monitoring Systems (VMS)**. This measure states that Contracting Parties shall ensure that licensed fishing vessels are equipped with a satellite-linked vessel monitoring device, and shall communicate at least every four hours to a land-based fisheries monitoring centre (FMC) of the Flag State of the vessel. The measure details as well, the information that vessels must give to the monitoring centre, such as identification, geographical position, date and time, among other data.

There are some similar initiatives underway in relation to the CAD, such as the Inter-American Tropical Tuna Commission (CIAT) Resolution C-04-06 –which establishing a vessel monitoring system, in a similar sense establishes that each Party with tuna fishing vessels 24 meters or more in length operating in the Eastern Pacific Ocean, and harvesting species with conservation measures, had to establish a VMS system, and vessels are required to communicate with the national competent authority at least once every six hours.

Returning to conservation measure 10-04 (2011), there is an obligation for masters and owners/licensees of fishing vessels to ensure that the vessel monitoring device is at all times fully operational, to avoid the submission of false information. Also, Contracting Parties have to forward VMS reports to the CCAMLR Secretariat. In this context, confidentiality is always engaged to the information facilitated by Contracting Parties.

On transshipment matters, **conservation measure 10-09 (2011)-Notification system for transshipments within the Convention Area**, establishes regulations applicable to vessels which intend to transship within the Convention Area. Most notably, a Contracting Party as a Flag State have to notify the Secretariat about transshipment operations, and such

notification shall include details of the type and amount of catches and/or other goods, food stores and fuel, involved in the transshipment.

Another measure to be analyzed in the present section is **Conservation measure10-05 (2012)-Catch Documentation Scheme for Dissostichus spp**. A catch documentation scheme is established under this measure, and it applies to landings, transshipments, imports, exports or re-exports of this particular specie. The information from the scheme provides a comprehensive and integral management overview of the particular fish stock, which also facilitates the traceability of the fish product that enter the market.

Finally, **Conservation measure 22-06 (2012) on bottom fishing**[375] seeks to codify and implement the precautionary and ecosystem approaches to fisheries management, as well as to protect vulnerable marine ecosystems. However, bottom fishing is not likely to occur in the CAD, because of the deepness of the seafloor in that area.

In summary, and as seen in this subsection, the CCAMLR Commission has established several measures on catch, fishing location and fishing effort, and also testing different fishing models like particular gears and practices or closed areas and seasons.

c. CCAMLR measures addressing climate change and ocean acidification

The Antarctic region is exposed to the impacts of climate change and ocean acidification. Specifically in relation with this area, the IPCC Report indicated that,

> "The Antarctic Bottom Water has warmed since the 1980s or 1990s, most noticeably near Antarctica."[376]

CCAMLR has to acknowledge the challenges that climate change, in addition to other human pressures, represent to the Antarctic. In this regard, technical bodies, like the Institute of Marine Resources and Ecosystem Studies (IMARES) in the Netherlands, have organized workshops to evaluate new data on the impact of climate change and increasing fisheries on Antarctic krill, as well as in the Antarctic ecosystems (ocean warming, sea ice loss and ocean acidification).[377]

In this context, *Resolution 30/XXVIII* reiterated the need to protect the integrity of marine ecosystems in the seas surrounding Antarctica in the face of climate change effects. The Commission has previously endorsed the work of the Scientific Committee in

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[375] CCAMLR Commission. Conservation measure 22-06 (2012) - Bottom fishing in the Convention Area. (on line): http://www.ccamlr.org/es/node/77628

[376] IPCC. Contribution to the IPCC fifth assessment report. 2013. Chapter 3 - Observations: Ocean Scientific-Technical Assessment. (on line): http://www.climatechange2013.org/images/uploads/WGIAR5_WGI-12Doc2b_FinalDraft_Chapter03.pdf Pg 49.

[377] CCAMLR Commission. Antarctic krill and climate change. (on line): http://www.ccamlr.org/en/sc-camlr-xxx/bg/03

Resolution XXVII (paragraph 4.61) in relation to CCAMLR management decisions about the impacts of climate change.

The Resolution also encourages all CCAMLR Parties to contribute towards science initiatives. There are a number of programmes in this regard including, the Integrating Climate and Ecosystem Dynamics science program and the Southern Ocean Sentinel program, which is aimed at improving CCAMLR's management actions.

When considering the various measures that have been adopted to mitigate and adapt to the effects of climate change, it is important to keep in mind the vital role that Antarctic krill plays in supporting predators in this unique ecosystem. This is a critical element in food chains and the balance of the Antarctic ecosystem, as well as being an important fishery in the area.[378] Antarctic krill is an abundant and yet underexploited fishery resource, according to FAO.[379] In this regard, scientists like Phillips and Atkinson, have written about the importance of krill and the ecosystem modifications due to climate change in the Antarctic area. Most notably, they have pointed out that:

> "Antarctic krill is a cold water species, an increasingly important fishery resource and a major prey item for many fish, birds and mammals in the Southern Ocean. The fishery and the summer foraging sites of many of these predators are concentrated between 0° and 90°W. Parts of this quadrant have experienced recent localized sea surface warming of up to 0.2°C per decade, and projections suggest that further widespread warming of 0.27° to 1.08°C will occur by the late 21st century."[380]

In this context, due to climate change impacts, scientists have argued that marine resources management in CCAMLR's framework must be adaptive and proactive, for example, research needs to be intensified on lifecycle processes of Antarctic krill, under-ice and benthic habitat uses, species capacity to adapt to environmental changes, modifications in ecosystem functions, among others.[381]

Challenges and lessons learned in the CCAMLR experience

The following section will overview the challenges and lessons learned in the three main aspects mentioned previously: marine conservation, in close relation to marine protected areas, as well as fisheries and ocean acidification, main relevant topics in the CCAMLR experience.

a. Marine conservation

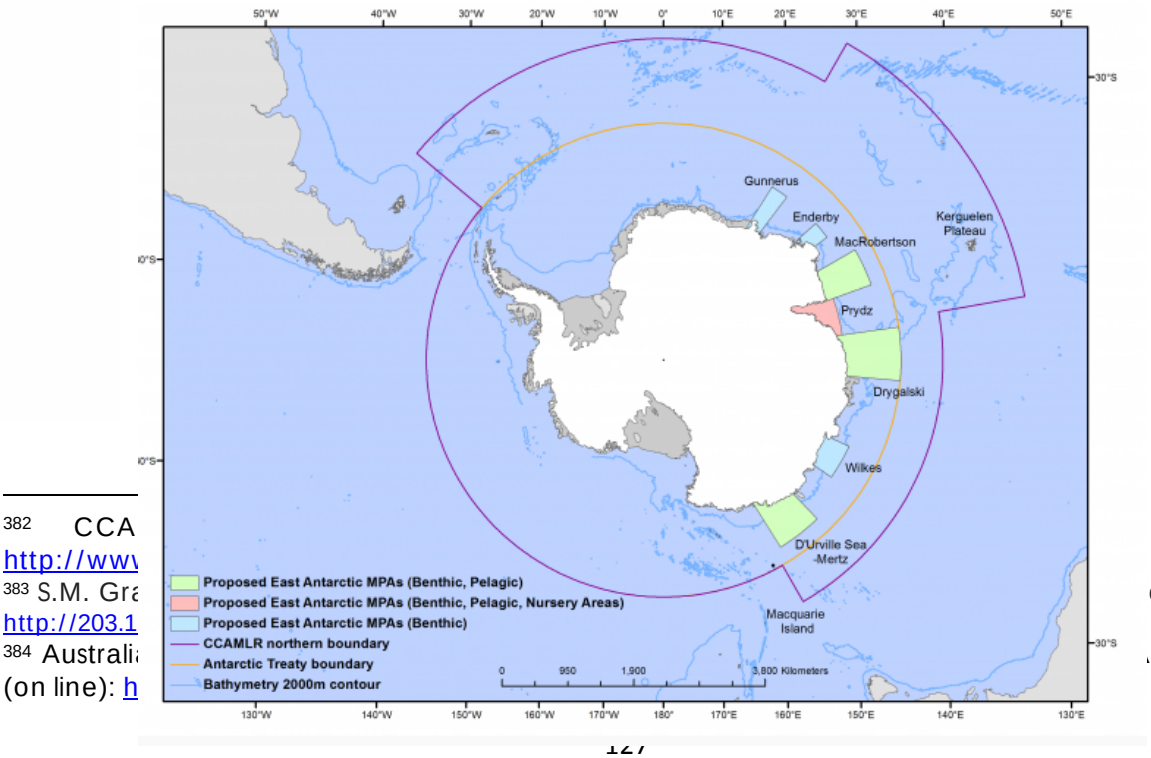
[378] FAO (2005) Review of the state of world marine fishery resources. Fisheries Technical Paper 457. Rome: FAO. 235 p.
[379] Ibidem.
[380] Hill SL, Phillips T, Atkinson A. (2013) Potential Climate Change Effects on the Habitat of Antarctic Krill. PLoS ONE 8.
[381] CCAMLR Commission. Antarctic krill and climate change. (on line): http://www.ccamlr.org/en/sc-camlr-xxx/bg/03

There is a lot to be learned from the CCAMLR approach to establishing MPAs and to protecting marine biodiversity. More specifically, CCAMLR has accomplished a number of goals and conservation measures for marine living resources in the Antarctica, such as pioneering protection of VMEs; as well as the establishment of a rigorous scientific processes to support MPAs in the Convention Area.[382] When reviewing the overall success of these measures it is also important to flag the development of ecological coherence which is largely achieved by the establishment of a representative system of Antarctic MPAs. Progress to date is quite impressive, as noted by S.M. Grant and P.N. Trathan who have pointed that:

> "There is one designated MPA managed by CCAMLR. In addition, the Antarctic Treaty Consultative Meeting has designated 6 exclusively marine Antarctic Specially Protected Areas, 4 of them with both marine and terrestrial components, and 3 Antarctic Specially Managed Areas with both marine and terrestrial components. A further 3 MPAs have so far been formally declared in those areas within the CCAMLR Convention Area that are managed under national jurisdictions."[383]

Despite these achievements, tensions are continuous and on-going particularly in relation to the creation of new MPAs. Thus, for example, as seen in previous sections, the current proposal to establish an MPA in the Ross Sea and the proposal of seven marine protected areas in East Antarctica (**Gunnerus**, **Enderby, MacRobertson, Prydz, Drygalski, Wilkes,** and **D'Urville Sea-Mertz** area) has provoked considerable debate and somewhat of an impasse within the CCAMLR framework.[384] In this context, and as mentioned before, the latest meeting of the CCAMLR Commission (32nd meeting in Hobart Australia, October 2013), again failed to agree on the establishment of new MPA in the Ross Sea and in the East Antarctica.

