A thesis submitted to the Department of Environmental Sciences and Policy of Central European University in part fulfillment of the Degree of Master of Science

"The Socio-Eco-Political Tangle Behind MPAs. The Challenge of Defining Success"



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1. Abstract of thesis submitted by:

Mariana MATA LARA for the degree of Master of Science and entitled: *The Socio-Eco-Political* tangle behind MPAs. The challenge of defining success.

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Marine Protected Areas (MPAs) are considered the most important and widely used tool for managing marine resources and for achieving conservation goals. Even though there is a world's target of designating MPAs that cover 10% of the oceans, its implementation is lagging behind for several reasons including the number of ineffective MPAs in existence worldwide. As a result, several guidelines and studies have focused on evaluating the success of MPAs based on their management practices. But a successful MPA may not necessarily need to be attributed only to its design and management, but also to its contextual factors. As each location has its own history and its unique social, economical, cultural, political and ecological contexts, the definition of success might vary for every place according to its different limitations, pressures and mainly the interconnections of the elements of the system (actors, rules, species, actions, etc.). Therefore, in order to understand how the contextual factors can influence the positive environmental outcomes of a MPA, this work analyzes the socio-economic, cultural and political local contexts of two marine reserves immersed in radically different conditions: the Ojo de Liebre Lagoon Complex in Baja California Sur, Mexico and the Channel islands National Marine Sanctuary in California, USA. A description of the elements that these MPAs should have in order to achieve success was compiled using the different stakeholders' perceptions. The work concludes with the description of the contextual factors that have helped each MPA to achieve positive environmental outcomes and it highlights the key elements that need to improve for fulfilling all the characteristics required for succeeding according to their actors.

Keywords: socio-economical, political, governance, context, MPAs, marine, protected, areas, Mexico, USA, Channel Islands, Vizcaíno, CINMS, REVIBI, success.

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Table of Contents

1. ABSTRACT OF THESIS	V
2. INTRODUCTION	1
3. METHODS	5
3.1 SOCIO-ECONOMIC AND MANAGEMENT INDICATORS	5
3.2 STAKEHOLDERS SUDVEY	5
2.2 WED DAGED TOOLG	0
3.3 WEB BASED TOOLS	ð
3.4 INTERCONNECTIONS' DIAGRAM	8
4. BACKGROUND	9
4.1 NORTH AMERICAN ECOREGIONS	9
4.2 SELECTION OF CASE STUDIES	10
4.2.1 OJO DE LIEBRE LAGOON COMPLEX	11
4.2.2 CHANNEL ISLANDS NATIONAL MARINE SANCTUARY	13
5. LITERATURE REVIEW / INTERVIEWS/ FINDINGS	14
5.1 THE WHALE SANCTUARY OF EL VIZCAINO / OJO DE LIEBRE LAGOON COMPLEX	x 14
5.1.1 CONTEXT	15
Physical and biological features	15
Cultural features	17
5.1.2 HISTORY	18
5.1.3 DESIGNATION AND MANAGEMENT – INDUSTRY, CONSERVATION AND COMMUNITY	24
Analysis	26
5.1.4 GOVERNANCE SETTING The Whole Senatury of al Vizaging / Oig de Lighte Lagger Complex	28
Conservation goals and agencies involved	20 32
5.1.5 SOCIO-ECONOMICAL SETTING	36
Socio-economical description of the area	36
Socio-economic setting implications	39
5.2 CHANNEL ISLANDS NATIONAL MARINE SANCTUARY	41
5.2.1 CONTEXT	42
Physical and biological features	42
Cultural features	44
5.2.2 HISTORY	44
5.2.3 PLANNING AND DESIGNATION OF MPAs	48
Analysis	54
5.2.4 GOVERNANCE SETTING	56
Conservation gools	50
Agencies involved and their roles	61
Governance Setting Implications	62
5.2.5 SOCIO-ECONOMICAL SETTING	65
Socio-economical description of the area	65
Socio-economic setting implications	68
5.3 DEFINING A SUCCESSFUL MPA	72

6. COMPARISON OF BOTH STUDIES	74
6.1 INDICATORS	74
6.2 INTERCONNECTIONS' DIAGRAMS	77
6.2.1 OJO DE LIEBRE LAGOON COMPLEX	77
6.2.2 CHANNEL ISLANDS NATIONAL MARINE SANCTUARY	80
7. DISCUSSION	82
7.1 OJO DE LIEBRE LAGOON COMPLEX	83
7.2 CHANNEL ISLANDS NATIONAL MARINE SANCTUARY	85
7.3 DEFINING SUCCESS	87
8. CONCLUSIONS	91
9. RECOMMENDATIONS	93
10. REFERENCES	94

List of Tables

Tabla 1. Allowed and prohibited activities in the Biosphere Reserve of El Vizcaíno, in the
UNESCO's Whale Sanctuary of El Vizcaíno and in the Ojo de Liebre Lagoon Complex 30
Tabla 2. Different conservation designations and goals. 33
Tabla 3. Jurisdictions and activities prohibited in each component of the Channel Islands
MPA complex 57
Tabla 4. Categories of protection and its goals. 59
Tabla 5. Description of the role that each agency plays in the Channel Islands MPA complex.
61
Tabla 6. Elements considered to make a MPA successful according to the literature review
and the interviews conducted in this work 73
Tabla 7. Indicators for the socio-economical situation and the governance status of both the
OdLLC and CINMS MPAs 75
Tabla 8. Comparison of the existence, absence and neutral or mid presence of chosen
variables, as a summary of the elements for each case study 76
Tabla 9. Important factors that define success of a MPA along time according to the
interviewed actors from the CINMS and the OdLLC, together with the repeated elements
from the literature review 88

List of Figures

Figure 1. Whale Sanctuary of El Vizcaíno Map	16
Figure 2. The Whale Sanctuary of El Vizcaíno in its broader context and the different	
conservation categories achieved by each component.	29
Figure 3. Measurement of poverty and vulnerability in Baja California Sur.	37
Figure 4. Channel Islands Marine Protected Areas network.	43
Figure 5. Overlapped jurisdictions in the MPAs complex.	64
Figure 6. California population by ethnicity groups.	66
Figure 7. Web of incentives in the OdLLC system.	79
Figure 8. Web of incentives in the CINMS system	81

List of Abbreviations

AICA	Areas of Importance for the Conservation of Birds in Mexico
BCS	Baja California Sur
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife
CI	Channel Islands of California
CIBNOR	Centro de Investigaciones Biológicas del Noroeste S.CNorthwest Biological Research Center-
CINP	Channel Islands National Park
CONAPESCA	Comisión Nacional de Pesca - Fisheries National Commission-
LGEEPA	Ley General del Equilibrio Ecológico y la Protección al Ambiente -Mexican General Law of
	Ecological Equilibrium and Environmental Protection-
MLPA	Marine Life Protection Act
NAICS	North American Industry Classification System
NAWCA	North American Wetlands Conservation Act
NMFS	National Marine Fisheries Service
РА	Protected Area
PET	Programa de Empleo Temporal - Temporary Employment Program-
PROCODES	Programa de Conservación para el Desarrollo Sostenible - Conservation Program for the
	Sustainable Development-
PROFEPA	Procuraduría Federal de Protección al Ambiente - Federal Attorney for Environmental
	Protection-
SMCA	State Marine Conservation Areas
UABCS	Universidad Autónoma de Baja California Sur -Autonomous University of Baja California
	Sur-

2. Introduction

The impact of human activities on the oceans has been widely documented along the years (Carlton 1989, Bellwood et al. 2004, Halpern et al. 2008, Halpern et al. 2009, Doney 2010, Osmond et al. 2010). Land-based activities and extraction of resources lead to pollution, eutrophication, depletion of fisheries, acidification of the ocean, and habitat loss, while introduced species drastically altered ocean ecosystems (Roberts and Hawkins 1999, Dulvy 2006, Wilkinson 2008, Jackson 2010). In fact, scientists estimated that 41% of world's oceans have been highly impacted by humans and that there is no area in the ocean that has not been influenced by human activities somehow (Halpern et al. 2008). Furthermore, about 50% of human population lives in the coastal zone hosting two-thirds of the world's largest cities and the number is expected to keep increasing together with the demand for coastal and marine resources (Cicin-Sain and Belfiore 2005, Queffelec et al. 2009, Rivera 2011). Moreover, coastal areas are not only the scenario for much of world's economic activities, but they are also amongst the world's most diverse and productive environments (Cicin-Sain and Belfiore 2005). These increasing pressures are the drivers that have made countries to re-consider their ocean management strategies and their approaches towards marine resources (McCarthy 2001, Osmond et al. 2010). As a result, within the available tools for managing marine ecosystems, Marine Protected Areas (MPAs) have emerged as the most important and widely used tool for achieving conservation goals (Osmond et al. 2010, Al-Abdulrazzak and Trombulak 2012).

It is important to mention that MPA is a term used as an umbrella for different levels of protection, ranging from no-take marine reserves to multiple use zoning (Osmond *et al.* 2010,

Chuenpagdee *et al.* 2013). The type of MPA usually depends on the objectives of the area, but broadly, their aim will be to preserve the biodiversity and habitats of the area in order to conserve the function and integrity of the marine and coastal ecosystems (Jentoft *et al.* 2011). The most common definition is the one given by the International Union for Conservation of Nature (IUCN) which states that an MPA is "*any area of intertidal or subtidal terrain, together with its overlying water and its associated flora, fauna, historical and cultural features, which has been reserved by legislation to protect part or all of the enclosed environment*" (Kelleher and Kenchington 1992).

Acknowledging all the threats to the oceans, a global commitment was made in the World Summit on Sustainable Development and the Convention on Biological Diversity in 2002 to protect 10% of world's marine and coastal zones by 2010 (Toropova *et al.* 2010). Nevertheless, as in 2010 the World Database in Protected Areas estimated that only 1.7% of the ocean was protected; countries agreed on extending the deadline until 2020 (Wood *et al.* 2008, Chuenpagdee *et al.* 2013). The reasons why the implementation of MPAs lags behind is attributable to various factors such as the cost that this target implies, the conflict it is generating as the human demands from marine resources are increasing, and the amount of ineffective MPAs worldwide (Toropova *et al.* 2010, Mora and Sale 2011).

Several studies have related the failure of the implementation of MPAs to several factors. The first one is related to their design, especially when they have attributes that are only applicable on terrestrial protected areas, for instance, creating subdivisions on the MPA, which do not work given the dynamics of the ocean and the depth component (Al-Abdulrazzak and Trombulak 2012). A second factor is connected to the complexity of the legal apparatus since it requires the consideration of several aspects such as the geography of

the land-sea conjunction; the politics in terms of what will be conserved and exploited; and the economics in terms of activities such as fisheries and tourism (Queffelec *et al.* 2009). The third factor, and the one that has had greater attention, is focused on the (mis)management practices (Jentoft *et al.* 2011). As a consequence, several international non-profit organizations and institutions such as IUCN, WWF, the World Bank, among others, have developed methodologies for assessing the management, the effectiveness and the degree of success/failure of marine protected areas (Ervin 2003, MBRS 2004, Pomeroy *et al.* 2004, Staub and Hatziolos 2004, Hockings 2006). Nevertheless, however useful these methodologies can be, they are centered on analyzing (a) the actions post-MPA designation, and (b) the decisions and practices made internally.

Chuenpagdee et al. (2013) argue that the success of a MPA will depend on what they call "the step zero". According to them, the success or failure can be predicted from this preliminary step that deals with the conditions, drivers, and processes prior to the inception of an MPA. Along this step is when the negotiations between stakeholders happen, and it is here where an attempt of agreeing on goals and aspirations is made (Chuenpagdee *et al.* 2013). On the other hand, Bennet and Dearden (2014) argue that the socio-political context should be the axis around which the design and co-management of a MPA should be built, in order to have an effective approach. They consider the context as an important determinant of the outcomes and the further success of MPAs (Bennett and Dearden 2014).

Chuenpagdee *et al.* (2013) and Bennet and Dearden (2014) disagree on the level of MPA implementation-management, which should be considered when assessing the MPA's success. However, they agree on that it is key to consider the context of the place as it will undoubtedly influence its outcomes and degree of success (Chuenpagdee *et al.* 2013, Bennett and Dearden 2014). Yet, a new question arises: what is a successful Marine Protected Area? This inquiry is related to the second mentioned factor to which literature attributes the failure of MPAs, the complexity of the legal apparatus, the politics and the economics that shape the goals and objectives and the hidden agendas under management decisions. A successful MPA can be defined in terms of biomass, in terms of stakeholders' participation, in terms of institutional coordination, in terms of degree of ecosystem recovery, in terms of community acceptance, in some of these or in all together; and it might also be a different definition for each particular case.

Therefore, based on the fact that (1) the failure of the implementation of MPAs worldwide has been widely reported, (2) the assessment tools for analyzing the failure/success of a Marine Protected Area are focused on activities post-MPA designation, mainly the management practices, and (3) the definition of a successful Marine Protected Area depends on the actor and the place; this work aims to identify the key features from the local context that have influenced two Marine Protected Areas to approach to be successful beyond the management practices.

The objective will be to analyze the socio-economic, cultural and political local context of two MPA's immersed in completely different conditions, and define the meaning of a successful MPA for the local actors in order to identify the key elements that have helped these areas in having positive ecological and conservation outcomes.

3. Methods

3.1 Socio-Economic and Management Indicators

Indicators are tools that provide us practical means for evaluating particular aspects of the system such as the state and the development of social systems or the accountability and performance of the management according to desired objectives (Ehler 2003, Sabatella and Franquesa 2004). According to Pomeroy *et al.* (2004), the best indicators are those that fit best for each case study. Accordingly, the selection of indicators for this work was made from different authors literature in order to be able to measure the desired variables. The objective of these indicators is not making an overall assessment of each category, but rather, to make a comparison between both case studies in order to facilitate the visualization of the difference between each MPA's context. The methodology for obtaining these indicators varied including using the results obtained from the surveys, using web-based tools and the revision of literature.

3.2 Stakeholders Survey

Given that some of the main interests were obtaining information from past events such as the planning and designation processes of the MPAs, hearing the perspectives of the interviewees regarding case study-specific situations, and hearing their different definitions of success; the surveys that were carried out followed a script for each sector of each case study with the information that was needed to ask. Nevertheless, given the nature of the survey, the interview was one of open-ended questions. This type of methodology, allows to receive more full, detailed and meaningful answers for our subject of concern and moreover, unanticipated findings can be discovered (Reja *et al.* 2003). Given that each case study has a different history and a different context, the questions were different on each MPA and they were targeted to obtain information that was missing or not complete in the literature review.

In the case of the Ojo de Liebre Lagoon Complex (OdLLC), a total of 14 face-to-face interviews were completed between January 26th - February 02nd, 2015. The interviewees belonged to different sectors of the population including the touristic, mining, fishing, and service sectors; key informants like park rangers, community leaders, authorities and managers; and finally individuals from the general public including an illegal fisherman. In average, each interview lasted about an hour.

Even though there were several questions focused on obtaining general information like the economical status of the person, the interview, in general terms, was centered in five questions:

- Perspective on the advantages and disadvantages of the OdLLC MPA.
- Level of involvement of the managers with the community and visceversa.
- Perspective of the relationship between Exportadora de Sal S.A. de C.V. (ESSA) and the Comisión Nacional de Áreas Naturales Protegidas -*National Commission in Natural Protected Areas*- (CONANP).
- What would they change from the system and how would they define a successful MPA.
- How they picture the area in 10 years from now.

In the case of the Channel Islands National Marine Sanctuary (CINMS), a total of 10 faceto-face and phone interviews were carried out between March 20th and April 2nd, 2015 as it was difficult to meet with various of the stakeholders given its tight schedule. Nonetheless, the interviews covered a wide range of topics and sectors having key informants like people involved in the MPA network designation process including the facilitator, members of the Marine Reserves Working Group (MRWG), National Park rangers, NOAA's staff, members of the Sanctuary Advisory Council, representatives of the conservation sector, a representative of the Santa Barbara County, a representative of the educational sector and a fisherman. In average, each interview lasted a bit more than an hour.

Even though the questions were varying according to the interviewed stakeholder, the survey, in general terms, was focused on the following questions:

- Socio-economical aspect of the stakeholders, for instance, the current standing of fishermen regarding the Sanctuary.
- The story of the designation process including the conflicts inside the Marine Reserves Working Group, the role of the Science Advisory Panel, the fishermen reactions and the resolution of the conflict.
- The complications of having overlapped jurisdictions and several agencies managing the resources in the same area.
- Their definition of a successful MPA and the elements that the CINMS was lacking of for reaching that success.

The obtained information from both case studies was used all along sections 5 and 6 of this work, complementing the information obtained from the literature review.

3.3 Web Based Tools

For obtaining geographical and population information such as density, housing characteristics in a municipal level and some geographic features, this work collected data from different databases such as the Instituto Nacional de Estadística y Geografía - *National Institute of Statistics and Geography*- (INEGI) from Mexico, The United States Census Bureau from the US and Socioeconomic Data and Applications Center, a world database. This tool helped mainly to give the context of each area and to answer some of the selected indicators.

3.4 Interconnections' Diagram

In order to understand the flows of the system including the connections between stakeholders, the way policies influence or affect activities, the actors involved, and the positive and negative influences of the system; a visual representation of the system was created for each case study. These interconnections' diagrams helped to set out, in a more precisely way, the results obtained from the literature review, the analysis of documents, including legislation, management plans and other publications, as well as direct observations in order to identify the leverage points of the system and to understand the key elements that have helped that particular MPA to have positive ecological and conservational outcomes.

4. Background

4.1 North American Ecoregions

In 2002, marine scientists and Commission for Environmental Cooperation officials from Mexico, United States and Canada reunited to work on a new, unified, ecological classification for oceanic and coastal regions which resulted on the publication of the book "Marine Ecoregions of North America" in 2009 (Wilkinson *et al.* 2009). Within the project, they created descriptive profiles that classify the ocean and coastal regions of North America according to their physical, oceanographic, and biological characteristics, and which resulted in the division of the area into 24 marine ecoregions.

The ecoregion 19, or the "Southern Californian Pacific" ecoregion stretches along the Pacific Coast going from the Channel Islands in California, US to the very end of the Baja peninsula in Cabo San Lucas, México (Figure 1). This region is characterized by the mix of water and fauna from the adjoining ecoregions (Wilkinson *et al.* 2009). On the north, the "Montereyan Pacific Transition" is considered to have a moderately high productivity given the seasonal upwelling, which together with the canyons, create suitable conditions for having whales and dolphins living in the area as well as migratory birds (Black 1994, Croll *et al.* 2005, Wilkinson *et al.* 2009). On the south of the Southern Californian Pacific, the "Mexican Pacific Transition" can be found which is considered to be very complex geomorphologically speaking. It is classified as a tropical sea which transforms seasonally into a subtropical one; and given its warm temperatures, it is also considered to be highly productive as it supports

different marine fauna from the Californian region (Meraz and Sánchez-Díaz 2008, Wilkinson et al. 2009).

Considering these adjoining ecoregions, the Southern Californian Pacific can be defined as the transition zone where the cold productive rich waters coming from the North confluence with the warm waters from the South, creating a complex region of mixed biota and thus a relatively high diversity of species (Wilkinson *et al.* 2009). Besides these ecological characteristics; Wilkinson et al. 2009 also characterize the area based on other features such sea surface temperature averages, oceanographic features, community types, endemic and endangered species, key habitats and human impacts.

Choosing only one ecoregion as the area of study of this work is of main importance since this work attempts to analyze the differences in the designation and management of marine protected areas under different political, social and economic context, but under the same ecological features. Therefore, the Southern Californian Pacific seems to be the most adequate zone since it comprises two countries that are in completely different contexts, starting with the obvious difference of being a developed and developing country; but still being in the same area managing similar resources under similar ecological conditions.

4.2 Selection of Case Studies

The Southern Californian Pacific ecoregion comprehends in total 56 Marine Protected Areas from where within the Mexican ecoregion, there are six of them classified in Biosphere Reserves; Flora and Fauna Protection Areas; and Sanctuaries (Rivera 2011, Ashcraft *et al.* 2012, CONANP 2014a). Respecting the United States portion, there are the other 50, classified in four categories according to their level of protection State Marine Reserves, State Marine Conservation Areas (no-take), State Marine Conservation Areas and Special Closures (Ashcraft *et al.* 2012).

In order to choose the two most adequate marine protected areas to be studied, two main steps were followed so that it was easier to reduce the number of MPA's available. Firstly, a broad description was made of the main characteristics and factors of each MPA. The factors included number of inhabitants (if any), biological importance, any other international or federal designation, location, external factors influencing or co-existing with the MPA, size and stakeholders involved. These elements helped to considerably narrow down the available options of MPA's. With the remaining case studies, a literature review was made in order to select the areas that have been already defined as successful by other authors in terms of ecological performance according to the percentage of fish recovery or the existing fish biomass; and/or defined as well in terms of the degree of accomplishment of goals. Since this work won't be focusing on assessing the degree of success of each Marine Protected Area, but for the contrary, the methodology used will seek to evaluate how the local context has influenced their already determined success, these two steps were satisfactory enough for determining the ideal case studies to be analyzed in this project.

4.2.1 OJO DE LIEBRE LAGOON COMPLEX

Ojo de Liebre Lagoon Complex (OdLLC) is a Protected Area with most of its territory immersed in the much bigger Biosphere Reserve of El Vizcaíno (REVIBI) which is why until date it's managed by REVIBI, the largest protected Area in Mexico, and the second in Latin-America (INE 2000, Lagunas-Vázquez *et al.* 2014). OdLLC is an internationally recognized whale sanctuary and two of their lagoons, Ojo de Liebre and San Ignacio, covering 370,950 ha (3509 km²), are recognized for being the world's most important reproduction area for the protected eastern subpopulation of North Pacific Grey Whale (CEC 2011, UNESCO 2014).

In the area of influence of the OdLLC we can find Guerrero Negro; a 13 054 inhabitants town that contains a major commercial salt plant with the biggest salt-producing marshes in the world, and which has been key in the development of the region (Cariño and Monteforte 2008, INEGI 2010b). The population economy is based on the commerce and service sector, fishing and mining, activities considered to be of subsistence as most of the population is considered to be vulnerable or to live in poverty (UABCS 2004, SEDESOL 2014).

Given that the OdLLC is immersed Mexico's largest protected area, that given it's richness and importance it has five national and international designations including a Natural World Heritage for UNESCO, given that is the most important place for the reproduction of the eastern subpopulation of North Pacific Grey Whale, given the social context of Guerrero Negro, and given that it is a place that integrates the different worlds of natural habitat and industrialization; OdLLC is a great case study for studying how the local context influences the environmental and conservation outcomes of a MPA.

4.2.2 CHANNEL ISLANDS NATIONAL MARINE SANCTUARY

The Channel Islands National Marine Sanctuary consists of a network of 11 no-take marine reserves and two conservation areas that allow limited fishing, around the Santa Barbara, Anacapa, Santa Cruz, Santa Rosa, and San Miguel islands (NOS 2014). With a surface of 82,660.68 hectares, which makes it the largest network off the US mainland; CINMS through its educational, conservational, scientific, and stewardship approaches, is a special place for species close to extinction, sensitive habitats, 150 shipwrecks and other maritime heritage artifacts (NOS 2014). Culturally speaking, the CINMS is an important place for the Native American Chumash tribe which have lived in the area for approximately 13,000 years (NPS 2014). Representatives of the Chumash people, together with representatives of State and Federal government agencies, and representatives of the general public, tourism, business, recreational fishing, commercial fishing, non-consumptive recreation, education, research, and conservation sector, form the CINMS Advisory Council which participate in the management decisions of the Sanctuary through an ecosystem-based management perspective (NPS 2014).

Given the great efforts for establishing a network of MPAs, the management challenges it presents, the involvement of stakeholders in the decision making process, the presence of a Native American tribe, the relevance of the area for marine species, its educational and outreach programs and the fact that belongs to a first world country; the CINMS has a completely different context than OdLLC, which makes both case studies of great interest for further analysis.

5. Literature review / interviews/ findings

This section aims to give a detailed description of the socioeconomic and political context of both El Vizcaíno Biosphere Reserve and the Channel Islands Marine Sanctuary in order to set the background for analyzing how the different contexts have influenced the conservation outcomes of these MPAs. Furthermore, this section will make a review of the planning and designation processes of each area, in order to understand the institutional tangle behind the creation of MPAs and ultimately, analyze which are the features that define a successful MPA.

5.1 The Whale Sanctuary of El Vizcaino / Ojo de Liebre Lagoon Complex

The Whale Sanctuary of El Vizcaíno (WSEV) is a UNESCO's Natural World Heritage also known as the Ojo de Liebre Lagoon Complex (OdLLC) as it embodies the two coastal lagoons Laguna Ojo de Liebre and Laguna San Ignacio, together with their transition areas surrounding them (UNESCO 2014). The area represents an interesting case study for this work since it embodies the different worlds of conservation and industrialization, being home to the world's largest salt works and, at the same time, an area of great importance for several marine mammals, birds, and especially, the North Pacific Grey Whale (UNESCO 2014, SE 2015).

Furthermore, if compared to the Channel Islands National Marine Sanctuary case study, the WSEV has a completely different socio-economic and political context as it has only 13, 054 inhabitants living in Guerrero Negro, as the dependence on resources is much higher basing its economy on the tertiary sector, as the political system is centralized and as the ethnic, racial, and religious backgrounds are not as diverse as in California (INAFED 2010, INEGI 2010a, UNESCO 2014).

A description of the history, context, socio-economic and governance settings of the area, and a review on the planning and designation of the MPA as well as the relationpships and interconnections between sectors will help to understand which are the factors of the local context that have influenced on having positive conservation outcomes and management practices of the lagoon complex.

5.1.1 CONTEXT

Physical and biological features

The UNESCO's Whale Sanctuary of El Vizcaíno is a 370,950 ha (3509 km²) area located on the Pacific Coast of the northern part of Mexico's State Baja California Sur in the Baja Peninsula (UNESCO 2014). Embedded in the much bigger Biosphere Reserve of "El Vizcaíno" (REVIBI), WSEV is part of the 5 km of coastline of REVIBI, the largest protected area in Mexico (2,546,790 ha) and the second largest one in Latin America (INE 2000, Lagunas-Vázquez et al. 2014).

The WSEV is considered a UNESCO Natural World Heritage Site and is comprised by the polygon that includes the coastal lagoons of San Ignacio and Ojo de Liebre together with the town of Guerrero Negro and its surrounding transitional habitats, a complex mosaic of wetlands, marshes, halophytes, dunes and deserts which are home to an extraordinary diversity and abundance of birds, fish, invertebrates and marine mammal species (INE 2000, PW 2004, UNESCO 2014) (Figure 1).