Figure 32. Proposal for a representative system of MPAs in the East Antarctic



[382] CCA line):
http://ww
[383] S.M. Gra on line):
http://203.1
[384] Australi ntarctic
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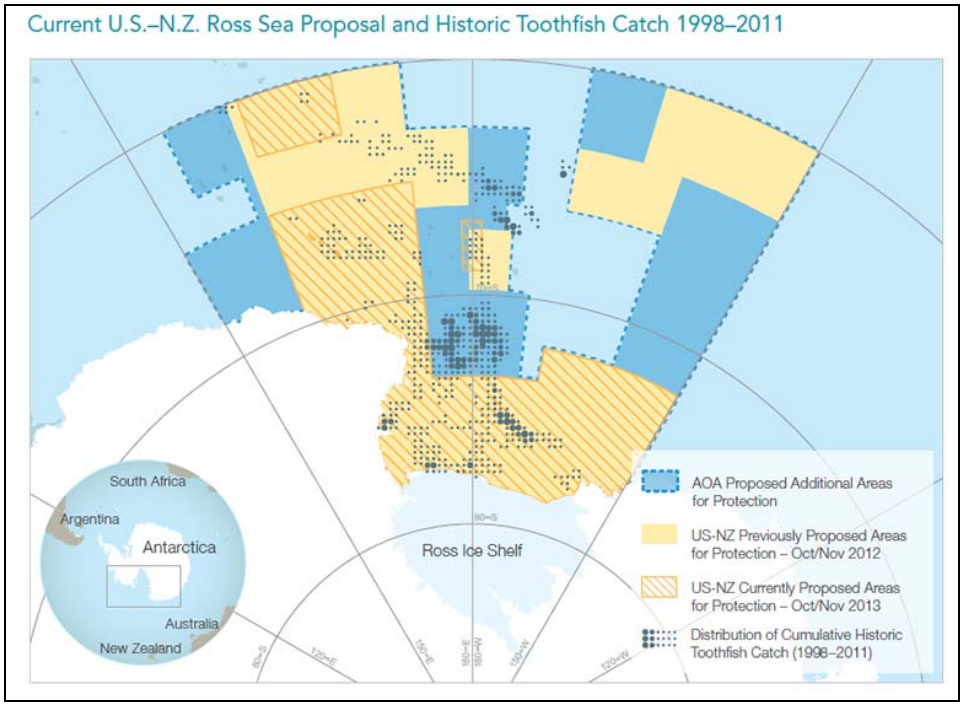
Source: Australian Antarctic Division [385]

Against this background, it is instructive to note that the Antarctic and Southern Ocean Coalition (ASOC), an environmental NGO, has pointed out that, the Ross Sea occupies 2% of the Southern Ocean but contributes 28% of total primary production and that this region in their view has disproportionate significance in terms of habitat protection. Accordingly, they have strongly advocated for the establishment of an MPA in this region which would ultimately ensure a comprehensive and representative network of MPAs in the Southern Ocean.[386]

Figure 33. Ross Sea MPA proposal



Source: The PEW Charitable Trusts.[387]

[385] Ibidem.

[386] Antarctic and Southern Ocean Coalition. The case for including the Ross Sea in a Southern Ocean network of MPAs. (on line): http://www.asoc.org/storage/documents/Meetings/CCAMLR/XXX/case_for_a_ross_sea_marine_reserve_cc-xxx-bg-23.pdf

[387] The PEW Charitable Trusts. The Case for a Marine Reserve in the Ross Sea. (on line): http://www.pewenvironment.org/news-room/fact-sheets/the-case-for-a-marine-reserve-in-the-ross-sea-85899459690

Overall, however, it should be said that even though the creation of these MPAs would mark a major marine conservation achievement, and a significant contribution to CCAMLRs objectives. These examples demonstrate the difficulties and challenges that regional frameworks have in relation to decision making processes by consensus, seeking to achieve a balance between environmental issues and fishing interests.

b. Fisheries management

Fisheries management in the CCAMLR experience could be categorized as one of the most developed and complete frameworks, based on the best available scientific information, and guided by the ecosystem-based and the precautionary approach. In general, the division of jurisdiction and management responsibilities is balanced and appears to work relatively well. Briefly stated, as seen in previous sections, the Commission agrees on specific conservation measures that determine the use of marine living resources in the Antarctic, and the Contracting Parties have the responsibility to implement these regulations.

In this context, some of CCAMLR's achievements in relation to fisheries management are summarized in Box 27 below:

Box 27. Successful Features of the CCAMLR Fisheries Management Scheme
• Recognized international at-sea scientific observer program.
• Management decisions take into account the impact on the ecosystem and the sustainability of fished resources.
• IUU fishing have significantly reduced due to a combination of surveillance, enforcement and market controls.
• Reduced incidental mortality of seabirds.[388]
• Use of a scientifically-based approach.[389]
• Adoption of a catch documentation scheme to prevent illegally caught fish entering the markets of CCAMLR nations.
• CCAMLR Members can only accept catches whose origins have been documented under the CDS Scheme.
• Enforcement of port State measures.
• CCAMLR conservation measures in relation to monitoring and compliance systems and tools.

There are a number of fisheries management measures in CCAMLR, however, that continue to pose problems and that require further actions. Most notably, illegal fishing remains a concern because it may involve the use of techniques and gears that impacts negatively non-target species as by-catch. Another specific and high profile example is the illegal toothfish fishery. Cooperation schemes has been established to control and minimize illegal catches including port State measures, improvement of the

[388] CCAMLR Commission. Conserving Antarctic Marine Ecosystems. (on line): http://www.ccamlr.org/en/system/files/flyer-eng.pdf

[389] Australian Antarctic Magazine. Southerly prospects: Antarctic science meets new challenges. (on line) http://www.antarctica.gov.au/__data/assets/pdf_file/0012/21171/aam-issue01.pdf

documentation scheme for legally catch fish, and reliance on trade measures, among several others.

Although CCAMLR is acknowledged as a successful regional management framework, there are nonetheless several areas where here is considerable scope for improvement. In particular, coordination and great effort is still needed from the Contracting and Non-Contracting Parties. The enforcement of conservation measures, monitoring and funding are main objectives to be achieved and consolidated through time. When viewed with the benefit of the various reports on the success of the CCAMLR regime, there are many lessons that can be applied to the CAD, particularly with a view to improving fisheries management. We will return to these lessons in the final chapter of this study.

c. Climate change and ocean acidification

The Scientific Committee on Antarctic Research has identified chronic impacts of climate change in the Antarctic Region. Some of these impacts are summarized in Box 28 below.[390]

Box 28. Climate change impacts in the Antarctic Region
• Long-term decreases in ice scour by icebergs, leading to decreased local but increased regional biodiversity.
• Physiological effect of direct warming, leading to geographic migration.
• Benthic responses to changes in the pelagic system, especially in the food web.
• Increased acidification, leading to skeletal synthesis and maintenance problems.
• Slight de-oxygenation of surface waters, ultimately leading to more serious de-oxygenation in deeper layers.
• The absence of wide latitudinal and environmental gradients around the Antarctic continent minimizes the advantage of migration for survival.

In general, it is absolutely vital that CCAMLR maintain and improve the ecosystem-based management approach, as well as the precautionary principle, to adapt its conservation measures for new environmental conditions in the Antarctica. Again, the scientific evidence is unequivocal with the Scientific Committee of Antarctic Research, pointing out that there has been a decline in krill stocks with an increase in phytoplankton.[391]

Also, the Scientific Committee has projected that surface ocean pH levels will become more acidic, approximately 0.2 to 0.3 units by 2100, which will impact negatively different species. For example, thinning of the aragonite skeletons of the pteropods (important part of the plankton at the base of the food chain); and also benthic

[390] Scientific Committee on Antarctic Research. Antarctic climate change and the environment. International Polar year 2007-2008. (on line): http://www.scar.org/publications/occasionals/ACCE_25_Nov_2009.pdf. Pg xxvi

[391] Ibidem. Pg xxv

calcifiers such as corals. In this context, scientists estimate that the Southern Ocean is at higher risk from these impacts because of its low saturation levels of calcium carbonate.[392]

Another issue to address is the evaluation on how further environmental changes might affect Antarctic krill, and consequently the biodiversity and ecosystem services of the Southern Ocean.[393] In this regard, authors like Kawaguchi (et al.) have indicated in relation to ocean acidification and its impacts on krill that, increased CO2 levels, increased mortality, reduced activity levels and fitness, caused moult cycle irregularities of post-larval krill.[394]

Furthermore, the CCAMLR Commission will have to develop and improve longer-term studies of acidification for the entire lifecycle of important species, considering specific studies about implications for non-calcifying organisms; impacts of ocean acidification on other biological processes, as well as the impacts of fishing on benthic organisms (including cold water corals) and the management of VMEs.[395]

Underpinning these issues, it is significant that CCAMLR Resolution 30/XXVIII called for additional management actions to help build resilience and protect the unique Southern Ocean environment against potentially irreversible impacts of climate change.

Conclusions

Marine conservation

The CCAMLR Convention complements the regulations established in the Antarctic Treaty and its Protocol on environmental protection, seeking for the comprehensive protection of the Antarctic environment and species. In this context, important management tools for marine conservation has been created in this framework, such as the Antarctic Specially Protected Areas and the Antarctic Specially Managed Areas, the protection of VMEs and the establishment of a rigorous scientific processes to support the designation of MPAs.

The development of a representative and comprehensive network of MPAs is one of the main goals of CCAMLR. In this context, two proposals to establish MPAs has been submitted to the CCAMLR Commission, a cluster of seven MPAs in East Antarctica, and the Ross Sea Region MPA. However, and despite the great ecological importance of these regions, CCAMLR Commission has failed to reach agreement due to some countries questioning the legality of the organization's ability to establish MPAs in ABNJ.

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[392] Ibidem.

[393] Hill SL, Phillips T, Atkinson A. (2013) Potential Climate Change Effects on the Habitat of Antarctic Krill in the Weddell Quadrant of the Southern Ocean. PLoS ONE 8.

[394] CCAMLR Commission. Impacts of ocean acidification on Antarctic krill biology. (on line): http://www.ccamlr.org/en/wg-emm-12/32

[395] CCAMLR Commission. Antarctic krill and climate change. (on line): http://www.ccamlr.org/en/sc-camlr-xxx/bg/03

This situation demonstrate the difficulties and challenges that regional frameworks have in relation to decision making processes by consensus, and makes evident the need of a new legal body to address a regime for MPAs in ABNJ.

Fisheries management

The CCAMLR experience could be categorized as one of the most developed and complete management frameworks, based on the best available scientific information, and guided by the ecosystem based principle, as well as the precautionary approach. In this context, CCAMLR classifies fisheries in five different categories, which have specific regulations. Bearing this in mind, the CAD case study ought to consider this fishery classification, to improve stocks management and support a more integral and comprehensive framework of action with current and future fisheries in that area.

Specific CCAMLR's achievements in relation to fisheries management are the following: recognized international at-sea scientific observer program; control and surveillance; market controls to reduce IUU fishing; adoption of catch documentation scheme; monitoring and compliance systems, among others. Further actions like coordination between Contracting and Non-Contracting Parties for the enforcement of conservation measures, monitoring and funding, are main tasks to be achieve in the CCAMLR case study.