Figure 1. Whale Sanctuary of El Vizcaíno Map. Source: UNESCO (2014).

The OdLLC –which includes the WSEV plus the lagoons of Guerrero Negro and Manuela- is mostly shallow (6-12m), with channels that reach the 16m in depth, and with five islets inside (INECC 1996). Along the coast, there are important upwelling areas that together with other physical and chemical characteristics such as depth, temperature, salinity and others, create a suitable area for numerous species all along the trophic chain going from phytoplankton to big sharks and whales (UNESCO 2014). In fact, these characteristics make the lagoons part of the REVIBI core areas since they are considered the World's most important place for the reproduction of the eastern subpopulation of the North Pacific Grey Whale, which was once endangered (INE 2000, PW 2004). Furthermore, San Ignacio bay is also considered a priority wetland by the North American Wetlands Conservation Council (Berlanga *et al.* 2008).

But mainy, it is the OdLLC's particular geology, climate, orography, oceanography, and hydrology that has shaped the economy of the region as it provides four main environmental services: fishing, salt work production, recreational use of the lagoon for whale watching and recreational use of the area for bird watching (Patiño 2012) (*See section 5.1.6 for further detail*).

Cultural features

Baja California Sur was inhabited by three main indigenous groups: Cochimíes, Guaycuras and Pericúes, all of whom have different origin and arrival time of in Baja California (INE 2000). Within REVIBI, Cochimíes were the predominat group, indigenous nomads who lived mainly from hunting, fishing and fruit picking, and who were extinct at the beginning of the XX century due to diseases brought by Spanish conquerors (INE 2000).

Within REVIBI, there are about 2000 sites with human evidence and more than 300 with cave paintings, where the oldest ones date back to over 10,500 years old, being the reason why an area within REVIBI, the Rock Paintings of the Sierra de San Francisco, is also considered a UNESCO World Heritage Site since 1993 (UNESCO 2015d). These paintings are of great worldwide importance since they are one of the most notable cave painting complexes in the world and which, given its difficult access location and its climate, they are in an admirable preserved state (UNESCO 2015c).

5.1.2 HISTORY

The first formal efforts for protecting wildlife in the Vizcaíno region where carried out in 1936 when Mexico and the United States signed the Treaty for the Protection of Migratory Birds an Mammals which translated into closure seasons for some species and the creation of refugee areas for mammals of hunting relevance (Valdez et al. 2006).

1949

A decade later, in the face of the massive whale slaughtering along the Californias, Mexico joined the International Whaling Commission in 1949

to monitor the protection and rational use of whale resources (IWC 2015).



At the beginning of the 1950's when Baja California wasn't even a state but rather a territory, the North American Daniel Ludwig built "Exportadora de Sal S.A." (ESSA), a saline that meant to meet the

demand of salt on the west coast of the United States. (ESSA 2011). Establishing around Ojo de Liebre lagoon, ESSA became operational in 1954 and it made its first shipment in 1957; it was thanks to Exportadora that Guerrero Negro was born as a town (ESSA 2011).



More than a decade later, in 1972, the Ojo de Liebre lagoon was declared an Area of Shelter for Whales and Calfs, and together with the San Ignacio

lagoon, they were both declared Refuge Areas for Migratory Birds and Wildlife (INE 2000).



Mitsubishi Corporation, one of the largest Japanese trading companies, bought from Daniel Ludwig 100% of the shares of ESSA (Cámara de

Diputados 1999). Later in the same year, within the framework of nationalizing mining activities, the Mining Development Commission acquired 25% of the shares of ESSA (Cámara de Diputados 1999).



The Mining Development Commission acquired an extra 26% of ESSA's shares, completing the process of mining nationalization as from then, till

date it is majoritarily owned by the state (51% of shares) (Cámara de Diputados 1999).



Five years later, in 1979, San Ignacio Lagoon was declared a Refuge of Whales and an Area of Maritime Atraction Zone given the influx and

congregation of whales in the area (INE 2000). And a year later, in 1980, the Area of Shelter for Whales and Calfs established in 1972 extended its boundaries creating the OdLLC which included the lagoons of Ojo de Liebre, Guerrero Negro, San Ignacio and Manuela (DOF 1980, INECC 1996).



The Biosphere Reserve of El Vizcaino was declared and published in the Federation Official Journal (DOF) by presidential decree (INECC 1996).



The UNESCO's World Heritage Committee inscribed the "Rock Paintings of the Sierra de San Francisco" as a UNESCO Cultural Heritage

Site and the "Whale Sanctuary of El Vizcaíno" at the Ojo de Liebre and San Ignacio lagoons as a UNESCO Natural Heritage Site, for its exceptional and universal value which must be protected for the benefit of mankind (UNESCO 2014).



ESSA presented to the Ministry of Social Development, which redirected to the Ministry of Environment, Natural Resources and Fisheries (SEMARNAP), an Environmental Impact Assessment (EIA) in order to expand their facilities to the San Ignacio Lagoon creating a new salt work (Cámara de Diputados 1999).



The National Institute of Ecology (INE) rejected the EIA arguing that it

was deficient regarding the identification, evaluation and description of the environmental impacts (INECC 2007).

In the face of ESSAs insistence on presenting a new EIA, SEMARNAP created a Scientific Committee composed by national and international specialists in whales and in management of natural resources, marine ecosystems and lagoon ecosystems, in order to create the parameters that ESSA should consider to identify in their new EIA; the so called "Terms of Referral" (INECC 2007). As a response, ESSA asked the Autonomous University of Baja California Sur (UABCS), the Scripps Institution of Oceanography, University of California San Diego and the National Autonomous University of Mexico (UNAM) to carry out the studies required by the Terms of Referral in order to comply with the national environmental regulations (INECC 2007). Nonetheless, since ESSA showed interest in creating a new EIA, opposing groups started to create a campaign to stop the project, and furthermore, they started promoting a petition to UNESCO so they would evaluate the affair as it would jeopardize the World Heritage status (INECC 2007). The campaign called the attention of more environmental organizations like Greenpeace and the Mexican Environmental Law Center (CEMDA) and they formed the so called "Coalition for the Defense of San Ignacio Lagoon" which took the matter into legal grounds in 1999.

998

The Mexican Government presented during the 22nd Extraordinary Session of the World Heritage Committee in Kyoto, Japan, a report of the status of

the Biosphere Reserve of El Vizcaino, together with a request that the document would be transmitted to the International Union for Conservation of Nature (IUCN) for further evaluation. After receiving IUCN's comments, the Mexican Government invited UNESCO to visit San Ignacio and assess the case themselves (INECC 2007).

The Coalition for the Defense of the San Ignacio Lagoon integrated by 52 Mexican environmental organizations, denounced ESSA to the Attorney's General Office for "environmental crimes" committed by the salt work company alleging to be responsible for the massive mortality in 1997 of turtles, for the spill over of 16 thousand cubic meters of brine that killed thousands of fish in May 1998 and the appearance of dead sea turtles in January 1999 (INECC 2007). Parallel to this event, the California Coastal Commission condemned the project announcing that it would create an opposition in several parts of the world; although ESSA tried to explain the project, it was not supported (CCC 2000).

Later on that year, thirty-three leading scientists among whom eight Nobel prizes, and academics from UNAM, Harvard, Princeton and Standford, together with seven environmental groups published in the New York Times a letter demanding the immediate suspension of the project for representing unacceptable risks to the Gray whale (Ortiz 2000).

The support was growing so fast internationally, that two months later, opposing groups organized a boycott against Mitsubishi, which resulted in fifteen international investment funds, with close to \$ 14 million assets, threatening Mitsubishi not to invest in their company as long as they would keep running ESSA's expansion project (Ortiz 2000).

At the end of the year, UNESCO's mission group, integrated by international specialists who evaluated the state of conservation of whale sanctuaries in the Reserve El Vizcaino, presented their report at the 23th Extraordinary Session of the World Heritage Committee in Marrakesh, Morocco where they submitted their recommendations (Ortiz 2000). They reported that even though ESSA's salt production technique, which is by evaporation, is one of the less environmentally aggressive known techniques, the magnitude of the project would imply a profound transformation of the landscape and would directly affect the World Natural Heritage as a third part of the area would be located inside its territory (UNESCO 1999). They said that as it was, San Ignacio was not in danger, that the number of whales arrivals was increasing, and warned that if the project would be implemented, the lands would transform into urban and industrial grounds that would affect the area, and therefore, a reevaluation of the Natural World Heritage status would need to be carried out (UNESCO 1999).

2000

After all the pressure along the year and before ESSA would submit the new Environmental Impact Assessment, the President of Mexico

Ernesto Zedillo along the "Evaluation of the National Policy on Biodiversity Conservation" announced his decision of definitely cancelling the San Ignacio Saltwork project. President Zedillo reiterated that the project did not pose risks to the gray whale, but that it would involve a modification of the landscape adjacent to San Ignacio Lagoon, which Mexico was committed to preserve (Presidencia 2000). In this year, the OdLLC was decreed as a National Protected Area, but until date is still managed by REVIBI (Montes 2015).

2002

The Mexican Whale Sanctuary was established covering all the EEZ,

equal to 3 million km² along the Pacific and Atlantic Oceans, and the Caribbean Sea (Angulo 2010). In this big refugee, 21 species of cetaceans became protected from hunting and capture, its aim being to maintain the environmental conditions necessary to ensure the biological functions of whales, such as reproduction, birth, breeding, growing, learning, migration and feeding (Angulo 2010).

The San Ignacio Lagoon and the Ojo de Liebre Lagoon were included as RAMSAR sites for being considered of international importance (RAMSAR

2004).

2009 The Western Hemispheric Shorebird Reserve Network (WHSRN) announced the designation of OdLLC as a Site of Hemispheric Importance (WHSRN 2009).

5.1.3 DESIGNATION AND MANAGEMENT – INDUSTRY, CONSERVATION AND COMMUNITY

The creation of the Biosphere Reserve of El Vizcaíno rose from two factors: (1) The concern of Berrendo's (pronghorn) status as endangered, together with the will of protecting the Mexican bighorn (Borrego cimarrón); and (2) all the existing treaties for protecting the Grey whale (Montes 2015). Because those species are the most valuable resources of the area, the federal government decided to create a biosphere reserve that would be wide enough for covering all the surrounding habitats and ecosystems needed to preserve species, decreeing in

1988 by unilateral decision the biggest protected area in Mexico, the Biosphere Reserve of El Vizcaíno that would go from coast to coast across the Baja Peninsula including part of the Sea of Cortes and part of the Pacific ocean (INECC 1996). Even though the community members were not fully convinced that this would be a benefit for them, their position soon changed. CONANP, the federal agency in charge of administrating Mexican protected areas, implemented rules that for instance, allow fishing only to people from the community, similarly to the allowances of providing whale watching tours (Montes 2015).

As described by most of the interviewed people for this work and as reported by Brenner and de la Vega (2014), most of the community supports in an active or passive way, the measures applied by CONANP, the objectives of the reserve and the measures for accomplishing them (Brenner and de la Vega Leinert 2014). The community sees CONANP as an ally since they support community initiatives and even many governmental initiatives from the municipal and state levels. Moreover, CONANP creates temporary jobs; works together with ESSA for Exportadora de Sal's program of environmental education; they meet with the sub committee of tourism every year before the whale season starts to talk about the problems, expectations, and general issues; and they give workshops on different themes such as training for providing a touristic service, what to do with a beached whale, among others (Domínguez 2015, Montes 2015, Pérez 2015). REVIBI managers and park rangers have the benefit of having presence in the community and being able to make the community coadjutors of the reserve resulting in benefits for both groups of actors. Nevertheless, two of the interviewed fishermen thought that despite the positive outcomes, the CONANP over-protects and overrules the resources having direct repercussions in the fishing sector, and that some allowances should be made like issuing more fishing permits (Hernández 2015, Pérez 2015). On the other
hand, another interviewee commented he wouldn't change a thing from CONANP as any project can be made if the law is followed and if an environmental impact assessment is made (Cachún 2015).

Analysis

Except for the two fishermen, in general terms REVIBI presents an unusual situation regarding biosphere reserves in Mexico. There is an acceptance, support and collaboration from the population and CONANP is seen more like a benefit than a harm, given the close relationship they established with the community, the preference for the local community when managing resources, the coordination it brought impeding the appropriation of resources, the economic benefits through their alternative programs, all the workshops they provide, all the support they give to the community and the good protection of resources (Brenner and de la Vega Leinert 2014, Cachún 2015, Montes 2015, Pérez 2015).

In the case of the salt work Exportadora de Sal, S.A. de C.V., even though it is categorized as a mining industry, it is described by CONANP staff as environmental friendly as they do not excavate any land and do not harvest or extract natural resources except for sea water, sun and wind (Montes 2015). Furthermore, ESSA presents annually to the Ministry of Environment and Natural Resources (SEMARNAT) an operating report in order to earn the Mexican Clean Industry Certificate which ESSA received since 2000. ESSA also has the international ISO 140001 certification, a warrant for effective environmental management systems (ISO 2004, ESSA 2010). Additionally, the industry monitors the emissions they produce and release to the atmosphere, their waste water discharges, they keep a control on the hazardous waste produced, and additionally, they have a monitoring program of the physic-chemical parameters of the lagoons (Domínguez 2015). Moreover, ESSA has the Administration of Comprehensive Management and Planning, the Department that deals among other things with all the environmental issues. Considered to be an environmentally strong department by CONANP's staff, both agencies have conjunct programs like the whale monitoring and censing, they support each other with money and staff respectively, they have meetings very often and as described by them, they maintain a good relationship that arose naturally (Domínguez 2015, Montes 2015).

Thus, despite the prejudices of the parasitism-type of relationship that industry and conservation could have where one generally is benefited whereas the other damaged; in the case of OdLLC the interaction between both sectors is not only acceptable, but also favorable for the industry-environment-community triad. Given ESSA's extraction and production techniques and given its willingness and historical support for conservation, ESSA and CONANP have formed a good alliance for cooperating between both sectors which has resulted in beneficial outcomes for both the community and the environment. In the end, ESSA arrived decades before REVIBI was decreed, ESSA was the reason why Guerrero Negro became a town and ESSA dealt since the beginning, with various of the community needs like homebuilding, electricity provision, waste recollection, the first school, among other things (Domínguez 2015).

5.1.4 GOVERNANCE SETTING

Unlike the Channel Islands where there are overlapping jurisdictions and MPAs are managed by state and federal agencies, in OdLLC management is much simpler as the political system in Mexico is highly centralized (Merrill and Miró 1996). Although the OdLLC is a Protected Area since 2000, its management is carried out by REVIBI as most of the territory is inside its boundaries. The OdLLC's Management Plan is currently being revised in order to create a proper division in management in the coming years. But presently, all the issues and management, budget and projects come from REVIBI (Montes 2015).

This section will describe the level of protection of the lagoon with the activities allowed, their goals, the agencies involved, and the results of the interviews in order to set the background for understanding the role of CONANP in the protection of the area, the role of the salt work company ESSA and the perspective of the community regarding the relationship between industry and conservation, and the role of each sector with the community.

The Whale Sanctuary of el Vizcaíno / Ojo de Liebre Lagoon Complex

The Ojo de Liebre Lagoon Complex is immersed, as mentioned before, in the much bigger Biosphere Reserve of El Vizcaíno except for part of the Manuela Lagoon and the Guerrero Negro Lagoon (Figure 2). Two of the complex's lagoons, Ojo de Liebre and San Ignacio are part of UNESCO's Whale Sanctuary of El Vizcaíno, and even though the OdLLC is a separate Biosphere Reserve itself, it is managed by REVIBI as most of the area is within its territory (Montes 2015, Porras 2015). REVIBI has thus, four categories for management of resources: (1) the buffer zones, (2) an area for sustainable use of natural resources and (3) two areas of restricted use where fishing is allowed and (4) a 16 core areas with a total surface of 362.438 ha where the allowed activities are restricted to environmental education, research, recreational and touristic activities (INE 2000, PW 2004). Both Ojo de Liebre lagoon and San Ignacio lagoon are part of these core areas (Table 1).



Figure 1. The Whale Sanctuary of El Vizcaíno in its broader context and the different conservation categories achieved by each component. *Source: (INE 2000, PW 2004, RAMSAR 2004, WHSRN 2009, UNESCO 2014).*

Tabla 1. Allowed and prohibited activities in the Biosphere Reserve of El Vizcaíno, in the UNESCO's Whale Sanctuary of El Vizcaíno and in the Ojo de Liebre Lagoon Complex.

Biosphere Reserve of El Vizcaíno (REVIBI)		
Activities allowed	Activities prohibited	
Core areas:	The most relevant are:	
- Ecosystem preservation	1) To modify the natural conditions of any	
- Scientific research	water body or interrupt or divert water flows,	
- Environmental education	except for those activities that have the	
Buffer areas:	authorization;	
- Productive activities	2) Trawling along the coastal fringe of the	
- Educational activities	buffer zones, inside the denominated	
- Recreational activities	Sanctuary zones, lobster farms and migratory	

Applied and training research

(As long as they abide with the ecological technical rules and the land uses).

- corridors;
- 3) Perform industrial or mining activities inside the San Ignacio Lagoon World Heritage Site; as well as inside the buffer zones without authorization on environmental impact;
- 4) Hunt, capture, disturb or remove any type of terrestrial or aquatic animals and plants and their products, including mineral material, without the corresponding authorization;
- Introducing exotic wild living species to 5) extensive regime;
- Carry out recreational activities outside the 6) routes authorized by the Directorate of the Reserve:
- 7) The use of timber and non-timber resources, without authorization, except those carried out for the purposes of consumption;
- The foundation of new settlements; 8)
- 9) Collecting fossils without authorization;
- 10) The draft of nets and traps of any kind in the channels of the Ojo de Liebre and San Ignacio lagoons, from December 15th to April 15th of the following year
- 11) Dumping or discharging wastewater fuels, oils, greases or any other contaminants, solid, liquid or otherwise, without the authorization for that purpose by the SEMARNAT;
- 12) Flights at altitudes lower than 3,000 feet (1,000 m) in the lagoons Ojo de Liebre and San Ignacio in the period from January to April of each year.

The Whale Sanctuary of El Vizcaíno

Core areas:

(Five isles inside Ojo de Liebre lagoon, island complex inside San Ignacio Lagoon and the core zone known as Guerrero Negro which includes the northern part of Ojo de Liebre lagoon, Arena island and the coastal areas of the Guerrero Negro lagoon):

Activities a	llowed	

- Ecotourism
- Environmental education
- Scientific research
- Management of wilderness
- Restoration
- Conservation

Activities prohibited

- Human settlements
- Fishing
- Tourist or fishing camps
- Aquaculture
- Clearings
- Mining
- Brine discharges
- Cattle raising
- Material banks harness
- Agriculture
- Forestry
- Fossil harness
- Salt production by evaporation techniques

World Heritage Sites:

(Ojo de Liebre lagoon and San Ignacio lagoon)

Activities allowed

Ojo de Liebre Lagoon:

- Ecotourism
- Fishing
- Tourist and fishing grounds
- Aquaculture
- Clearings
- Mining
- Brine discharges
- Material banks harness
- Environmental education
- Scientific research
- Management of wilderness
- Restoration
- Conservation
- Salt production by evaporation

Activities prohibited

Ojo de Liebre Lagoon:

- Human settlements
- Cattle raising
- Agriculture
- Forestry
- Fossil harness

San Ignacio Lagoon:

- Ecotourism
- Human settlements
- Fishing
- Tourist and fishing grounds
- Aquaculture
- Cattle raising
- Material banks harness
- Environmental education
- Scientific research
- Management of wilderness
- Restoration
- Conservation

San Ignacio Lagoon:

- Clearings
- Mining
- Brine discharges
- Agriculture
- Forestry
- Fossil harness
- Salt production by evaporation

Source: (INE 2000).

Conservation goals and agencies involved

Each of these categories of protection for the components of the OdLLC, have been designated for different reasons, by different agencies and therefore, having different goals. Thus, in order to understand the importance of the OdLLC for the conservation of different habitats and species, Table 2 will explain the conservation goals aimed by each given designation.

Tabla 2. Different conservation	designations	and goals.
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CONANP Biospher	e Reserve of El Vizcaíno (REVIBI)
Goal:	 Conservation of representative samples of ecosystems of Baja California; Conservation of genetic and biological materials from the area; Establishment of specific mechanisms for the conservation of the known endemic, rare, threatened and endangered flora and fauna species; Encouragement of scientific studies and research in order to increase the knowledge of the regional biological richness, and the development and promotion of alternative processes of use and exploitation of natural resources, enabling its conservation and long-term protection; Promotion and provision of opportunities for economic and social development of local communities that can generate and rescue experiences of production and appropriation of technological means compatibles to the conservation and protection of natural ecosystems. Promotion of both productive and eco-tourism activities in order to improve the quality of life of the community; and Development of a land planning and administrative model of natural resources.
UNESCO World He (Ojo de Liebre and San Ig	eritage Sites – Biosphere Reserves nacio lagoons and its surrounding ecosystems)
Goal: 1. 2. 3.	Conservation of important biological resources; Development of environmentally sound economic growth; and Support for research, monitoring, education, and information exchange related to conservation issues.
RAMSAR Site (Ojo de Liebre Lagoon Co	omplex)
Goal: 1. 2. 3.	Ensure the wise use of the natural resources; Encourage the designation and maintenance of Wetlands of International Importance, while ensuring their effective management; and Cooperate internationally on trans-boundary wetlands, shared wetland systems and shared species.
Western Hemispher (Ojo de Liebre Lagoon Co	e Shorebird Reserve Network (WHSRN) site
Goal:	 To sustain healthy populations of shorebirds; and To maintain the ecological integrity of the key sites that provide the habitats and nourishment they need for survival.

Areas of Importance for the Conservation of Birds in Mexico (AICA) site as part of the North American Wetlands Conservation Act (NAWCA)			
Goal:	1.	Contribute to the creation of a global network of leading conservation sites for the long-term maintenance of bird species diversity.	
	2.	Protect and maintain the AICA sites in order to secure the survival and continuance of processes and interactions among species.	
	3.	Long-term protection of wetland and associated upland habitats needed by waterfowl and other migratory birds.	

Source:(INE 2000, Arizmendi and Berlanga 2007, Bonells and Zavagli 2011, NAWCA 2014, UNESCO 2015a, WHSRN 2015).

Despite the fact that there are different national and international entities involved in the area (Table 2), the management of the Biosphere Reserve of El Vizcaíno is carried out by CONANP, a governmental entity from the Secretariat of Environment and Natural Resources (SEMARNAT). The aim of SEMARNAT is to conserve the most representative ecosystems of Mexico and its biodiversity through protected areas and other conservation tools, fostering a culture of conservation and sustainable development of the communities in their environment, using inclusion and equity criteria (CONANP 2012).

The Management Plan of el Vizcaíno, its goals and its programs are in accordance to the Mexican General Law of Ecological Equilibrium and Environmental Protection (LGEEPA) which specifically states that within a Protected Area (PA), the natural resources must directly benefit the people that live there or that are associated with the PA (Carabias 2010). Accordingly, REVIBI's Management Plan helped to refocus and to consolidate the programs of fishing exploitation benefiting only the local communities (Carabias 2010, Patiño 2012). Similarly, REVIBI follows the General Law of Wilderness through the birds refuges in Guerrero Negro, the General Law of Sustainable Fishing and Aquaculture through the

regulations on fishing for optimizing the resources in the lagoons, the Law of Navigation and Maritime Trade through all the regulations put in place for transporting the salt, and the General Law of Tourism through all the specific guidelines and rules for whale and bird watching (Patiño 2012).

REVIBI is managed from Guerrero Negro with a staff of 22 people, from which 5 are managerial staff such as the Biosphere Reserve Director, the Sub director, a Manager and two Coordinators of projects; and the rest are personnel that support the field work and surveillance activities (PW 2004). It is in the hands of these 22 people to maintain and comply with all the commitments made to each protected entity, in order to comply with international designations.

REVIBI has an Advisory Council formed by 21 people from different sectors of the population such as the governmental sector, industry sector (touristic, fisheries, agricultural and mining), education sector, NGOs (represented by ProNatura), academic and research sectors (represented by CIBNOR) and conservation sector. Simultaneously, there are sub councils represented by people from different REVIBI areas and sectors that help the managers to keep updated with the problems and happenings, being one of the available tools for integrating the community and the managers (Montes 2015, Pérez 2015). There are sub councils of fishing (composed of fishermen from the areas of Guerrero Negro, San Ignacio Lagoon and North Pacific), waste management, tourism (tourist service providers from Guerrero Negro and San Ignacio town), mining (represented by people from ESSA and small plaster companies from Santa Rosalía) and the newest one, the subcommittee for climate change (initiative made by board members, not CONANP) (Montes 2015).

The reserve's budget varies each year and it has been decreasing because of governmental budget cuts. For 2015, the annual budget given to the reserve by CONANP for operation and management is of \$ 800 thousand pesos (\$51,452 dollars) (Montes 2015). If compared to Channel Islands, it is 2% of CI's budget for managing an area of almost the same size. Nonetheless, CONANP received this year an extra funding of \$1 million pesos (\$64,000 dollars) from a Protected Areas Fund (whose budget comes from Global Environmental Fund (GEF)) created by the coalition CONANP and Mexican Fund for Conservation for creating projects with NGOs; and furthermore, REVIBI is part of a national wide project focused on the management of invasive alien species and on projects for resilience (*Idem*). The budget for this was also of \$800 thousand pesos and it comes from the United Nations Development Programme. If put together, CONANP counts with a total of \$2,600,000 pesos (about \$167,000 dollars) for operating in 2015, 8% of Channel Island's budget (Hastings 2015, Montes 2015).

5.1.5 SOCIO-ECONOMICAL SETTING

Socio-economical description of the area

Baja California Sur, with a population of 637, 026 inhabitants, has distinguished itself as the least populated state of Mexico, having a density population of 9 inhabitants per km² (at a national level density is 57 inhabitants/km²) and a very concentrated density (77% of the population lives in La Paz and Los Cabos) (INEGI 2010b). Likewise, it has a low illiteracy rate of 2.8% compared to the national level of 6.9%, and together with Baja California it concentrates more scientist per km², therefore having a social structure with specific productive capacities (INEGI 2011, Patiño 2012). Baja California Sur has a very homogenous population in terms of culture, religion and ethnicity as 81% of the population is Catholic, only 1% of the population speaks an indigenous language, and only 1% of the residents come from another country (70% of whom come from the USA) (INEGI 2010b, GBCS 2011).