Climate change and Ocean acidification

Due to climate change impacts, marine resources management in the CCAMLR framework must be adaptive and proactive, for example, research needs to be intensified on lifecycle processes of Antarctic krill, species capacity to adapt to environmental changes, modifications in ecosystem functions, among others.

CCAMLR needs to maintain and improve the ecosystem-based management approach, as well as the precautionary principle, to adapt its conservation measures for new environmental conditions in the Antarctica due to climate change, and to develop longer-term studies of acidification for the entire lifecycle of important species, as well as the impacts of fishing on benthic organisms and the management of VMEs.

Section B. The Sargasso Sea case study

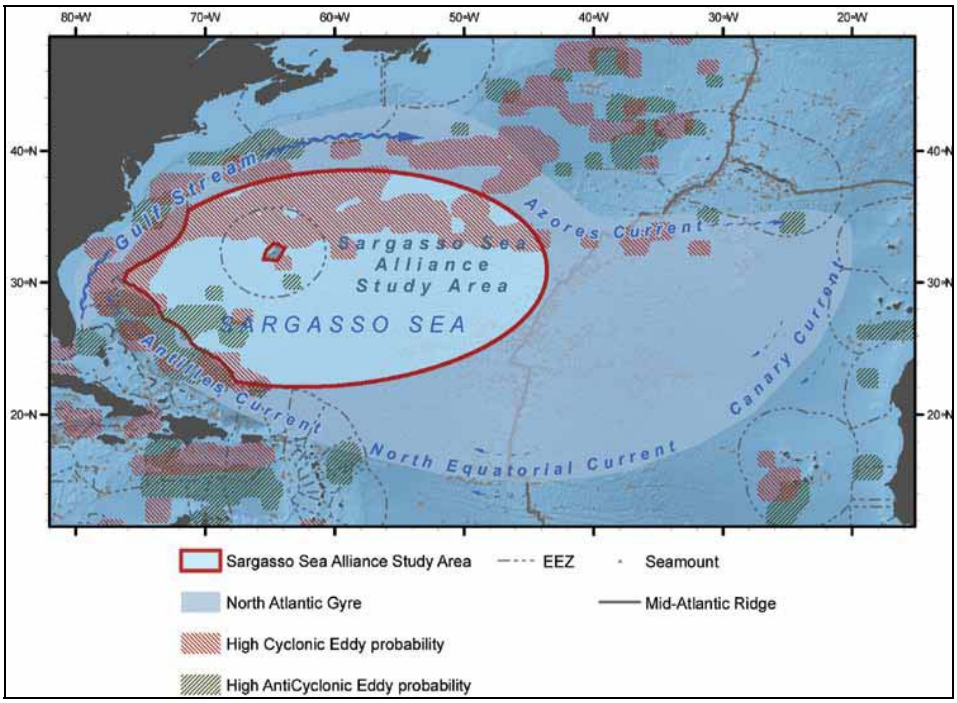
The aim of this section is to briefly describe the Sargasso Sea initiative, its geographical and environmental features, as well as the threats to the conservation of the marine resource and unique biodiversity of the region. Similar to other chapters, the analysis focuses on three predominate activities, marine conservation, fisheries and tourism, which have major economic and ecological significance within the region. This particular high seas management initiative is similar in many ways to the CAD case study. Accordingly, it is an excellent example of an evolving management regime that is applicable to areas both within and beyond national jurisdiction, which is relevant to the CAD. Indeed many of the lessons derived from the experience to date in the Sargasso Sea can be applied by policy experts when they are formulating management strategies and policy initiatives for their particular ocean regions.

Geographical and environmental features of the Sargasso Sea

The Sargasso Sea is a unique open-ocean ecosystem in the Atlantic, being the only sea on Earth without a land boundary. Considering this unique feature, other biological characteristics and oceanic conditions have been used to help define the sea's location. In this regard, and because of this exceptional condition, the Sargasso Sea's boundaries are defined by currents circulating around the North Atlantic sub-tropical gyre. More specifically, the Gulf Stream establishes the Sargasso Sea's western boundary; the North Atlantic Current defines its north boundary, while the Canary Current outlines the east limit, and the North Atlantic Equatorial Current shapes the south boundary (figure 34). As currents define the spatial area, the precise geographical limits of the Sargasso Sea are seasonally dynamic and its precise borders vary. Indeed, it shares this extraordinary geographical mobile characteristic with the CAD. Bearing this in mind, the Sargasso Sea at any given time is approximately 1126 kilometers wide and 3219 kilometers long (Conover and Seiburth 1964).[396]

Figure 34. Sargasso Sea boundaries defined by meandering currents

[396] McKenna, Sheila; Hemphill, Arlo. The Sargasso Sea. Global Ocean Biodiversity Initiative. (on line): http://www.gobi.org/Our%20Work/rare-2



Source: Ardron et al. 2011.[397]

The most outstanding scientific characteristic of the Sargasso Sea is the ecosystem supported by the *Sargassum* seaweed, a holopelagic[398], golden drift algae that aggregates to form extensive floating mats on the surface of the ocean.[399] This particular condition makes the Sargasso Sea the only area in the world to function as a center of distribution for a self-sustaining community of holopelagic drift algae, that gathered in enormous amounts of floating *Sargassum,* dominated by two species (*S. natans* and *S. fluitans)* [400] and creates its own ecosystem, an oasis for several species.

This unique condition of algae vegetatively reproducing independent of the benthos[401], is just known to happen in the greater subtropical and tropical North Atlantic, as indicated by Laffoley *et al*,

> "The Sargasso Sea is the only area of significant *Sargassum* distribution where it grows in truly open ocean, thereby providing a rare form of valuable habitat in deep open water far from land." [402]

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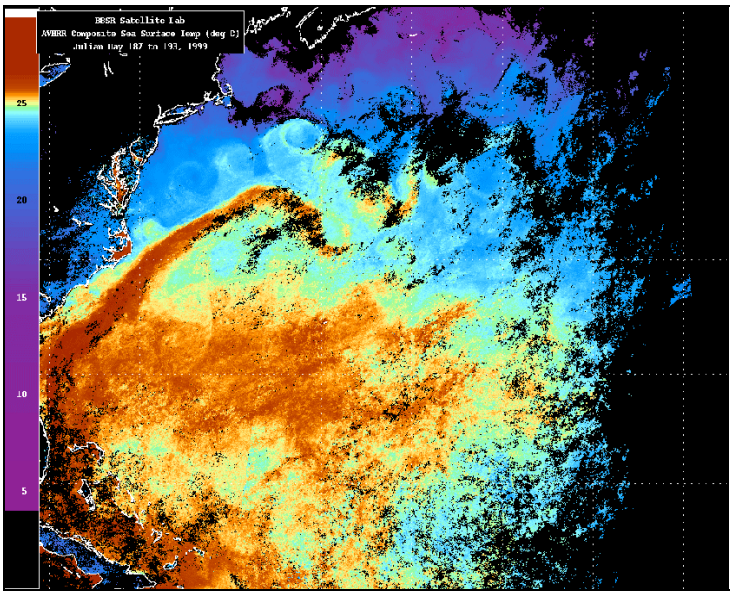
[397] Laffoley, D (et al.) The protection and management of the Sargasso Sea. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance, 44 pp. Pg 8.
[398] Meaning that the algae freely floats around the ocean, and reproduces vegetatively on the high seas. (on line): http://oceanservice.noaa.gov/facts/sargassosea.html
[399] Sargasso Sea Alliance. (on line): http://www.sargassoalliance.org/where-is-the-sargasso-sea
[400] McKenna, Sheila; Hemphill, Arlo. The Sargasso Sea. Global Ocean Biodiversity Initiative. (on line): http://www.gobi.org/Our%20Work/rare-2
[401] Ibidem.
[402] Laffoley, D (et al.) The protection and management of the Sargasso Sea. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance, 44 pp. Pg. 12

Picking-up on the same theme, McKenna and Hemphill have pointed out that the Sargasso Sea is a globally unique marine ecosystem, whose entire water column provides a range of critical services (e.g. habitats, migratory routes, spawning and feeding grounds) to a multitude of species including endemic, endangered and commercially important ones.[403]

Another exceptional characteristic of the Sargasso Sea is its pelagic and benthic features. In this area, productivity is increased by Gulf Stream eddies which transport colder, nutrient-rich water into the Sargasso Sea.[404] The different types of eddies create localized upwelling and downwelling, and impact the upper layers of the Sargasso Sea by mixing surface and deeper waters. This affects nutrients, heat and salinity which together create localized areas of high productivity,[405] as shown in figure 35. A similar oceanographic feature is present in the CAD, making these two areas highly productive and rich in biodiversity. This is another reason why due consideration must be given to similar management considerations for both ocean regions.

Figure 35. Sargasso Sea nutrient-rich water, sea surface temperature



The bright red color shows the warmer water of the Gulf Stream that defines the western boundary of the Sargasso Sea. Eddy/wind interactions pump deep nutrient rich water up to fuel plankton blooms in the Sargasso Sea increasing primary productivity (McGillicuddy et al. 2007). Source: Sheila A. McKenna and Arlo H. Hemphill.[406]

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[403] McKenna, Sheila; Hemphill, Arlo. The Sargasso Sea. Global Ocean Biodiversity Initiative. (on line): http://www.gobi.org/Our%20Work/rare-2

[404] Ibidem.