In terms of economy, 59.6% of the population is economically active but 68% of the population is considered to be vulnerable or to live in poverty: 30.1 % of the population lives in moderate or extreme poverty; 7.9% are considered to be vulnerable by income, 30% by social deprivation, and only the remaining 32% are nor vulnerable, nor poor (Figure 3) (SEDESOL 2014).



Figure 2. Measurement of poverty and vulnerability in Baja California Sur. Source: SEDESOL, 2014.

In a smaller scope, one of the five municipalities of BCS is Mulegé, the most northern entity with 3,309,220 ha, from which 79.69% of the area is covered by the Biosphere Reserve of El Vizcaino, and where the most inhabited locality is Guerrero Negro with a population of 13,054 people (INE 2000, INEGI 2011).

Guerrero Negro is a town that was developed as a result of the creation of the most important economic pillar of the region, the salt work Exportadora de Sal S.A. de C.V (Patiño 2012, Domínguez 2015). Along its 58 years of existence, the town's economic activities have developed from being purely dedicated to mining, to a more diverse distribution as it passed from being a workers campground, to a proper town with all the basic infrastructure and services (Maya 2011). In a socio-economic census made in 2004, economic activities here were divided by importance of jobs created as follows: commercial and service sector (36.6%), fishing (34.8%), mining (19.3%), agriculture (2.5%), cattle raising (2.5%) and the remaining 4.3% in tourism (UABCS 2004, Patiño 2012). Nevertheless, in monetary terms, industry, fishing and tourism are the most important sectors (Patiño 2012).

The work done by UABCS in 2004 noted the big difference between their reported percentages and a census made in 1990 where mining generated 40.7% of the jobs *(Idem)*. This big change along 14 years does not mean that the amount of jobs created by ESSA reduced but rather, that the population increased as the opportunities and economical activities broadened. Similarly, back in 2004, when the aforementioned census was conducted, the economically active population was only 37.2% of the total population, whereas in 2010 it was of 58.2% (UABCS 2004, INEGI 2011). Therefore, the current percentages of the jobs created by sector are expected to have shifted, specially increasing in tourism as the number of permits

for whale watching service providers has slightly increased, and the number of tourists in Guerrero Negro has also raised (DGVS 2006, Hernández 2015).

Socio-economic setting implications

At a local level, the impact of ESSA is bigger in terms of the contributions to the community. Leaving behind the fact that ESSA built the first houses, provided the electricity for the town, and basically was the reason why Guerrero Negro was firstly inhabited; currently ESSA still provides several services and it is a central partner in terms of education, sports, culture, and environmental conservation, but also in terms of maintenance of urban infrastructure and public services participating in paving streets and sidewalks, cleaning services, sewage, water treatment, roads, and recreational areas (ESSA 2012, Domínguez 2015).

Nevertheless, although ESSA provides only 1200 jobs, in monetary terms it is undoubtedly the economic pillar of the region as with its production capacity of 7.5 million tons of salt, which represents 26% of the salt production worldwide, ESSA contributes annually to the Treasury of the country on average, through various types of contributions, approximately 160 million pesos (\approx 10.4 million dollars) (ESSA 2012).

Ojo de Liebre generates an important income for Guerrero Negro of about \$250,000 USD a year only from whale watching tours along the season that goes from December to April (Patiño 2012). On the other side, fishing generates about \$300,000 USD a year along the fishing season which varies per species but, it is worth mentioning that the OdLLC is closed for fishing along the whale season (Patiño 2012). Switching between the fishing and tourist sectors is very common in Guerrero Negro as the seasons don't overlap and, as soon as the whales arrive, all type of fishing gear needs to be removed from the lagoon, fishing is prohibited, and not all the areas of the lagoon are accessible; those that are, are only accessible before 3 pm so the whales have a time for resting (Patiño 2012, Pérez 2015, Porras 2015). Even though the activities are well organized along the year leaving similar earnings, the net average income of the economically active people is about \$ 3,790.00 pesos a month (\approx \$247 USD a month) (Patiño 2012). In this sense one can consider both fishing and touristic related services as activities of subsistence.

The problem faced in Guerrero Negro, with fishing representing almost 35% of the generation of jobs and being considered an activity of subsistence; is that when valuable fisheries collapse, there are not a lot of available alternatives that can counteract the impact. This is a current problem that the 'negroguerrerenses' are facing since the clam Mano de León started collapsing in 2010 (Murillo 2014). There are different hypothesis of the causes of the massive clam deaths, such as a drastic change in an important current's temperature, a *Vibrio* that affected this particular species, overfishing, residual brine from salt production, and illegal fishing; the problem in any case is something that gets out of the Biosphere Reserves managers' hands to control (Domínguez 2015, Hernández 2015, Pérez 2015). What the National Commission of Natural Protected Areas (CONANP) does instead, is creating Temporary Employment Programs (PET) in coastal cleaning, monitoring of natural resources, comprehensive waste management, environmental awareness, among others to help the affected people (CONANP 2014b, Cachún 2015). However as much as these temporary programs are useful, more long term solutions need to be implemented in order to take out pressure from overfishing and illegal fishing (two of the mentioned hypothesis). This would

help to conserve the area, and would help the community to have a higher income that can transform the fishing for subsistence situation. Some solutions are already taking place, such as aquaculture projects in the OdLLC area given all the unused coastal lands; and some other projects are being suggested for increasing tourism (Gomez and Duron 2014, Domínguez 2015, Porras 2015).

5.2 Channel Islands National Marine Sanctuary

The Channel Islands National Marine Sanctuary represents an interesting case study for this work for several reasons. Firstly, the socioeconomic and political context in which the Channel Islands are immersed is completely different that the one in the Biosphere Reserve of El Vizcaíno. For instance, the management of the Channel Islands waters is very complex as there are overlapping jurisdictions and therefore several agencies involved. Furthermore, the region counts with an interesting rich and diverse community characterized by a wide variety of ethnic, racial, and religious backgrounds statewide, with a population of more than 38 million people coming from more than 150 different cultures (Davis 2005, USCB 2014).

Secondly, the Channel Islands MPAs are a pioneer example from many points of view, such as at the involvement of the community not only in the use of local knowledge, but also in their involvement along the designation process. Moreover, they are also a case study of good practices in relation to the use of scientific knowledge and the balance of ecological and socioeconomic goals in a way that satisfies all the interest groups. But mainly, they are a pioneer example at the creation of a network of marine reserves.

5.2.1 CONTEXT

Physical and biological features

The Channel Islands National Marine Sanctuary (CINMS), located in the Southern California Bright, northeast Pacific Ocean, encompasses an area of 3807 km² (1,470 square miles) around five of the eight Channel Islands of California (CI): Anacapa, Santa Cruz, Santa Rosa, San Miguel and Santa Barbara Islands (NOAA 2014a). Given its complex oceanography, varied bathymetry, diverse habitats, remarkable biodiversity, and rich maritime heritage, the Sanctuary's waters are considered to be an area of national significance (ONMS 2009, NPS 2013). Within its boundaries, the Sanctuary has a network of eleven no-take marine reserves where the use or exploitation of any type of living marine resources is prohibited. In addition, there are two marine conservation areas where limited catch of lobster and pelagic fish is allowed, covering together approximately 21% of the Channel Islands National Marine Sanctuary (Figure 4). The other 79% of the CINMS is an area open to scientific research, education, recreation, and commerce, where a diversity of activities is allowed such as recreational and commercial fishing, kayaking, diving, boating, wildlife viewing, research, and shipping transit (CDFG 2008).

Given their geographical location, the waters around the five islands combine the northern cold and southern warm currents that create an exceptional habitat for many species, being the home of more than 1,000 species of fish, invertebrates, and algae (NPS 2013). Considered one of the most productive biological communities in the world, the area is also of main importance for twenty-six species of marine mammals that use the sanctuary at some stage of their life for feeding, transiting or raising grounds, like different species of dolphins, whales and sea lions (NPS 2013). In fact, given that these predators are at the top of the food chain feeding from fishes and invertebrates which at the same time feed on other marine life like phytoplankton; the abundance and distribution of these marine mammals is of great significance, as they are indicators of the general ecosystem health and ecological integrity of the marine region (USDC 2008).



Figure 3. Channel Islands Marine Protected Areas network. No- take marine reserves are shown in red. Marine conservation areas, which allow limited commercial and/or recreational take, are shown in blue. State waters (0-3 nautical miles (nm)). Federal boundaries (3-6 nm). *Source: CDFG, 2008.*

Cultural features

Before the European arrival, the Chumash Native American tribe lived on the islands for thousands of years. Its developed maritime culture permitted tribe members to exploit fish and marine mammals, besides the exploitation of inland coastal natural resources, which enabled them to have a high living standard (NPS 2015d). The area has since been one of intense maritime activities, leaving us today with a vast heritage translated in hundreds of shipwrecks and maritime archaeological and paleontological artifacts of great cultural importance and historic value (USDC 2008).

Today, the islands are still of great value for the nearly 5,000 Chumash people, as they are part of their cultural and historical heritage (NPS 2015d). Every year, around 200 Chumash people with family and friends paddle on their traditional canoes "Tomols" across the Santa Barbara Channel and arrive to the island of Limuw, or Santa Cruz, to renew their cultural knowledge, to share their ancestors stories, to recreate the old ceremonies and to craft traditional artifacts such as baskets, musical instruments and jewelry (USDC 2008).

5.2.2 HISTORY

The resource management jurisdictions at the Channel Islands waters is complicated due to numerous governmental agencies at different levels being involved and to overlapping jurisdictions (CINP 1985). A clear example is the evolution of the levels of protection along the years and the implementation of no-take reserves after the Marine Life Protection Act (MLPA) of 1999 came into force. Hence, a revision of the history seems to be the most adequate approach for understanding the evolution of the Sanctuary and the creation of the largest network of no-take MPAs off of the continental United States (NOAA 2014a).

Given its cultural resources, notable geographical and paleontological features, and its rich flora and fauna communities both inland and offshore, the interest in the islands conservation of the islands started early in 1938, when Anacapa and Santa Barbara Island were denominated a U.S. National Monument (CINP 1985).



Some 35 years later, in 1974, the California Water Resources Control Board established the Areas of Special Biological Significance, which are

considered important for supporting an unusual variety of aquatic life, and for often hosting unique individual species (CDFW 2015d).

Both the Channel Islands National Park and the Channel Islands National Marine Sanctuary were established to protect its vast natural and cultural resources (WCMC 1990, NPS 2015a). Nevertheless, the meaning of protection within a Sanctuary was broadly misunderstood as a place of marine resources conservation, but in fact, the Sanctuaries Act of 1972 provided neither a definition for marine sanctuaries, nor a guidance on the specific uses that would be allowed (Chandler 2006, McGinnis 2015). Hence, the Channel Islands National Marine Sanctuary was designated for protecting the area specifically from oil development while allowing all fishing activities, given that the main concern was avoiding having another accident like the Santa Barbara oil spill from 1969 (McGinnis 2015).

1998

The lack of fishing regulations for almost two decades of the islands being

designated caused negative effects on the maritime ecosystems of the Sanctuary. Different studies noted that there were dramatic differences in the density, distribution and size structure of several fish, invertebrates and algae; for instance, it was observed that the area lost 80% of the kelp forest density (Davis 2005). Concerned about the unfavorable ecological status and the negative consequences it would bring, a group of public agencies, commercial and recreational fishermen, representatives of the local community and environmental organizations pushed for changes in the public policy by requesting together with the Channel Islands National Park the establishment of no-take marine reserves that would cover no less than 20% of the park's waters (Bergen and Carr 2004). This led to the creation in 1998 of the Channel Islands National Marine Sanctuary Advisory Council (CINM SAC), conformed by 21 voting members and 21 alternates who represent all sectors: tourism, business, recreational and commercial fishing, general public, education, research, recreation, conservation, the Chumash community and local, state and federal government. Such a diverse and comprehensive stakeholder participation was initiated in order to ensure continued public participation in the management, protection, and achievement of conservation goals at the Sanctuary (NOAA 2015).

1999

A year later, the Marine Life Protection Act (MLPA) was promulgated, mandating the California Department of Fish and Game (CDFG) to re-

evaluate and re-design of California's state MPAs into a statewide network that would be more effective in tackling habitat and species loss (Davis 2005, Fox *et al.* 2013, Gleason *et al.* 2013).



Between 2000 and 2002 there were two unsuccessful attempts to implement the MLPA; however in 2004, a public-private partnership

called MLPA Initiative was launched to provide assistance to the state and it facilitated the regional MPA planning process (Fox *et al.* 2013, Sayce *et al.* 2013). A pilot project was thus initiated where the 1,100-mile Californian coast was divided into five study regions. To date, in four of those regions the planning, redesign of the MPAs and implementation of the regulations was successfully completed in a process that took around seven years (Fox *et al.* 2013, CDFW 2015a).

Parallel to the MLPA initiative, the CINMS and the CDFG carried out a controversial public process for reaching consensus on the goals, design, location and establishment of a network of marine reserves (*See section 5.3.3 for further detail*). The process eventually resulted in the implementation of a set of 13 MPAs in 2003 -and extended into federal waters in 2007-that altogether encompass 21% of the Sanctuary's area (Airamé *et al.* 2003, Davis 2005, Gleason *et al.* 2013, NPS 2015a). In this way, the Channel Islands reserve network was a pioneering effort for setting a network of MPAs through a transparent, science-based and community-driven decision-making process (Davis 2005).

In 2009, NOAA published a report on the condition of the CINMS after five years of monitoring. The findings showed that most water quality parameters were in relatively good conditions due to the Sanctuary's offshore location and distance from major urban centers (Gittings *et al.* 2013). Nevertheless, human activities together with changing ocean conditions have degraded to a certain extent the state and quality of habitats and living resources (USDC 2008). The most important concern within the sanctuary was and still is population increase and its potential to rise the pressure on habitats and species while negatively impacting resource availability (*See section 5.2.5 for detailed information*) (ONMS 2009).

An economic report showed that in 2011 the Channel Islands National Park visitors spent more than \$22 million on the local market, supporting

300 jobs in the vicinity (Yue *et al.* 2013). In the same year, an estimation of the economic impact of commercial fishing operations on a five-county area was done, where in average, 248 commercial fishing operations earned more than \$27 million in harvest revenue from catch in the CINMS (NOAA 2014c) (*See section 5.2.5 for detailed economic information*).

5.2.3 PLANNING AND DESIGNATION OF MPAs

As previously mentioned in section 5.2.2, even though that the CINMS was created in 1980, it was not protecting any habitats from fishing activities, but rather from potential oil pollution and extractive activities (McGinnis 2015). Consequently, drastic impacts were observed like a 99.4% loss on the abalone's density, 83% loss on the red sea urchins' density, and other similar patterns for lobster, rockfish and other species (Davis 2005).

After seeing such a significant change, the idea of implementing a network of reserves was initiated in 1998 by a group of recreational anglers that requested the California Fish and Game Commission to create a network of no-take zones that would cover 20% of the sanctuary's waters so it could restore the ecosystems of the sanctuary and the depleted

populations (Helvey 2004). A year later, the California legislature enacted the Marine Life Protection Act (MLPA), an action that required the state to redesign all existing state MPAs and to create a networked system (CDFW 2015a). With these two requests, the Channel Islands National Marine Sanctuary proposed the California Fish and Game Commission to make the Sanctuary's Advisory Council (*stakeholders group composed by government, nongovernment seats, representatives of the commercial fishing, conservation, recreation, education, business, tourism, research, and citizens*) the referee and leader for starting the process (Helms 2015).

Once agreed, and having as an example the creation of MPAs in the Florida Keys National Marine Sanctuary, where they had a collaborative approach with stakeholders, the Advisory Council created the Marine Reserves Working Group (MRWG) composed of 17 members representing a diverse group of stakeholders to advise the Fish and Game Commission on the creation of the marine reserves (McGinnis 2015). Parallel to the working group, the Advisory council formed two panels: (1) a Science Panel that could provide the MRWG with the best available scientific information, one of the main four principles of the National Marine Sanctuary Program; and (2) a Socioeconomic Panel that could advise the MRWG with short term socio-economic losses and other impacts (Bergen and Carr 2004, Etheridge *et al.* 2010). Together, they developed data, maps and analytical tools that helped creating different scenarios of the reserves design, taking into account the five goals to achieve with the creation of the MPAs (Ugoretz 2002):

- Ecosystem Biodiversity Goal: To protect representative and unique marine habitats, ecological processes, and populations of interest.
- Socio-Economic Goal: To maintain long-term socioeconomic viability while minimizing short-term socioeconomic losses to all users and dependent parties.

49

- Sustainable Fisheries Goal: To achieve sustainable fisheries by integrating marine reserves into fisheries management.
- Natural and Cultural Heritage Goal: To maintain areas for visitor, spiritual, and recreational opportunities which including cultural and ecological features and their associated values.
- Education Goal: To foster stewardship of the marine environment by providing educational opportunities to increase awareness and encourage responsible use of resources.

The socioeconomic panel collected data to determine the maximum impact that the creation of the marine reserves could have on recreational, commercial and non-consumptive user groups. Furthermore, it created a background database of the levels and patterns of use of the Channel Islands and the economic value it represented for these groups (Bergen and Carr 2004).

On the other hand, the science panel was concerned with proposing the smallest adequate area sizes that could viably represent the different habitats in the CINMS, and that could form a connected network. In doing so, the panel created a tool that incorporated the socioeconomic data input and identified ideal areas in different reserve configurations for locating the MPAs (Airamé *et al.* 2003). This visual tool was useful during negotiations with different user groups; nevertheless, as the science panel recommended that in order to achieve both goals of conservation and sustainability of fisheries the reserve network would need to cover between 30-50% of the CINMS waters, a conflict started between members of the MRWG (Bergen and Carr 2004, McGinnis 2012).

In a process funded by state and federal agencies, the MRWG met voluntarily with professional facilitators several times a week for two years in an attempt to agree on a MPAs network in both state and federal waters (see Figure 4). Consensus was impossible to reach (Davis 2005, McGinnis 2012).

Having the Science Panel recommendation of protecting at least 30% of the area, which was based on the balance between achieving conservation, sustaining fisheries, and having the minimum possible socioeconomic impact on user groups; the MRWG decided to call for a vote in favor or against this proposal. Surprisingly, despite that the California MLPA (1999) stated the need to improve existing MPAs and creating new ones that could be capable of protecting habitats and ecosystems while rebuilding depleted fisheries, the State representatives in the MRWG voted against Science Panel's proposal (Davis 2005, McGinnis 2015). Similarly, having the National Marine Sanctuaries Act mandating to use the best available science, which had in fact been delivered by the Science Panel, the Federal representatives in the MRWG voted against the Science Panel's proposal (ONMS 2009, McGinnis 2015). In the same tone, representatives from conservation groups, commercial fishermen, recreational fishermen and in short, all members but one voted against science (McGinnis 2012).

Ozawa (2006) suggests a list of points that she considers would help avoiding scienceintensive conflicts like the one in the CINMS. Among these points she recommends to carry out *"Workshops, panels, and other opportunities to disclose and explain discretionary elements of research. Data and analysis should be scheduled regularly, as needed*"(Ozawa 2006). In the case of the CINMS, the MRWG met with the Science Panel to understand and work on the suggested scenarios for the establishment of the MPAs. Furthermore, the meetings of the MRGW for discussing different concerns and for working towards the implementation of the marine reserves happened so often, that the whole process lasted 3 years instead of the 6 months planned.

Ozawa also suggests that "Technical expertise should be made available to all parties" (Ozawa 2006). This was also seen along the CINMS designation process when the Science Panel met with the MRGW for explaining them all the data they created, when they presented maps to facilitate the understanding of this data and in fact, according to several interviewees, the stakeholders learned a lot from this process (Hastings 2015, McGinnis 2015).

Lastly, Osawa also suggests that "When differences arise between or among different expert advisors, a public airing should be held to clarify the basis for the discrepancies". In the CINMS this was clearly seen at the end of the process when the meetings passed from 17 members of the MRGW to a much broader range of the community that involved around 500 people including the press (McGinnis 2015).

As shown, many of the points suggested by Ozawa (2006) were carried out along the CINMS designation process, and nonetheless, the conflict persisted. According to the interviewees, the reasons for the 16:1 result are attributed to several factors: the willingness to comply with the initial proposal of protecting 20% of the area; the pressure from users on the different levels of government; the negative effects on profitability of this recommendation for some interests groups; the fear of breaking the positive relationship between fishermen and some conservation groups; a difference in values between voters; the according to some, the alleged unproven benefits of MPAs to fisheries; and a different way of interpreting and

weighting the Science Panel advice (Bergen and Carr 2004, Helvey 2004, Helms 2015, McGinnis 2015). It is thus interpretable from this, that the conflict was not on the credibility of the Science Panel's advice, but rather, it was a matter of politics, personal agendas and distribution of power.

The conflict and negotiations within the MRWG lasted for five months between 2000 and 2001. The first alternative presented was covering 8% of the waters, but eventually a different proposal covered 18% of the Sanctuary waters, and was generally accepted by most MRWG members. However, MRGW could not agree on the size and MPAs locations as two commercial fishermen opposed to all alternatives brought into discussion (Helvey 2004, McGinnis 2012). With the pressure of having to take a decision, the CDFG and the CINMS took all the maps, data, recommendations from the panels, information from the MRWG meetings, the goals and mission established for the reserves, the Federal and State permitting requirements, and in general, all the information created along those 2 years and made a decision (Helvey 2004, McGinnis 2012, 2015). Thereby, the authorities created in 2003 a MPAs network in the marine areas from 0-3nm and extended to federal waters (3-6 nm) in 2007, which complied with most of the Science Panel's design criteria but with a coverage that was more similar to the initial proposal, protecting thus, 21% of the Sanctuary waters (Helvey 2004, Davis 2005).

For Helvey (2004) the process of the creation of the MPAs network establishment is considered a failure given that the MRWG was neither able to reach consensus nor to deliver, in his words, "an acceptable product"; that the process took longer than expected and therefore, the habitat protection was delayed; and finally to that as the two fishermen opposed to the proposal, the MPA network was not supported by the whole community (Helvey 2004). Nevertheless, plenty of other authors and stakeholders involved in the process, such as members of the MRWG, members of the Sanctuary Advisory Council (SAC), the facilitator, a representative of the Santa Barbara county, and even other fishermen see the process as a successful one despite the disagreements along the process, due to the final conservational outcomes and the level of participation along the designation process (Davis 2005, McGinnis 2012, Black 2015, Davis 2015, Galipeau 2015, Hastings 2015, Helms 2015, Jostes 2015, McGinnis 2015, Steele 2015).

Analysis

It is indeed true that the MRWG could not give a consented proposal supported by all the 17 members and that reaching consensus was one of the ground rules. Certainly, there was a failure there, but it was not in not counting with 100% of the votes on one particular proposal; it was in the design of the working group rules when thinking that consensus could be reached. Furthermore, it is erroneous to think that consensus should be an outcome itself when it is in reality a process of the design stage (McGinnis 2015). In a community as diverse as the one in California and therefore, as the one at the CINMS users, it is highly complicated to create a network of MPAs able to satisfy everyone's interests while achieving all the established goals. Until the proposal of having no-take marine reserves, fishing was allowed everywhere in the Sanctuary and fishermen had in a sense a franchise of resources; it was expected then that MPAs would represent a threat to their privileged use when having to have an equal stake in ocean management than other users (McGinnis 2012, Helms 2015).

It is also true that the process was delayed. Was it a mistake from the authorities to wait for unanimity for so long when their task was to make decisions on behalf of all stakeholder groups' interests, without favoring a specific one? Did the two years of complicated negotiations and controversial approaches result in a positive change? If the decision was taken in the beginning, only 8% of the area would have been protected. Instead, those two years resulted in protecting 21% of the area. It can be argued that in the long term, not delaying the process would have perhaps had negative ecological consequences.

It is important to note that it is highly uncommon to include the community in the process of designing MPAs. While it is true that authorities sometimes consult communities in order to obtain valuable local information for taking better-informed decisions, they do not include them in the creation of objectives and goals of the marine reserves. The involvement of the stakeholders in the CINMS MPAs designation process was in fact so high, that the authorities forgot that community inclusion process is not a substitute of governance (Hastings 2015). The CINMS case study might have failed in having a consensual agreement on the size and location of the MPAs, but it was successful in the community representatives' agreement of goals and objectives of the marine reserves, on having a science-based planning process, on being a pioneer effort to restore marine areas as it was the first region that successfully implemented the MLPA. Furthermore, it is an important example for being one of the few MPAs network in the world and the largest no-take MPAs network in the US (Davis 2005, Davis 2015). Helms 2015, Jostes 2015, McGinnis 2015).

5.2.4 GOVERNANCE SETTING

Channel Islands National Marine Sanctuary and others levels of protection

The interest in CINMS comes from the fact that it is the entity that has jurisdiction over most of the protected marine environments, and that the MPAs are located inside its boundaries. Nevertheless, as mentioned in section 5.2.3, the Channel Islands have acquired different categories of protection along their history. As such, there are 21 overlapping and interdependent MPAs that surround the islands, extending as far as 11.2 km off the islands' coast (Table 3).

This section will describe the level of protection of each MPA with their related allowed activities (Table 3), their goals (Table 4) and the agencies involved (Table 5). These will set the background for understanding the complex dynamics behind the wide variety of interests and agendas around these marine reserves, the need of coordination and cooperation efforts from the various authorities managing the same areas, and the distribution of responsibilities.

Table 3 gives a description of the Channel Islands MPAs complex, the jurisdictions of the different protection categories and the prohibited activities in each case. All together, they regulate from water and air quality to oil and gas exploration, having as well authority over fisheries management, development to seabed construction, ocean dumping, and shipping (Davis 2011).

Tabla 3. Jurisdictions and activities prohibited in each component of the Channel Islands MPA complex.

Channel Islands MPAs complex

Channel Islands National Park

Encompasses five islands (San Miguel, Santa Rosa, Santa Cruz, Anacapa, and Santa Barbara) and the 1st nm (1.8 km) of the ocean environment surrounding each island. In total it covers 1010 km² (249,561 acres) where half of the park is underwater (submerged lands and water), and the other half is composed by land.

In the CINP it's prohibited to feed, collect, disturb, or harm park wildlife, plant life, or other natural and cultural features. It is also unlawful to injure, damage, take, or possess any living, geological, or cultural marine resource. No fishing permitted, but limited harvest is allowed in marine conservation areas.

Channel Islands National Marine Sanctuary

CINMS covers 3807 km^2 of the waters surrounding the islands going from the mean high water out to the 6^{th} nm (11.2 km). It includes federal water extensions -that go from 5.5 to 11 km- offshore the 11 no-take state marine reserves.