[405] Laffoley, D (et al.) The protection and management of the Sargasso Sea. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance, 44 pp. Pg. 24

[406] McKenna, Sheila; Hemphill, Arlo. The Sargasso Sea. Global Ocean Biodiversity Initiative. (on line): http://www.gobi.org/Our%20Work/rare-2

The **geomorphology** of the Sargasso Sea area is of major significance as it contains the New England Seamount chain and the Corner Rise Seamounts. Both provide a haven in the open ocean for marine life and have been extensively damaged by destructive benthic trawling by fishing vessels (Watling, Waller and Auster 2007, Shank 2010).[407]

From a biodiversity perspective it is also important to point out that the Sargasso Sea provides habitat, spawning areas, migration pathways and feeding grounds for different endemic, endangered, and commercially important species. These include unique communities of **endemic species**[408] have adapted to the Sargassum mats[409] As mentioned previously, these marine species have evolved unique shapes and color patterns that camouflage them among the Sargassum habitat.[410] McKenna and Hemphill have also indicated that several species have life-history patterns adapted to habitats unique to the floating *Sargassum* mats and have in turn adapting some of their characteristics to blend in with the algae.[411] In addition, the *Sargassum* is home to different small invertebrates and fishes. More than 145 invertebrate species have been documented in association with *Sargassum,* including molluscs, crustaceans and flatworms.[412]

Perhaps one of the most pressing biodiversity management issues in the region is the protection of nursery grounds of sensitive marine species in the region. Notably, within the region, there are nursery grounds of many different species of **turtles** including five Atlantic sea turtles that are on the IUCN Red List.[413] Hawksbill, green and loggerhead turtles use *Sargassum* mats as nurseries and this is scientifically documented as increasing their chances of survival at a life stage when they are vulnerable to predation (Carr and Meylan, 1980).[414] Also different species of **sharks and rays** benefit from the Sargasso Sea ecosystem, for example the whale sharks, tiger sharks, manta rays and spotted eagle rays (Hallett 2011, unpublished).[415]

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[407] Laffoley, D (et al.) The protection and management of the Sargasso Sea. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance, 44 pp. Pg 26

[408] Sargasso Sea Alliance. The Sargasso Sea: The floating rainforest of the North Atlantic. (on line): http://www.sargassoalliance.org/storage/documents/sargasso-leaflet.pdf

[409] For more information refer to Laffoley, D (et al.) The protection and management of the Sargasso Sea. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance, 44 pp. Pg. 13

[410] The PEW Charitable Trust. Bermuda's Rain Forest of the Sea. (on line): http://www.pewenvironment.org/news-room/other-resources/bermudas-golden-rainforest-of-the-sea-85899370586

[411] For more information refer to McKenna, Sheila; Hemphill, Arlo. The Sargasso Sea. Global Ocean Biodiversity Initiative. (on line): http://www.gobi.org/Our%20Work/rare-2

[412] Laffoley, D (et al.) The protection and management of the Sargasso Sea. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance, 44 pp. Pg. 13

[413] Sterrer, Wolfgang. The Sargasso Sea should be protected. (on line): https://bamz.org/files/ckimages/files/eBrochure%20March%202012_1.pdf

[414] Laffoley, D (et al.) The protection and management of the Sargasso Sea. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance, 44 pp. 16

[415] Ibidem. Pg. 14

The Sargasso Sea is a migratory pathway for many species that are on the CITES Annexes or the IUCN Red List of Threatened Species including the humpback whales, loggerhead sea turtles, whale shark, and the leatherback turtle, included most of them.[416] In this regard, the Wiatt Foundation has pointed out that:

> "The Sargasso Sea supports a range of endemic species and plays a critical role in supporting the life cycle of a number of threatened and endangered species such as the Porbeagle shark, the American and the European eel, as well as billfish, tuna and several species of turtle, migratory birds and cetaceans. There is emerging recognition of the crucial role it plays in the wider ecosystem ranging from the Atlantic to the Caribbean and the Gulf of Mexico." [417]

Also, a wide range of **cetaceans** benefit from the Sargasso Sea. At least thirty species of whales and dolphins have been recorded in this area, for example humpbacks use Bermuda's marine areas on their migrations, and the mid-ocean seamounts in the Sargasso Sea as feeding and aggregation sites before heading north (Stevenson 2011, unpublished).[418] In relation to these species, there are different conservation Treaties including the Convention on the Protection and Development of the Marine Environment of the Wider Caribbean Region (SPAW Protocol), require Caribbean countries to implement specific conservation measures to protect them.

There is considerable scientific evidence, which demonstrates that the Sargasso Sea provides a valuable ecosystem service to the international community by means of **carbon sequestration**.[419] Furthermore, the carbon dioxide time series in the Sargasso Sea have showed that ocean acidification is evident in the northwestern area, and suggest that the Sargasso Sea is a critical location for understanding global ocean acidification and its consequences at both regional and global levels. In particular, and being subject of long-term studies, the Sargasso Sea provides information on a changing ocean and its responses to climate change. [420]

Management and policy initiatives

One unique feature of the Sargasso Sea is the absence of a distinctive management regime similar to those that have been examined elsewhere in this study such as the regional cooperative regimes that are in place under the OSPAR, Barcelona and CCAMLR Conventions. Furthermore, as noted previously, many of these regional arrangements have evolved from agreements focused on addressing vessel source pollution into broader management approaches that are aimed at protecting and preserving marine ecosystems. There is however, an important management initiative

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[416] NOAA. The Sargasso Sea. (on line): http://oceanservice.noaa.gov/facts/sargassosea.html
[417] Waitt Foundation. Sargasso Sea Protection. (on line): http://waittfoundation.org/sargasso-sea-protection
[418] Laffoley, D (et al.) The protection and management of the Sargasso Sea. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance, 44 pp. Pg 26
[419] For more information refer to Laffoley, D (et al.) The protection and management of the Sargasso Sea. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance, 44 pp. Pg 27.
[420] Ibidem. Pg 29

underway to address this lacuna at a regional level pertaining the Saragossa Sea under the chapeau of the ***Sargasso Sea Alliance.***

The Sargasso Sea Alliance is a partnership led by the Government of Bermuda, in collaboration with scientists, international marine conservation groups and private donors, to promote the importance of the Sargasso Sea.

In 2009, the Government of Bermuda decided to improve the stewardship of their surrounding sea areas, including its EEZ and the high seas, together with marine and science organizations. Further meetings with international conservation agencies and marine institutions, lead to the creation of the Alliance in 2010.

The Alliance seeks to promote four key objectives:

- To build an international partnership that will secure recognition of the ecological significance of the Sargasso Sea and its threats.
- To use existing regional, sectoral and international organizations to secure a range of protective measures for the Sargasso Sea to address key threats.
- To establish a management regime for the Sargasso Sea.
- To use the process as an example of what can and cannot be delivered through existing institutions in areas beyond national jurisdiction.[421]

These guidelines aims to develop an international recognition of the Sargasso Sea, and to start the process of establishing appropriate management and precautionary regimes within existing agreements.[422] Clearly, they are also applicable to the CAD initiative and many important lessons can be derived from the process that can be applied elsewhere.

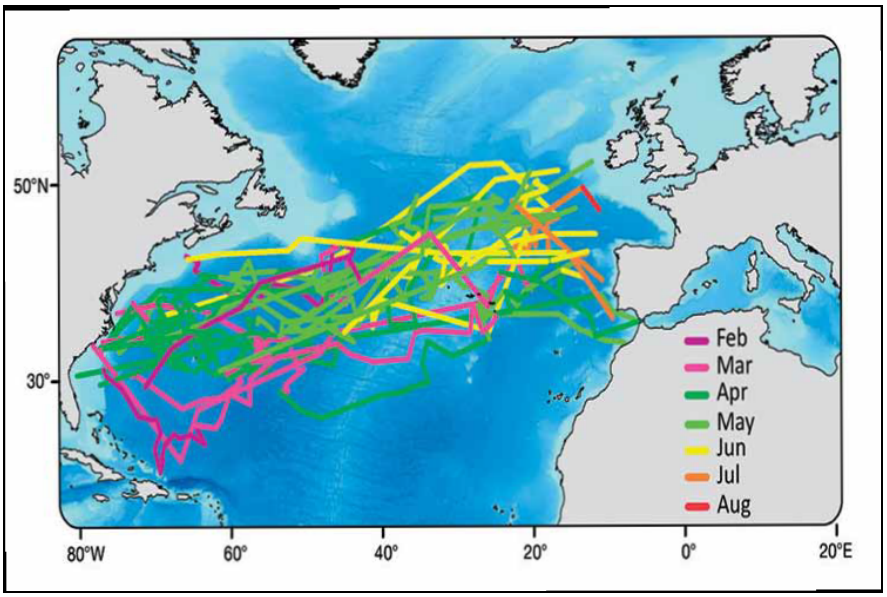
In a parallel initiative, other regional conservation measures are being launched with a view to protecting the unique biodiversity associated with the Sargasso Sea. For example, Bermuda's Government with the Pew Environment Group and Sylvia Earl, support the creation of a large marine reserve within Bermuda's EEZ, a project called the "Bermuda Blue Halo Initiative."[423]

Fisheries

The Sargasso Sea makes a significant contribution to the economies of Bermuda and other countries in the region. In this context, commercially important fisheries such as tuna (Bluefin, yellowfin and bigeye tuna), wahoo and billfish, are undertaken within the region (figure 36).

Figure 36. Transatlantic routes taken by tagged bluefin tuna moving from west to east

[421] Ibidem Pg. 6
[422] Ibidem Pg. 5
[423] Mission Blue. Dr. Earle advocates for Sargasso Sea conservation & Bermuda Blue Halo initiative. (on line): https://mission-blue.org/2012/06/dr-earle-advocates-for-sargasso-sea-conservation-bermuda-blue-halo-initiative/



Source: Wilson and Block (2009).[424]

As noted before, the Sargasso Sea is an ecosystem where floating patches of *Sargassum* act as fish habitat and as fish aggregating devices (FADs)[425], and several commercially important fish species spawn in this area, for example billfishes such as the White marlin (*Tetrapturus albidus*), the Blue marlin (*Makaira nigricans*), yellowfin tuna (*Thunnus albacores*), and the Albacore tuna (*Thunnus alalunga*). Another important specie is the porbeagle shark (*Lamna nasus*), which travels from Canada to give birth to live young, as well as Tiger sharks (*Galeocerdo cuvier*) which spend months in the Sargasso Sea waters.[426]

In light of the significance of fisheries to the region, this ecosystem provides an abundance of invertebrates and small fish, which are prey of many large species of fish of ecological and economic value, for example: swordfish (*Xiphius gladius)*, jacks (Carangidae), dolphinfish (Coryphaenidae), filefish and triggerfish (Balistidae), and driftfish (Stromateidae), amberjacks (*Seriola spp*.), rainbow runners (*Elagatis bipinnulata)*, dolphins (*Coryphaenus spp*.), barracudas (Sphyraenidae), mackerels, wahoo and tunas (Scombridae), and billfishes (Istiophoridae).[427]

The importance of this area should therefore not be underestimated as the Sargasso Sea supports important pelagic fisheries. Local and international fisheries benefit from the species caught in that area, for example in Bermuda, pelagic species like wahoo and yellowfin tuna dominate the local commercial fishery, and make up approximately

[424] Laffoley, D (et al.) The protection and management of the Sargasso Sea. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance, 44 pp. Pg. 15

[425] McKenna, Sheila; Hemphill, Arlo. The Sargasso Sea. Global Ocean Biodiversity Initiative. (on line): http://www.gobi.org/Our%20Work/rare-2

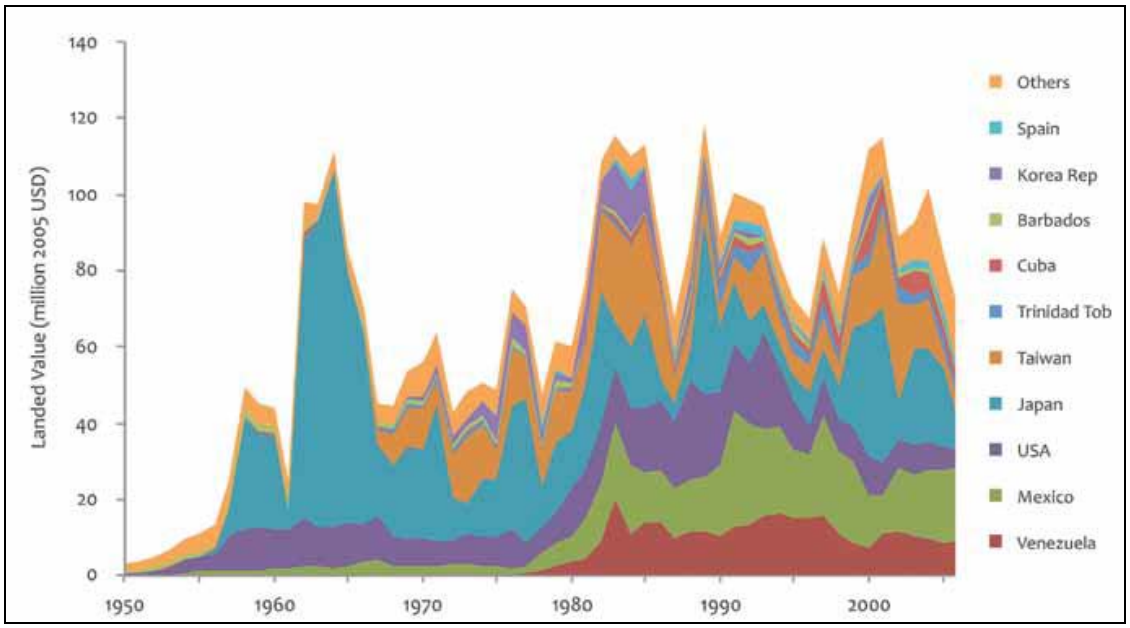
[426] Sterrer, Wolfgang. The Sargasso Sea should be protected. (on line): https://bamz.org/files/ckimages/files/eBrochure%20March%202012_1.pdf

[427] Laffoley, D (et al.) The protection and management of the Sargasso Sea. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance, 44 pp. Pg. 14

half of the total annual landings valued at around US$1.5 million per annum over the past decade (Bermuda Department of Environmental Protection 2011, pers.comm). [428]

As shown in the charts bellow (figure 37 and 38), fisheries represent considerable income percentages for various countries in the region.

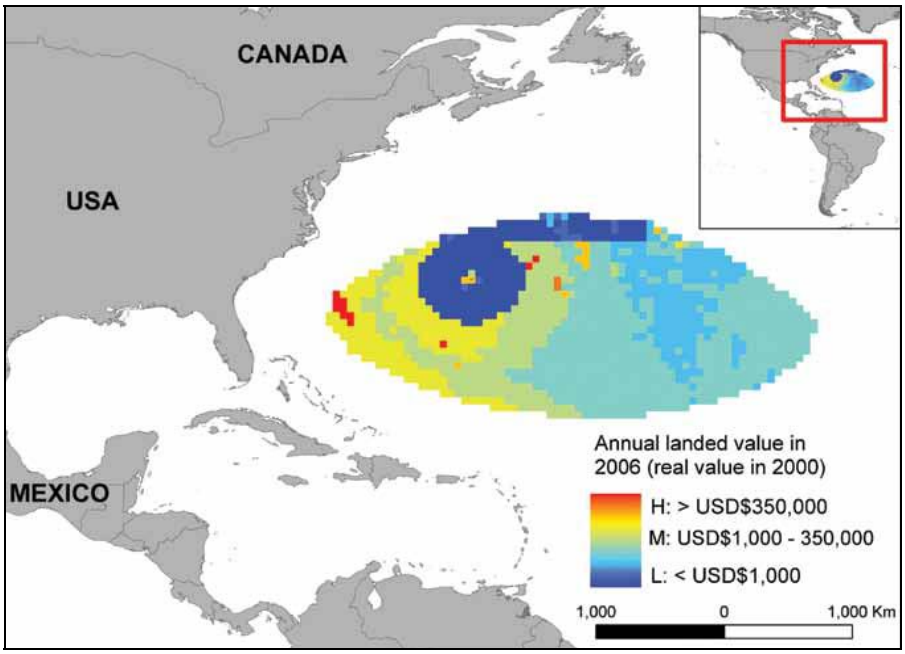
Figure 37. Sargasso Sea landed values by country of commercially caught fish



Source: Sumaila et al. 2011, unpublished.[429]

Figure 38. Spatial distribution of landed values of commercially caught species of fish in the Sargasso Sea

[428] Ibidem. Pg 30
[429] Ibidem. Pg 30.



Source: Sumaila et al. 2011, unpublished.[430]

In addition, there has been identified that the greatest values and largest catches are taken from High Seas areas in the western Sargasso Sea.[431]

Another important fishery dependent on the Sargasso Sea is the eels' fishery. It has been estimated that around 11,000 tonnes of eel that originate from the Sargasso Sea are caught each year in North America and Europe. This fishery generates resource rent of about $36 million a year. The resultant household income and economic impacts are estimated at over $60 million and $360 million a year respectively (Sumaila *et al*. 2011, unpublished).[432]

Even though eels may not be the most likeable of species, the Sargasso Sea is the only ocean region where the American and European eels spawn.[433] In this regard, Sterrer has pointed out that:

> "Both the European (*Anguilla anguilla*) and the American eel (*A. rostrata*), are born in the Sargasso Sea. After one to three years of travel, the larvae (glass eels) reach the shores of Europe and North America, respectively, where they are caught in huge numbers as they enter river estuaries, to migrate into freshwater streams and lakes."[434]

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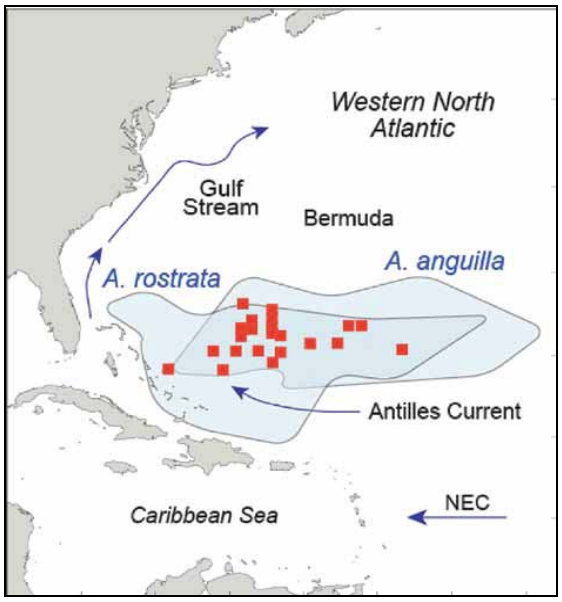
[430] Ibidem. Pg 31.
[431] Ibidem Pg 30.
[432] Ibidem. Pg 31.
[433] Freestone, David. Leadership on marine conservation has to begin at home. The royal Gazette. 2013. (on line): http://www.royalgazette.com/article/20131019/COMMENT/131019632
[434] Sterrer, Wolfgang. The Sargasso Sea should be protected. (on line): https://bamz.org/files/ckimages/files/eBrochure%20March%202012_1.pdf

Following on from this it needs to be noted that recruitment and populations of both eel species are in significant decline, with the European eel listed by CITES and classified by IUCN as 'critically endangered' and at increasing risk of global extinction. [435] In response, the European Union has established an eel recovery plan (EC 2007)[436], which requires Member States to reduce eel fishing efforts and to achieve a target escapement rates of adult silver eels from river basins in the coastal EU Member States. Likewise, Canada has introduced measures to regulate eel fishing and eel escapement back to the sea. [437]

Figure 39. Spawning grounds of the two Atlantic eel species in the Southern Sargasso Sea



Red squares indicate stations where small recently hatched larvae 7 mm or smaller of both species were collected together. Source: Miller and Hanel 2011 unpublished, adapted from McCleave, Kleckner and Castonguay (1987).[438]

In relation to inshore fisheries, there are many species including bermudians target groupers (Serranidae), parrotfish (Scaridae), grunts (Haemulidae), snappers (Lutjanidae), jacks (Carangidae), and triggerfish (Balistidae), that are dependent on the *Sargassum* ecosystem.[439] The latter provides a habitat for over 127 species of fish, of which at least 80 species have been recorded offshore.[440] Reef fishing and recreational

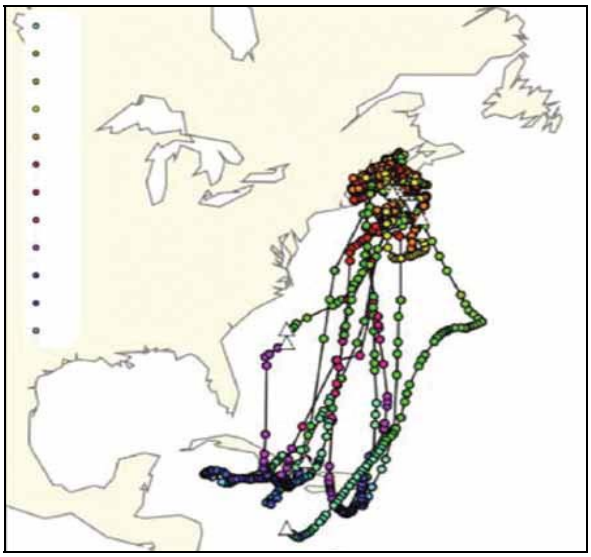
[435] Laffoley, D (et al.) The protection and management of the Sargasso Sea. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance, 44 pp. Pg. 22
[436] European Union. Council regulation (EC) No 1100/2007 of 18 September 2007. (on line): http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:248:0017:0023:EN:PDF
[437] Laffoley, D (et al.) The protection and management of the Sargasso Sea. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance, 44 pp. Pg. 23
[438] Ibidem. Pg. 23
[439] Ibidem. Pg. 11
[440] Ibidem. Pg. 13

fishing is of major economic significance and is estimated at a value of $5 million in 2007.[441]

As has been noted in the previous paragraphs, the Sargassum ecosystem is vital for many commercially important fish species, including bluefin, yellowfin and bigeye tuna. In this context, the United States of America established a Fishery Management Plan (South Atlantic Fishery Management Council 2002), which designated *Sargassum* as essential fish habitat (National Marine Fisheries Service 2003). In the same sense, ICCAT also recognized the importance of *Sargassum* as fish habitat and requested that Contracting Parties should assess the ecological status of *Sargassum* as habitat for tuna, billfish and sharks.[442]

The Sargasso Sea is an important habitat for Atlantic swordfish (*Xiphias gladius*). In this regard, commercial catches of this specie in the West Atlantic are focused on the Gulf Stream and associated frontal zones (ICCAT 2010)[443] as seen in figure 40.

Figure 40. Swordfish movements from satellite tags 2005 and 2006



Source: Neilson *et al.* (2009).[444]

In synthesis, and after taking a brief look to the most important fisheries related to the Sargasso Sea, it is vital to recognize the food security variable, which adds a major concern for the protection of this highly productive area.