Except additional prohibited otherwise for the or regulated activities in marine reserves and marine conservation areas, the following activities are prohibited and thus unlawful for any person to conduct or cause to be conducted within the sanctuary: (1&2) Exploring for, developing, or producing hydrocarbons and minerals; (3) Discharging any material except for fish parts and specific biodegradable matter; (4) Drilling into, dredging, constructing, or otherwise altering the submerged lands; (5) Abandoning any structure in the submerged lands; (6) Operating within one nm of any Island except to transport persons or supplies; (7) Disturbing a seabird or marine mammal by flying a motorized aircraft at less than 1,000 feet; (8) Moving, removing, injuring, or possessing a Sanctuary historical resource; (9) Taking any marine mammal, sea turtle, or seabird within or above the Sanctuary, except as authorized by the Marine Mammal Protection Act (MMPA), Endangered Species Act (ESA) or Migratory Bird Treaty Act (MBTA); (10) Possessing within the Sanctuary any marine mammal, sea turtle, or seabird, except as authorized by the MMPA, ESA, MBTA; (11) Marking, defacing, damaging, moving, removing, or tampering any monument, stake, post, or other boundary marker related to the Sanctuary; (12) Introducing or otherwise releasing from within or into the Sanctuary an introduced species, except striped bass (Morone saxatilis) released during catch and release fishing activity; and (13) Operating a motorized personal watercraft within waters of the Sanctuary.

11 No-take State Marine Reserves + federal extensions

The 11 no-take marine reserves cover a total of 800 km² of water that extend 11.2km off the islands and are divided as follows: Anacapa Island (40 km²), Carrington Point (33 km²), Footprint (70 km²), Gull Island (90 km²), Harris Point (127 km²), Judith Rock (12 km²), Richardson Rock (189 km²), Santa Barbara Island (148 km²), Scorpion (48 km²), Skunk (4 km²), and South Point (39 km²).

The State Marine No-Take Area designation and maintenance to continue. In the case of these MPAs, take of all living marine resources is prohibited.

2 State Areas of Special Biological Significance

The first one encompasses 1114 km² and is confined by the waters that extend 5.5 km off San Miguel, Santa Rosa and Santa Cruz Islands. The second one encompasses 141 km² and it extends in the waters 5.5 km off

Anacapa and Santa Barbara Islands.

These are areas monitored and maintained for water quality by the State Water Resources Control Board, considered to be important for supporting an unusual variety of aquatic life, and to often host unique individual species. They are considered building blocks for a sustainable, resilient coastal environment and economy. Discharge of wastewater, both point and nonpoint, is prohibited.

2 State Marine Conservation Areas (SMCA)

The first SMCA is Painted Cave covering an area of 5 km², and the second SMCA is Anacapa Island covering an area of 25 km².

The SMCA designation allows some recreational and/or commercial take of marine resources (restrictions vary). In the case of Painted Cave, the take of all living marine resources is prohibited except for the recreational take of spiny lobster and pelagic finfish. Anacapa Island has the same prohibitions plus the commercial take of spiny lobster.

3 Special Closures

These are Anacapa A (2 km²), Anacapa B (0.5 km²), and San Miguel A-1 (2 km²).

The Special Closures are areas designated by the Fish and Game Commission that prohibits access or restricts boating activities in waters adjacent to sea bird rookeries or marine mammal haul-out sites. In the case of Anacapa, the closure is in place for protecting pelicans nesting. No net or trap may be used in waters less than 20 feet deep off the island. In the case of San Miguel, the closure targets the protection of pinnipeds. Boating is allowed except for the closure between Judith Rock and Castle Rock where boats are prohibited closer than 300 yards from shore.

California Channel Islands International Biosphere Reserve

Its boundary coincides with the Channel Islands National Park. International Biosphere Reserves management seeks to achieve sustainable use of natural resources while ensuring conservation of the biological diversity of the areas. Channel Islands National Park was designated an International Biosphere Reserve in recognition of its genetic diversity and importance as an environmental baseline for research and monitoring.

The international biosphere does not create any regulations, but reserves need to fulfill three interconnected functions:

- <u>Conservation</u>: protecting cultural diversity and biodiversity, including genetic variation, species, ecosystems and landscapes and securing services provided by such diversity
- <u>Development</u>: fostering economic and human development that is environmentally and socially sustainable and culturally appropriate.
- <u>Logistic support</u>: facilitating demonstration projects, environmental education and sustainable development education and training, research, and monitoring.

Source: (NOAA 2014d, CDFW 2015d, CSWRCB 2015, NPS 2015c, UNESCO 2015a).

Conservation goals

Each component of the Channel Islands MPA complex has different conservation and management goals. In order to understand what are the concerns and elements addressed by each category, the overlapped purposes, and the interests addressed by each. Table 4 will summarize the different goals of each category of protection, and Table 5 the agencies involved in their management.

Altogether, they aim to conserve, protect, provide, understand, maintain, restore, enhance and support, the natural, scenic, historical, archaeological, cultural, scientific, educational, recreational and ecological values as well as the enjoyment, heritage, sustainable uses and public awareness of the area.

Categories of Protection		GOALS
Channel Islands National Park	1.	To conserve the scenery and the natural and historic objects and the wild life therein and to provide for the
(Defined in 16 U.S. Code - 16 USC - § 1 and §410ff)		enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations (16 USC 1):
	2.	To protect the nationally significant natural, scenic, wildlife, marine, ecological, archaeological, cultural, and scientific values of the Channel Islands in the State of California, including, but not limited to, the following: (1) the brown pelican nesting area; (2) the undisturbed tide pools providing species diversity unique to the eastern Pacific coast; (3) the pinnipeds which breed and pup almost exclusively on the Channel islands, including the only breeding colony for northern
		fur seals south of Alaska; (4) the Eolian landforms and caliche; (5) the presumed burial place of Juan
		Rodriquez Cabrillo; and (6) the archaeological evidence of substantial populations of Native
	3.	To understand populations dynamics and trends in terrestrial and marine ecosystems; and
	4.	To provide for visitor use on a low-intensity, limited entry basis to assure negligible adverse impact on the

Tabla 4.	Categories	of protection	and its goals.
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		park resources.
Channel Islands National Marine Sanctuary	1.	To maintain the natural biological communities and to protect, and, where appropriate, restore and enhance natural habitats, populations, and ecological processes;
(Defined in 16 U.S. Code - 16 USC - 1431(b))	2.	To enhance public awareness, understanding, appreciation, and wise and sustainable uses of the marine environment, and the natural, historical, cultural, and archeological resources of the sanctuary.
	3.	To support, promote, and coordinate scientific research on, and long-term monitoring of, the resources in the marine areas:
	4.	To facilitate to the extent compatible with the primary objective of resource protection, all public and private uses of the resources of the marine areas (sanctuary) not prohibited pursuant to other authorities
	5.	To develop and implement coordinated plans for the protection and management of these areas with appropriate Federal agencies, State and local governments, Native American tribes and organizations, international organizations, and other public and private interests concerned with the continuing health and resilience of these marine areas:
	6.	To create models of, and incentives for, ways to conserve and manage these areas including the
	7.	application of innovative management techniques; and To cooperate with global programs encouraging conservation of marine resources.
State Marine Reserves and	1.	To protect the natural diversity and abundance of
Conservation Areas		marine life, and the structure, function, and integrity of marine ecosystems.
(Defined in the California Fish and Game Code 2853)	2.	To help sustain, conserve, and protect marine life populations, including those of economic value, and rebuild those that are depleted.
	3.	To improve recreational, educational, and study opportunities provided by marine ecosystems that are subject to minimal human disturbance, and to manage these uses in a manner consistent with protecting
	4.	To protect marine natural heritage, including protection of representative and unique marine life habitats in
	5.	California waters for their intrinsic value. To ensure that California's MPAs have clearly defined
		objectives, effective management measures, and adequate enforcement, and are based on sound scientific midelines
	6.	To ensure that the state's MPAs are designed and managed, to the extent possible, as a network.
Areas of Special Biological	1.	To preserve and protect unique and sensitive marine
Significance	2.	ecosystems for future generations; and To protect species or biological communities to the extent that alteration of natural water quality is

(Defined in the Ocean Plan)		undesirable.
International Biosphere Reserve (UNESCO)	1. 2.	Conservation of important biological resources; Development of environmentally sound economic growth; and
(United Nations Education, Scientific and Cultural Organization (UNESCO) oficial purpose)	3.	Support for research, monitoring, education, and information exchange related to conservation issues.
		* Adapted from Davis (2011).

Agencies involved and their roles

At a broad scale, including the five islands, the management zoning is complex and complicated. There are different landowners and collectively, 32 agencies of local, State, and Federal governments are involved in the management, having authority over people and natural and cultural resources (Davis 2011). For the purposes of this work, attention is focused only on the management, authority and jurisdictions of the marine component which lays mainly in two Federal and two State agencies (Table 5). The other agencies that are somehow related to the marine area will be mentioned below.

Tabla 5. Description of the role that each agency plays in the Channel Islands MPA complex.

Agencies involved

The National Park Service

They manage activities on five islands and the submerged lands, waters, rocks, and islets surrounding the islands to a distance of 1 nautical mile. The Park Service owns and manages the islands of Santa Barbara, Santa Rosa, the east end of Santa Cruz, and Anacapa. The Park Service manages San Miguel; however, the island is owned by the U.S. Navy. The Park Service may apply its regulations to activities on the surface of the water, within the water column, in the area below mean or ordinary high water, and in some cases on the seabed, even on state- owned submerged land.

The National Oceanic and Atmospheric Administration

It manages the Channel Islands National Marine Sanctuary, which overlaps the park's marine waters and extends 6 nautical miles beyond the mean high tide for each island. Sanctuaries are managed to protect and conserve their resources and to allow uses that are compatible with resource protection. The CINMS regulates uses and activities within the sanctuary's marine waters, including oil and mineral extraction; disturbance to wildlife from aircraft, discharge or deposits of substances; alteration of or construction on the seabed; commercial vessel
operations; and protection of submerged cultural resources.

California Department of Fish and Wildlife

It has jurisdiction and management over the living marine resources in the water column and seabed surrounding the park islands, starting at the mean high tide. In particular, commercial and sport fishing are regulated by the agency.

California Environmental Protection Agency, State Water Resources Control Board

The State Water Board oversees the allocation of the state's water resources to various entities and for diverse uses. In the case of the Channel Islands, is in charge of the state areas of special biological significance.

The other agencies that can be somehow related to the Sanctuary waters though not directly

engaged in the management of Sanctuary resources, are those consulted to ensure compliance

with legislation, executive orders, and other mandates. These agencies include:

• The National Marine Fisheries Service

Management of threatened and endangered species and marine mammals in the

area of Federal jurisdiction (within 3-6 nm of CINMS waters).

• California Office of Historic Preservation

Management of Cultural resources

Pacific Fishery Management Council

Manages fisheries for about 119 species of salmon, groundfish, coastal pelagic species (sardines, anchovies, and mackerel), and highly migratory species (tunas, sharks, and swordfish) on the exclusive economic zone of Washington, Oregon and California.

Governance Setting Implications

The involvement of different agencies in the management of the MPAs complex has brought some difficulties along the years both between agencies and between agencies and stakeholders (Davis 2015). Ocean governance in the Channel Islands has involved different cultures, different agendas, different capacities and sometimes, different willingness of cooperation set at the same table. An example is the intergovernmental conflict that sprung up along the MPA planning process (*see section 5.3.5*) where state and federal agencies where not agreeing on which was the role that the federal government should play on the designation of the MPAs; over the appropriateness of using marine reserves for managing fisheries and the role of the Sanctuary in management; and over which agency should lead the development of the MPAs under NOAA (McGinnis 2012).

Similarly, an example of conflict between agencies and stakeholders also arose during the planning of the MPAs when some stakeholders, particularly fishermen, did not want marine reserves to be implemented (*see section 5.3.5 for further detail*). The reason of their disagreement has been attributed to different factors such as: (1) fishermen's unconformity on using marine reserves as a fishery management tool when having 'successful' single species fisheries management; (2) doubting the legitimacy of the CINMS in regulating those fisheries; (3) some fishermen representatives being paid lobbyists for representing certain industries interests; and (4) a set of value-differences from this sector (McGinnis 2012, Davis 2015, Hastings 2015, Helms 2015, McGinnis 2015).

Yet, diverse opinions between agencies and between agencies and stakeholders are not the only complications within the governance setting. Related to the latter conflict, another complication is the overlapping boundaries and therefore jurisdictions over the area and its resources (Figure 5). Explained in detail in table 5, the Channel Islands' waters are divided and managed by different agencies, with the CINMS the one that has to coordinate and cooperate with all. This can become an issue for instance with conservation purposes since the agencies use different management approaches such as regulatory vs. non-regulatory measures. Another problem are the complications on coordinating and cooperating with financial and human resources for addressing issues in the area while maintaining the interests and agendas of each federal and state agency involved. Representatives of these agencies have confirmed that it is indeed the coordination of agencies is indeed one of the most difficult tasks of all (Davis 2015, Douros 2015, Galipeau 2015, Hastings 2015).



Figure 4. Overlapped jurisdictions in the MPAs complex. Channel Islands National Park (CINP) jurisdiction: islands to 1 nm. California Department of Fishing and Wildlife (CDFW) jurisdiction: 0-3 nm. National Marine Fisheries Service (NMFS) jurisdiction: 3-6 nm. Channel Islands National Marine Sanctuary (CINMS) jurisdiction: 0-6 nm.