Another important element to acknowledge is the role of the International Commission for the Conservation of Atlantic Tunas (ICAAT), as the competent RFMO in the Atlantic

[441] Ibidem. Pg 31
[442] Ibidem. Pg. 13
[443] Ibidem. Pg. 16
[444] Ibidem. Pg 18.

Ocean. Subsequently, its fisheries management regulations are applicable on the Sargasso Sea area.

ICCAT was established on 1966, by the Conference of Plenipotentiaries on the Conservation of Atlantic Tunas[445], and is responsible for the conservation of tunas and tuna-like species. Some of its main functions are to compile fishery statistics from its members and other entities fishing in the Atlantic Ocean, to coordinate research on stock assessment, develop scientific-based management advice, provide mechanisms for Contracting Parties to agree on management measures,[446] among other matters.

In this regard, ICCAT has signed an Agreement with FAO to ensure coordination and cooperation between both organizations, as well as consultation processes, mutual assistance and joint action in fields of common interest, particularly in respect to the collection and analysis of statistics, stock assessment and the formulation of conservation and management measures relating to tunas (Yellowfin, Bigeye, Bluefin, Skipjack, Bonito, Bullet, Frigate, King mackerel, Little tuna, Spanish mackerel) and tuna-like fishes (swordfish, albacore, billfishes) of the Atlantic Ocean.[447]

Specifically about the Sargasso Sea, ICCAT has established Resolution No. 05-11(2005)[448] on Pelagic Sargassum, which requests Contracting Parties to provide to the Sub-Committee on Statistics (SCRS) information about activities that impact pelagic Sargassum on the high seas, directly or indirectly, with particular emphasis in the Sargasso Sea. Thereafter, the SCRS should examine available and accessible data on the status of pelagic Sargassum and its ecological importance to tuna and tuna-like species, and propose recommendations to ICCAT.

Tourism

As in many regions of the world, ecotourism has been expanding in the Caribbean for the last years, and has been developing as an important income for populations in coastal and rural areas.

In the particular case of Bermuda, humpback whales support an increasing whale watching industry (Stone, Katona and Tucker 1987). In the Caribbean region (Antigua and Barbuda, Dominica, Dominican Republic, Grenada, Guadeloupe, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines), this activity has been estimated to be worth over $22 million annually. (O'Connor, Campbell, Cortez and Knowles 2009).[449]

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[445] ICCAT. (on line): http://www.iccat.int/Documents/Commission/BasicTexts.pdf. Pg 3.
[446] ICCAT. (on line): http://www.iccat.int/en/
[447] ICCAT-FAO. Agreement between the FAO and ICCAT. (on line): http://www.iccat.int/Documents/Commission/BasicTexts.pdf. Art. 1
[448] ICCAT. Resolution 05-11(2005). On line: http://www.iccat.int/Documents/Recs/ACT_COMP_2008_ENG.pdf#search="SARGASSO SEA". Pg. 198
[449] Laffoley, D (et al.) The protection and management of the Sargasso Sea. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance, 44 pp. Pg 32

Other species also contribute to the ecotouristic industry rising in the Caribbean, such as turtles and sea birds. Also important to take in consideration is the value of the reefs in the area, where a recent study (Beukering *et al*. 2010) has estimated the Total Economic Value (TEV) of Bermuda's coral reefs in $722 million, representing approximately 12% of Bermuda's GDP, after considering values for coral reef associated with tourism, fisheries, coastal protection, and cultural and recreational values. [450]

Bearing in mind the different ecosystem services that the Sargasso Sea offers to several species, it is clear that this area significantly contributes to regional and local economies,[451] and that a precautionary management and ecosystem based approach are needed to protect and manage the biodiversity associated with this unique sea.

Threats to conservation

The Sargasso Sea is a vulnerable ecosystem, exposed to multiple threats such as overfishing, climate change, ocean acidification, shipping pressures, accumulation of plastic and other pollutants,[452] as well as new proposals to harvest Sargassum seaweed for commercial-scale extraction and innovative uses.[453] All of these threaten the long-term uniqueness, viability and health of this unique ecosystem.[454]

As it could be derived from the previous sections, the Sargasso Sea is a key ecosystem for several species and economies of countries in the region, meaning that the potential loss of Sargassum algae habitat would signify the modification and loss of several endemic and threaten species.

The following paragraphs outline the principal threats to biodiversity and the resources that are found in the Sargasso Sea.

- ***Overfishing***

As is well known, fisheries around the world have declined significantly, and it isn't a surprised that this same condition is present in the North Central Atlantic, including the Sargasso Sea. There is clear and unequivocal scientific evidence of this decline. All targeted tuna and tuna-like species regulated by ICCAT are now for instance on the

[450] Laffoley, D (et al.) The protection and management of the Sargasso Sea. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance, 44 pp. Pg. 32
[451] Iidem Pg. 32
[452] Freestone, David. Leadership on marine conservation has to begin at home. The royal Gazette. 2013. (on line): http://www.royalgazette.com/article/20131019/COMMENT/131019632
[453] The PEW Charitable Trust. Ocean Global Legacy – Bermuda. (on line): http://www.pewenvironment.org/campaigns/global-ocean-legacy-bermuda/id/328701/overview/
[454] Waitt Foundation. Sargasso Sea Protection. (on line): http://waittfoundation.org/sargasso-sea-protection

IUCN Red List. This decline extends to fish lower down the food chain and lower in value (Pauly and Watson 2005, Pauly, Watson and Alder 2005).[455]

In this context, the International Commission for the Conservation of Atlantic Tunas has established management measures for different species of tuna, like the Bluefin, yellowfin and bigeye tuna. That said, catch limits have not been set for other species, known as "small tunas", which spawn in the Sargasso Sea (like the wahoo, Spanish mackerel and blackfin tuna.

Another management problem is the by-catch of species that are not main focus or target of the fishing industry. In this regard, gill nets are still used in the Sargasso Sea, and this type of gear is associated with high levels of by-catch.

There have been some positive developments, in relation to IUU fishing in so far as the recent controls on the trade of large pelagic species managed by ICCAT has shown a decline of IUU activity targeting these species.[456]

- ***Shipping***

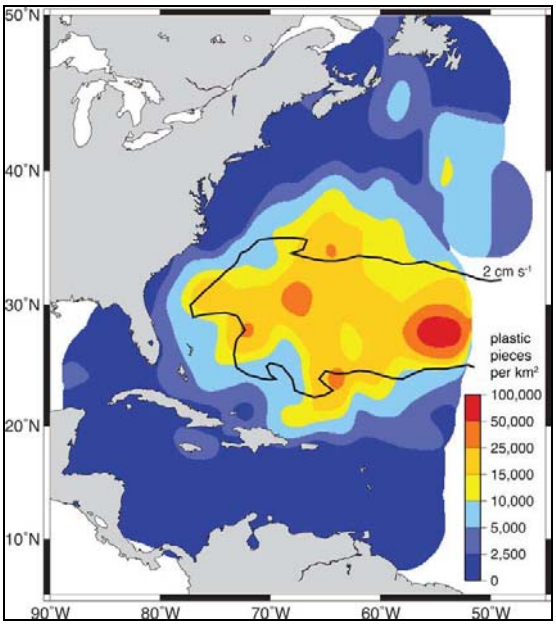
Busy international shipping lanes passes through the Sargasso Sea and these represent an environmental risk due to the discharge of harmful pollutants (sewage, oil, chemicals, and foreign organisms in ballast water) by transiting ships.[457] Specifically in the Sargasso Sea, oil and tar balls from ship discharges or accidents have historically been recorded. Also residues of petroleum and tar have been found in *Sargassum* and its species, like crabs, snails, and post-hatchling loggerhead turtles.[458] Noise pollution is another shipping related concern and the disturbance of cetaceans (Wright *et al*. 2009).[459] There is no specific evidence of the risk of noise pollution to well-being of cetaceans in the Saragossa Sea.

In contrast, the singular characteristic of the rotating gyre of ocean currents that defines the boundaries of the Sargasso Sea, has a collateral effect as well, collecting pollutants that remain trapped in the area for long time. Plastic pollution and high levels of persistent organic pollutants in the Sargasso Sea adds another level of risk if they are ingested by marine species (Rios, Moore and Jones 2007).[460] In this context, the North Atlantic "garbage patch" (figure 41) of accumulated plastic, is another threat that must be taken into consideration. Different impacts on marine species has been identified, like plastic eaten by turtles, seabirds and fish, which risks their wellbeing as a

[455] Laffoley, D (et al.) The protection and management of the Sargasso Sea. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance, 44 pp. Pg. 34
[456] Ibidem. Pg. 34
[457] Ibidem. Pg. 35
[458] Ibidem. Pg. 35
[459] Ibidem. Pg. 35
[460] Ibidem. Pg. 36

result of cumulative disposal of these materials in their environment and into their bodies[461]

Figure 41. North Atlantic garbage patch



Plastic density/km2 in the North Atlantic. Source: Wilber, 1987.

In a similar trend, oil drilling accidents are a significant threat for the Sargasso Sea including accidents such as the Gulf of Mexico IXTOC-1 oil spill in 1979 which impacted severely on the populations of marine turtles (Richardson & McGillivary, 1991).[462]

- ***Commercial extraction of seaweed***

Different uses for *Sargassum* weed had taken place in Bermuda, such as artisanal and commercial use as fertilizer and cattle feed. However, the commercial extraction of *Sargassum* algae may be a potential threat to the integrity of the Sargasso Sea ecosystem. Thus, for example industrial, medical and nutritional uses has been proposed, including applications as an antibiotic, antifungal and antifouling substance, also as a biofuel raw material, and the potential seabed mining in the area. With this in mind, new uses of *Sargassum* weed could radically increase pressures for large-scale exploitation and harvesting,[463] putting in risk the integrity and functionality of the Sargasso Sea.

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[461] Mission Blue. Dr. Earle advocates for Sargasso Sea conservation & Bermuda Blue Halo initiative. (on line): https://mission-blue.org/2012/06/dr-earle-advocates-for-sargasso-sea-conservation-bermuda-blue-halo-initiative/

[462] Mission Blue. The Sargasso Sea Hope Spot. (on line): https://mission-blue.org/2011/06/the-sargasso-sea-hope-spot/

[463] Laffoley, D (et al.) The protection and management of the Sargasso Sea. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance, 44 pp. Pg. 37

- ***Climate change***

Finally, climate change and ocean acidification are major threats to the ecosystems and species that inhabit the Sargasso Sea, which have adapted to this specific algae community. In this regard, the Sargasso Sea Alliance has indicated that the impacts on creatures that are full-time residents of the *Sargassum* community by climate change must be considered. Nearly 1500 fish species are visitors that lay their eggs in *Sargassum*, including more than 100 species of commercially harvested fish (Butler, et al., 1983; Casazza and Ross, 2008).[464]

Significantly, in light of the scientific findings of the Fifth IPCC Climate Change Assessment[465] the Sargasso Sea which has unique oceanographic singularities like the marine upwelling, may be impacted by climate change and ocean acidification, affecting consequently the species that depends on it, and the regional fishery and tourism industries that benefits from the Sargasso Sea.

The path towards sustainability and robust management measures

The Sargasso Sea's importance is derived from many unique factors including its interdependent ecological properties, its role in ocean processes, its socio-economic and cultural values, as well as its unique scientific properties.[466]

In this regard, further actions are being coordinated for the protection of the Sargasso Sea. One of them is the Hamilton Declaration on the Collaboration for Conservation of the Sargasso Sea, which is supported by the Government of Bermuda. The adoption of this Declaration in 2014, by Ministers from a dozen countries[467] representing many foreign governments. One of the first objectives is to establish an international Sargasso Sea Commission, based in Bermuda, to act as a custodian and steward for this exceptional area.[468] Clearly, it is too early in the policy process to judge the success of the measures outlined above that are underway in relation to the Saragossa Sea.

Nonetheless, as is evident from other case studies mentioned in this study, the development of an international legal framework to address marine conservation in areas beyond national jurisdiction is crucial and a major concern for States and several organizations. Moreover, as pointed out previously, the international legal regime for

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[464] Sargasso Sea Alliance. The Sargasso Sea: The floating rainforest of the North Atlantic. (on line): http://www.sargassoalliance.org/storage/documents/sargasso-leaflet.pdf

[465] IPCC. Working group I - Contribution to the IPCC fifth assessment report. 2013. Chapter 3 - Observations: Ocean Scientific-Technical Assessment. (on line): http://www.climatechange2013.org/images/uploads/WGIAR5_WGI-12Doc2b_FinalDraft_Chapter03.pdf Pg 7.

[466] Laffoley, D (et al.) The protection and management of the Sargasso Sea. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance, 44 pp.

[467] US, UK, Portugal and the Azores, the Dominican Republic, the Bahamas, Trinidad and Tobago, South Africa, The Netherlands, Belgium and Ireland.

[468] Freestone, David. Leadership on marine conservation has to begin at home. The royal Gazette. 2013. (on line): http://www.royalgazette.com/article/20131019/COMMENT/131019632

ocean governance in areas beyond national jurisdiction is insufficient, fragmented and riddled with loopholes.

Accordingly establishing an MPA in ABNJ for the protection of the Sargasso Sea would need to be supported by many other measures including protection measures from the sectoral treaties that regulate specific of activities in the Sargasso Sea, such as the fisheries; navigation or seabed mining. In addition, it will require scientific evidence to support the adoption of such protective measures, as well as political support to secure the participation from all States in the policy and management initiatives that are underway at a regional and multilateral levels. [469] In the interim, as noted above, while an international legal framework for the creation and management of MPAs in ABNJ is developed, Governments could build partnerships with international organizations, scientists, agencies and civil society to develop innovative ways to improve conservation in ABNJ. The Bermuda Government is an example to help guide other States to support this kind of initiatives.

Conclusions

The lessons that may be derived from the Saragossa Sea can undoubtedly be applied in other ocean regions, which lack a specific ocean management regime. As seen above, it shares many common features with the CAD. Most notably, the Sargasso Sea is a unique open-ocean ecosystem in the Atlantic with boundaries that are defined by currents that are seasonally dynamic. This unique characteristic is also of crucial importance in defining the spatial extent of the CAD, where the maritime boundaries are also ambulatory in a scientific sense. Moreover, the Sargasso Sea is incredibly diverse in so far as it provides habitats, spawning areas, migration pathways and feeding grounds to different endemic, endangered, and commercially important species. This is the second feature that it shares in common with the CAD.

One of the most interesting aspects of the management regime that is evolving is its very broad constituency. More specifically, the development of an international recognition of the Sargasso Sea has been supported by the Sargasso Sea Alliance, a partnership led by the Government of Bermuda, in collaboration with scientists, international marine conservation groups and private donors, to promote the importance of the Sargasso Sea. Furthermore, there is considerable scope for greater engagement with civil society due to economic significance of the marine resources in the region. As seen above, local and international fisheries benefit from the species caught in the Sargasso Sea. For example, in Bermuda, pelagic species total annual landings are valued at around US$1.5 million annually. Another important fishery sustained by the Sargasso Sea ecosystem is the North American and European eels' fishery, generating about $36 million annually. Similarly ecotourism has been increasing in the Caribbean, and has been developing as an important income for populations in

[469] Sargasso Sea Alliance. Management and enforcement. (on line): http://www.sargassoalliance.org/management-and-enforcement

coastal and rural areas. In the particular case of Bermuda, humpback whales support a growing whale watching industry.

The Sargasso Sea as a unique and vulnerable ecosystem is exposed to multiple threats. The most important threats identified above include the following: overfishing (all targeted tuna and tuna-like species regulated in the area are on the IUCN Red List, and fisheries have progressed from high value bluefin tuna to fish lower down the food chain and lower in value); shipping (busy international shipping lanes represent risks in relation to discharges of pollutants, as well as noise pollution); pollution (plastic pollution and high levels of persistent organic pollutants); commercial extraction of *Sargassum* algae (industrial, medical and nutritional uses, biofuel, seabed mining); climate change and ocean acidification (oceanographic singularities may be impacted).

The International Commission for the Conservation of Atlantic Tunas (ICAAT) is the competent RFMO in the Atlantic Ocean, subsequently, its fisheries management regulations are applicable on the Sargasso Sea area. Specifically about the Sargasso Sea, it has established Resolution No. 05-11(2005)[470] on Pelagic Sargassum, which requests Contracting Parties to provide to the Sub-Committee on Statistics information about activities that impact pelagic Sargassum on the high seas, and further measures could be taken to protect its ecological importance to tuna and tuna-like species.

[470] ICCAT. Resolution 05-11(2005). On line: http://www.iccat.int/Documents/Recs/ACT_COMP_2008_ENG.pdf#search="SARGASSO SEA". Pg. 198

Proposal for establishing a regional management framework for the CAD

Drawing from the various case studies presented in this study, the aim of this section is to highlight the most important actions that can be taken within a legislative and policy framework by countries within the region, and to propose some actions that could be applied to the CAD by the organizations that are responsible for marine governance scheme within the region.

1. Marine Conservation and MPAs

The conservation and sustainable use of marine resources in areas beyond national jurisdiction is not yet fully regulated by one uniform multilateral agreement, as mentioned in previous sections, but there are many elements already in place under UNCLOS, the CBD, the 1995 FAO Fish Stocks Agreement, the FAO Compliance Agreement, the FAO Port State measures, among others. In this regard, the lack of a single and coherent institutional and legal framework for the conservation and management of the different activities in ABNJ, represents some difficulties for the CAD as it results in a complex governance matrix that is sometimes undermined by sectorial management approaches to different maritime activities.

In this context, and specifically about MPAs, it is well known that they are an essential in situ conservation tool to improve resilience in marine ecosystems, and to respond to overfishing, pollution, climate change and ocean acidification.

The creating process of MPAs in ABNJ has been approached differently by the regional frameworks studied in previous chapters. Thus, for example, within the OSPAR case study, it requires the collective agreement of Contracting Parties who must agree by consensus to the proposed management measures. However, the CCAMLR experience has shown that decision making process which depends on consensus can be easily undermined as seen in relation to the arguments about the legality of CCAMLR's ability to establish marine protected areas in ABNJ such as the Ross Sea MPA and the East Antarctic MPAs. In this regard, regional frameworks have shown that there are considerable difficulties and challenges that must be overcome in relation to a management structure that relies on decision making processes by consensus. This is clearly a major consideration for the Central American countries that are reflected upon the most appropriate management and governance scheme for the CAD.

Nonetheless, the creation of an MPA covering the CAD (or perhaps a network of MPAs) should be supported by a regional Agreement within the Central American Integration System (SICA). This appears to be the most appropriate regional body competent to set out this legal framework. In this regard, the OSPAR, CAMLR and Barcelona Convention experiences have shown that specific Protocols to address particular environmental matters are a successful mechanism to achieve specific policy objectives. Such a protocol could for example set out the process for the creation of a

regional MPA, as well as the criteria for identifying human activities and its impacts to the marine environment. Moreover, flexible instruments such as Memorandums of understanding are another useful tool that can be applied prior to agreement on more binding legal instruments. In particular, there appears to be considerable scope for the agreement of MOUs between CCAD, OSPESCA and CIAT, with respect to regional MPA arrangements, as well as with regional bodies that have complementary competences in fisheries management and environmental protection.

There are many geographical factors that have a bearing on the most appropriate governance and management structure for the CAD. In particular, it must be noted that Costa Rica has an extended continental shelf and should due course be making a submission[471] under article 76 of UNCLOS to the CLCS. Accordingly, similar to Portugal within the OSPAR case study, any such submission or indeed the existence of extended continental shelf will have a major bearing on any future designation of MPAs in or at areas that are adjacent to the CAD.

CCAD could also develop guidelines regarding the management of regional MPAs, accountability measures, management plans, evaluation tools, and the requirement of annual reports from the Central American countries' focal points. In this context, the Ministries of Environment from each country are the designated focal points within the CCAD framework, and they could act like the Regional Activity Centres, created under the Barcelona's Convention framework, to ensure the enforcement of recommendations at the national level.

Other tools such as spatial management of protected areas, like the ones developed and applies within the CCAMLR case study (Antarctic Specially Protected Areas and the Antarctic Specially Managed Areas) are cogent examples that can be adapted and replicated in the CAD. In this context, further conservation measures based upon the CCAMLR experience could include all or some of the following: protected species; quantity of any species which may be harvested; opening and closing of areas scientific study or conservation.[472]

Another useful instrument is the creation of lists which identifies specially protected areas and threatened species, like the Barcelona's Convention List of Specially Protected Areas of Mediterranean Importance (SPAMI's List). These lists could also help raise public awareness and use of "umbrellas" species to protect whole ecological communities, similar to the Pelago's MPA in the Mediterranean Sea. Significantly the latter example demonstrates the utility of using voluntary measures in this particular instance by three governments (France, Italy, Monaco), which are aimed at to minimizing the environmental impacts on the area. Likewise, the Sargasso Sea Alliance, a partnership led by the Government of Bermuda, in collaboration with scientists, international marine conservation groups and private donors, work towards the protection of this unique marine ecosystem. In this regard, similar lobby processes could

[471] Costa Rica has submitted a preliminary information note, for more information refer to: http://www.un.org/depts/los/clcs_new/submissions_files/preliminary/cri2009informacion_preliminar.pdf

[472] For more detailed measures refer to Part II. Chapter 2. Section A. The CCAMLR experience.

be address within the Central American countries, specifically as part of the CCAD and OSPESCA regional agendas.

2. Fisheries management

There are significant commercial fisheries in the CAD and fishing activities are an important source of employment and wealth for economies within the region. As is well known, however, UNCLOS only makes general reference to straddling and highly migratory stocks and does not set down a fully comprehensive regulatory scheme for the management of such fisheries. Subsequently, many of the issues concerning the conservation and proper management of these stocks are addressed in the 1995 Fish Stocks Agreement, which is an implementing Agreement under UNCLOS, as well as within the FAO Compliance Agreement, the FAO Port State measures, and FAO Code of conduct for responsible fisheries. Also important to take into consideration is the fact that if a fisheries management arrangement is going to be settled by a group of States, it must meet the specific requirements of the Fish Stocks Agreement[473]. In this context, non-participant States are not discharged from the obligation to cooperate in the conservation and management of such stocks.[474] Moreover, there is considerable emphasis in international agreements on the use of the precautionary principle and ecosystem-based management as key normative tools in fisheries management. In particular, the implementation of the ecosystem approach must be applied requires the adoption of an integrated and holistic approach to the regulation of marine

resources, marine activities, control of land-based and maritime sources of pollution,

integrated coastal zone/ocean management, as well as adaptive management solutions to particular sensitive or challenging issues.

Fisheries management measures are already well established in several of the case studies examined above and some of these may be replicated for the CAD, utilising the SICA and CIAT frameworks. Instructively, the most relevant measures taken within the OSPAR region by NEAFC and the EU as the competence bodies, include the following: area-based measures including closed areas, marine protected areas and gear management areas; fleet reduction including the removal of subsidies to increase capacity, and monitoring programmes for undersized fish and banned species in catches.[475]

Meanwhile, fisheries management measures established for the Mediterranean region under the EU, GFCM and ICCAT frameworks include the following: limiting fishing effort;

[473] 1995 Fish Stocks Agreement. Article 9, 10.
[474] 1995 Fish Stocks Agreement. Article 17, 33.
[475] For more detailed measures refer to Part II. Chapter 1. Section A. The OSPAR experience.

establishing incentives to promote more selective or low impact fishing; zones and/or periods in which fishing activities are prohibited or restricted, among others.[476]

Again as is evident from, the CCAMLR case study, there are different management measures, designed to ensure that fishing does not expand faster than the acquisition of information necessary to ensure that each fishery meets long-term management objectives. Examples of such an approach include the following: regulations on fishing effort, harvesting methods, and fishing gears; fisheries classification in five categories with a particular management approach; specific measures to address IUU vessels; notification system for transhipment operations; scientific observer program, among the most important.[477]

The Memorandums of Understandings are another example of a coordination tool which allows regional organisations to work together. The Barcelona Convention has various examples of MoU on cooperation on fisheries and biodiversity preservation in the Mediterranean region, as well as OSPAR and CCAMLR. In this regard, it must me pointed out that in the Central American framework, MoU between CCAD, OSPESCA and CIAT are already in place, but additional ones could address specific matters in relation to other management schemes for the CAD, particularly those that are established to give effect to an ecosystem-based management approach.

- *Control & Surveillance*

In regards to control and surveillance, OSPAR, the Barcelona Convention and CCAMLR Contracting Parties have improved port State measures, complying with the provisions of the FAO Port State measures Agreement. Also, these three regional bodies have established public lists of IUU fishing vessels, as part of a naming and shaming process. Likewise, CIAT has established the process for the publication of a list of vessels presumed to have carried out IUU fishing activities, being this particular action the consolidation of one of the measures established in the FAO Port State measures Agreement on the Eastern Pacific region.

Another operational measure that could be adopted is the mandatory installation of remote monitoring systems on all fishing vessels. Such as a requirement is similar to the one imposed in, CCAMLR, which sets down specific requirements regarding satellite-linked vessel monitoring device, as well as the obligation for masters and owners/licensees of fishing vessels to ensure that the vessel monitoring device is at all times fully operational. In a similar way, CIAT has established a vessel monitoring system (VMS) applicable to tuna-fishing vessels which are 24 meters or more in length, and Parties must submit specific data to the designated authorities.

- *Trade measures*

[476] For more detailed measures refer to Part II. Chapter 1. Section B. The Barcelona Convention case study.
[477] For more detailed measures refer to Part II. Chapter 2. Section A. The CCAMLR experience.

The use of trade measures that ensure the traceability of fish products and the promotion of responsible consumption could improve fisheries management. In this subject area, several regional bodies have developed an eco-labelling and certification program for sustainable fisheries.

Meanwhile, in relation to the Mediterranean Sea, GFCM has established that fisheries products shall only be sold from a fishing vessel to registered buyers or at registered auctions. In addition, where a minimum size has been fixed for a given species, operators responsible for selling, stocking or transporting must be able to prove the geographical origin of the products.

In CCAMLR, importers and transporters should avoid dealing with transhipping of fish caught by vessels on the IUU vessels list. Another measure in place is a catch documentation scheme which applies to landings, transhipments, imports, exports or re-exports of a particular specie, which facilitates the traceability of the fish products and helps prevent illegally caught fish entering the markets.

In the Central American countries, OSPESCA and CIAT could adopt similar measures to improve fisheries management in the region, and undertake resolutions to promote stricter controls to made progress with traceability of fish products caught in the CAD, and with a view of encouraging the creation of a certification or eco-labelling regional programmes of fish products.

3. Climate change and ocean acidification

Global warming, ocean acidification are some of the factors that are changing production patterns, and altering species distribution and abundance in the marine environment. Scientific information from the OSPAR experience indicates that there is likely to be shifts and changes in fish distribution and abundance, given that climate change and ocean acidification will modify either the distribution of species in the natural environment, as well as human activities regarding uses of marine living resources. In this regard, the development of modelled scenarios of potential impacts, methodologies and indicators to monitor and assess the progression of climate change impacts at regional scales is one of the main challenges faced by OSPAR and other regional seas bodies.

Significantly, under the Barcelona Convention framework, the Mediterranean Sea Acidification project created the Mediterranean Reference User Group, as an advisory body, which brings scientists, managers, industry, policy-makers together to participate and work on the communication of information to the end-users audiences in the Mediterranean Region. One of the most important characteristics of this group's work is that the information is focused and adapted to different audiences. Also, in close relation to scientific support for decision makers, the Regional Activity Centre for Specially Protected Areas established a bibliographic database and a working group to analyse the vulnerability and impacts of climate change on the Mediterranean biodiversity. This specific approach different audiences could be taken

into consideration by the CCAD, to address climate change and ocean acidification as it applies to the CAD.

The importance of further scientific studies cannot be overemphasised. Notably, in CCAMLR, Contracting Parties are requested to contribute towards science initiatives, as well as to develop and improve long-term studies of acidification for the entire lifecycle of important species, and the evaluation on how further environmental changes might affect the Antarctic species and ecosystem services. Similarly, the Sargasso Sea experience points out that climate change and ocean acidification are major threats to the ecosystems and species that inhabit that unique ecosystem, which have adapted to this specific algae community.

Finally, it must be pointed out that marine resources management must be adaptive and proactive, and management actions to help build resilience and protect marine biodiversity have to be taken within the Central American region. In this context, CCAD, OSPESCA and CIAT should take the lead by taking firm actions and measures that are aimed at the conservation and management of marine resources in the CAD.

4. Area based management tools

As seen in preceding chapters, area based management tools have been developed under the auspices of the different United Nations Agencies, as well as the regional seas bodies. Undoubtedly such tools could be applied to the CAD. There has been some progress in this regard and the CAD has been submitted to the EBSAs identification process in 2012. Moreover, this particular process has been supported by Non-Governmental Organizations, such as MarViva Foundation and Mission Blue, who recognize the CAD as a 'Hope Spot' and acknowledge its importance as a critical regional for the health of the eastern Pacific Ocean. If the CAD is designated as an EBSA by CBD CoP, its ecological importance will be further highlighted at an international level, but as noted above this will not in itself lead to the automatic creation of an MPA in the area.

Also, the Regional Seas Programme and the Large Marine Ecosystems framework provide useful tools for the implementation of an ecosystem based management approach that could be applied to the CAD. In this context, it is worth proposing the CAD initiative as a suitable project for additional support from U.N agencies with a view to addressing conservation and sustainable use of marine resources, as well as to protect this complex marine environment.

On the FAO framework, the identification of VMEs in the CAD could also lead to the adoption of protection measures and additional regulations. As mentioned previously, if a VME is identified under jurisdictional waters, the specific Central American country will be the one to apply the measures, but if the VME is located in ABNJ, the Inter-American Tropical Tuna Commission, being the competent RFMO in such area, will be the competent organization to adopt such conservation measures.

Finally, in regards of any proposal for the establishment of a PSSA in the CAD, it could be submitted by two or more States with a common interest in a particular area, to be followed by protective measures, such as re-routing of vessels, special discharge restrictions, reporting systems, among others. In the regional framework, COCATRAM is the obvious regional entity that is capable of supporting the Central American countries through the application of this area based management tool.

Conclusions

After the identification of the most important conservation and management measures taken within the four case studies analyzed in this study, the following conclusions highlights the main elements that could be applied to the CAD.

Even though some regulations about conservation and sustainable use of marine resources in ABNJ are under UNCLOS, and other international Treaties, the lack of a single and coherent institutional and legal framework represents some difficulties for the CAD, as it results in a complex governance matrix, which could be undermined by sectorial management approaches to different maritime activities.

The creating process of MPAs in ABNJ has been approached differently by the regional frameworks studied, but agreements by consensus have been the most popular way, being also easily undermined. Nonetheless, the creation of an MPA covering the CAD, or a network of MPAs, should be supported by a regional Agreement within the SICA. In addition, it is important to point out that Costa Rica has an extended continental shelf and has submitted preliminary information to the CLCS, and it will have a major bearing on any future designation of MPAs in or at areas that are adjacent to the CAD.

Flexible instruments such as MoUs are another useful tool that can be applied prior to agreement on more binding legal instruments. In the regional scope, CCAD, OSPESCA and CIAT could agree with respect to regional MPA arrangements, fisheries management and environmental protection. Other useful tools that could be implemented in the CAD are spatial management of protected areas, guidelines regarding the management of regional MPAs, creation of lists which identifies specially protected areas and threatened species.

International agreements call for the implementation of the ecosystem-based management and the precautionary principle in fisheries management. In this context, fisheries management measures established in the case studies may be replicated for the CAD, utilizing the SICA and CIAT frameworks. Specifically in relation to control and surveillance, the improvement of port State measures, the establishment of public lists of IUU fishing vessels, the mandatory installation of VMS, and stricter controls in traceability of fish products, are useful tools to improve the effectiveness of conservation measures.

Global warming and ocean acidification are changing production patterns, and altering species distribution and abundance in the ocean. It must be pointed out that

marine resources management must be adaptive and proactive, and management actions to build resilience and protect marine biodiversity have to be taken within the regional frameworks, including the CAD.

Area based management tools have been developed under the auspices of different United Nations Agencies, as well as the regional seas bodies. In this regard, such tools (EBSASs, VMEs, PSSAs, specific projects within the Regional Seas & LME) could be applied to the CAD.

Conclusions

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