Conflict is sometimes necessary for noticing unconformities, concerns, values, interests and mainly bringing together stakeholders and authorities, or different agencies to engage in dialogue. On the other hand, conflict can unnecessarily complicate and slow down processes that are of benefit for a majority. Even though this has been sometimes the case in the Channel Islands marine governance; the agencies' efforts on balancing stakeholders' interests as far as possible in the MPAs designation process resulted in the establishment of the existing MPAs complex. Likewise, the Sanctuary's management has been satisfactory during the last decade given the continuous effort of coordination and cooperation among state and federal agencies (Davis 2015, Jostes 2015). Nevertheless, there is a need for persistent and effective enforcement of rules and regulations, involvement of the community and coordination of agencies to decrease the complications of the governance setting and to increase the protection of resources and achieve more of the MPAs complex agencies' goals. The outcomes have been positive so far, but there is always room for improvement.

5.2.5 SOCIO-ECONOMICAL SETTING

Socio-economical description of the area

California's economic history has been described as one of constant change, growth and prosperity; and currently, the largest in the United States (CDOF 2013). According to World Economic Outlook Database from the International Monetary Fund, California as a state, ranks in the top 10 economies of the world, being of the size of Brazil with a GDP of \$2,203 billion, and bigger than countries like Russia, Canada and Spain (CDOF 2014, IMF 2014).

California's economy is very diverse, and if using the North American Industry Classification System, the five largest sectors of employment in the state are trade, transportation and utilities; government; professional and business services; education and health services; and leisure and hospitality (LAO 2013). Furthermore, at the national level, California is the leader state in high tech, biotech, agriculture, entertainment, manufacturing, and tourism economic sectors (GOBIZ 2012). Nevertheless, the state has a significant income inequality, since it accounts for some of the most wealthiest per-capita areas in the U.S., especially cities along the coast, but it also has the highest poverty rate of any state in the country with a total of 23.5% of the total population (USCB 2012).

Starting back in 1850 as a sparsely populated region with less than 100,000 residents and entering the 2000's with 33,871,648, California has now a population that exceeds the 38 million, a number that makes California, if compared with world's countries, the 34th most populous in the world (USCB 2013, 2014). No single racial or ethnic group forms a majority of California's population, which is distributed as follows: Latinos (38.5%), White non-Latinos (39%), Asians (14%), African American (6.5%), and American and Hawaiian Indian natives (2%) (Figure 6).



Figure 5. California population by ethnicity groups. Source: United States Census Bureau population data from 2013 (USCB 2013).

The Channel Islands, located offshore from Santa Barbara and Ventura Counties are part of the Southern California Region, an area that encompasses eight metropolitan areas which includes Los Angeles, the 13th largest metropolitan area in the world and the second-largest metropolitan area in the United States (USDC 2008, USCB 2013). As the rest of the state, the Southern California Region has shown an increase in the population over the last decades, currently overpassing the 23 million people (USCB 2013).

This increase of the local and regional population is one of the CINMS' concerns as it involves an increase on the number of users in the Sanctuary (ONMS 2009). Examples of the variety of activities allowed include commercial and recreational fisheries, marine wildlife viewing, sailing, boating, kayaking, diving, snorkeling and maritime shipping (USDC 2008).

In terms of education, 17.4 % of the population over 25 years old has a bachelor's degree, 25.5 % went to collage but didn't obtained a degree, 9.5% has a graduate degree, 7.9% an associate degree, and the 39.6% attended high school or a lower education level (USCB 2014).

Regarding occupation, most of the population works either in management, professional and related activities (36.5%) or at sales and office (27.3%). The rest is distributed between services (13.4%); production, transportation and material moving (11.5%); construction, extraction and maintenance (8.2%), and lastly, farming, fishing, and forestry (3.1%) (USCB 2014). From this last category, if we would split fishing from forestry and agriculture, it would represent even a smaller percentage of people's occupations. Nevertheless, the Sanctuary represents an important source for commercial fishing as it has extremely productive fishing grounds with very economically valuable species (ONMS 2009). The commercial and recreational fishing regulations are managed by the California Department of Fish and Wildlife, also in charge of issuing the fishing licenses (CDFW 2015c).

Socio-economic setting implications

Since the purposes and policies of the National Marine Sanctuaries Act as mentioned in Table 4, include to both "protect...the natural habitats, populations and ecological processes" of the Sanctuary and "facilitate to the extent compatible with the primary objective of resource protection, all public and private uses of the resources of the Sanctuary not prohibited pursuant to other authorities" (16 USC - 1431(b)(3)); the management of the CINMS is very complex as it needs to assure both conservation and recreational values (USDC 2008). Since the Sanctuary was created in 1980, the population in California has increased 43% and consequently, the number of regional Sanctuary users has been growing exponentially (USDC 2008).

The problem entailed is that the only restrictions on the number of users allowed is set on the number of visitors permitted to access the islands; and in fact, this number is based on the experience of concessionaries, park managers and visitors' comments through the years instead of scientific carrying capacity studies (Davis 2015). Despite that the limit of visitors set in the islands affects various of the activities happening inside the marine reserves, there are no restrictions or permits required for private boat owners and therefore, they can freely enter and exit the Sanctuary (Davis 2015). On the economic side, Leeworthy *et al.* reported in 2014 the economic impact of commercial fishing within the CINMS based on estimates of harvest revenues reported by the California Fishery Information System, which helped calculating the output, income, value added and employment generated from the CINMS fisheries. In a three-year average from 2010 to 2012, the majority of the economic impact was concentrated in Ventura and Santa Barbara Counties (98.1% of total value of landings from CINMS), being *Market Squid, Urchin, Spiny Lobster, Crab, and Prawn & Shrimp* the top species groups caught; however, there were also reported landings at different ports of Los Angeles, Orange and San Luis Obispo Counties (Leeworthy *et al.* 2014).

In monetary values, the three-year average of each measurement in the five counties were as follow. The harvest revenue, equivalent to what fishermen receive when they land their catch, generated \$27.2 million. The output, equivalent to the total industry production, was \$45.3 million. The value added reached almost \$30.9 million; the total income \$27.8 million; and it generated 659 full- and part-time jobs (Leeworthy *et al.* 2014). These amounts do not tell the real impact that the CINMS has in average on a regional scale (five counties surrounding the islands). Therefore, if compared to the economy of the area, the commercial fisheries accounted for only the 0.03% of the total income by place of work, 0.02% of total income by place of residence and the jobs generated represented only the 0.009% of all jobs for the three year period in the five studied counties (Leeworthy *et al.* 2014). At a state level, these percentages would be even smaller.

In terms of recreation, the most recent study was carried out in 2003 as part of the study to assess the economic impact that the creation of the marine reserves would have in the local economies (Leeworthy et al. 2003). In this study, the commercial fishing dependence on the CINMS represented only 0.04% of the local economy, a slightly higher number than the study made by Leeworthy et al. in 2014 where it was found that the creation of the reserves would not have a significant impact on the commercial fisheries and the local economy. Likewise, the study in 2003 evaluated the economic dependence of the recreational activities on the CINMS, and it compared it to the total economy of each county. The results were 0.02% dependence in Santa Barbara and 0.14% in Ventura for Consumptive Recreational Activities; and 0.02% in each county for Non-consumptive Recreational Activities (Leeworthy et al. 2003). Although there is no recent study on the economical dependence on CINMS recreational activities at a local level, since 2003, the annual number of recreational fishing trips has reported to remain fairly constant (CDFG et al. 2008).

Even though there is a dependence on both commercial and recreational fishing in CINMS, if compared to a regional level it represents a very small part of the local economy (<0.05%). Nonetheless, when creating the MPAs in 2003, the fishermen opinions were considered valuable and the process was delayed by trying to reach an agreement with them. Although it was not possible to completely satisfy the fishermen's requests, the creation of the marine reserves has shown to improve the ecological conditions, and increase the biodiversity and fish biomass inside the reserves. Consequently, the network is already starting to have a spill over effect as some individuals move from reserves to fished areas (CDFG *et al.* 2008). Moreover, some commercial fisheries have grown in value in the CINMS. This includes the rock crab, spiny lobster, market squid, and red urchin; whereas others like the sea cucumber, California sheephead, and rockfish have declined (CDFG *et al.* 2008, Davis 2015).

Regardless of how difficult is to assess the socioeconomic impact that the MPAs have had for stakeholders and local economies given all the factors that can influence the results, the studies made previous to the creation of the MPAs and five years after did not note any significant impact (Leeworthy *et al.* 2003, Leeworthy *et al.* 2014). As examples of the broad range of changing factors that can have an impact on the socioeconomic situation are the fishing regulations, changes in environmental conditions like the noted warming of water temperatures, changes in gasoline prices, the resolution of the data systems based on 10x10 sq mile areas of reported overall landings by fishermen, and patterns of behavior (Hastings 2015, Helms 2015, McGinnis 2015).

Furthermore, different from the designation process where there was an outstanding inclusion of the community on the design of the marine reserves, the CINMS currently lacks of means to involve the stakeholders more in the management and decision making process. Even though the CINMS counts with an Advisory Council, this does not seem to be enough. As one of the members of the CINMS Advisory Council stated:

"The CINMS designation process was very collaborative. You had fishermen, scientist and various interests sitting in a room and talking. But the involvement of stakeholders is not that active anymore. The reality is that in all these processes there are a lot of promises made, but ultimately the government functions on money ... I like the process where you actually involve people and you treat them like they have something to contribute. Why would you ask the fishermen to attend if all you want to know is where are the fishes and how much money you can make? We know a little bit more than that" (Steele 2015).

In a study on the California MLPA initiative the lack of inclusion of the community was already noted. Jones *et al.* (2013) recommended that increasing public participation and the integration of local knowledge into MPA decision-making processes are key areas in which improvements can be made. That if done, there will be and empowerment of local users that will help having a better balance of power in such top-down MPA initiative (Jones *et al.* 2013).

5.3 Defining a Successful MPA

As mentioned in section 2, the establishment of MPAs is lagging behind the now extended target of protecting 10% of the world's oceans by 2020. One of the reasons of such delay and the failure in MPAs implementation, is the ineffectiveness of existing MPAs (Toropova *et al.* 2010). Nonetheless, there are some known MPAs stories considered successful for different reasons, such as Cabo Pulmo National Park in Mexico, where the fish biomass increased 460% in 10 years (Aburto-Oropeza *et al.* 2011). Another example is no-take areas targeted at increasing the abundance specific species like in the Glover's Reef Marine Reserve in Belize which boosted four times the abundance of reef sharks in five years; or other marine reserves considered successful for creating a significant spillover effect on fishing areas like the six no-take reserves of the Great Barrier Reef in Australia (Bond *et al.* 2012, Harrison *et al.* 2012). Even though there are some common success elements that are compatible for all types of MPAs, the reasons why an MPA is considered successful varies according to different factors like the objectives and goals for which the MPA was established, the different user's and stakeholder's backgrounds and affiliations, or simply diverse values and points of view (Lundquist and Granek 2005, Himes 2007). Therefore, the aim of this section is to document

the stakeholders' opinions of what a successful MPA is, and put them together with the general elements that a successful MPAs should have according to the literature; to construct a

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definition that matches more accordingly to peoples' perspective.

Tabla 6. Elements considered to make a MPA successful according to the literature review and the interviews conducted in this work.

Ecological factors	Socio-economica factors	¹ Management factors
Increased species abundance	Stakeholders participatio	on in management processes and activities
Signs of recovery	Engagement of all users	in design and implementation of reserves
Increase in size of fish and invertebrates	Interaction betweer	n managers and stakeholders
Spillover effect	Education ar	nd outreach programs
Maintenance of natural function	Empowerment of stakeholders	Effective design of MPA
Maintenace of habitat complexity and health integrity	Community support	Collaboration between managers and scientists
ow human disturbance.	Meets needs of people	Explicit objectives
	Connection to local communities	Effectiveness of MPA management
	Local understanding of MPAs regulations	Inclusion of available science in management decisions
	Economic benefits for the community	Effective protection of resources
	No long term impact on fishermen	Enforcement of regulations
		Proper understanding of the system
		Mitigation capability
		Evaluation of objectives

When it is not longer needed. According to Montes (2015), an MPA reaches success when its citizens are educated enough for using the area in a responsible, sustainable and responsible way.

Source: Pollnac and Crawford 2000, Pomeroy et al. 2004, Lundquist and Granek 2005, Christie et al. 2009, Black 2015, Davis 2015, Hastings 2015, Helms 2015, Jostes 2015, Montes 2015 and Steele 2015.

6. Comparison of both studies

Analyzing the differences between the socioeconomic and political context of the CINMS and OdLLC will help to identify the factors that have influenced these reserves in making the management decisions and achieving the conservation outcomes of the MPAs. Furthermore, creating a diagram of the interconnections for each case study will help to visualize and understand all the flows of the system including the connections between stakeholders, the way policies influence or affect activities, the actors involved, and the positive and negative influences of the system. These interconnections' diagrams will help to set out, in a more precise way, the results obtained from the literature review, the indicators, the interviews, and direct observations, identifying the leverage points of the system in order to understand the key elements that are helping that particular MPA to become successful.

6.1 INDICATORS

Indicators are tools that provide us with practical means for evaluating particular purposes such as the state and the development of social systems or the accountability and performance of management with regard to desired objectives (Ehler 2003, Sabatella and Franquesa 2004). Pomeroy *et al.* (2004) suggested that the best indicators are those that fit best for each case study. Building on this, the following indicators were chosen from different authors along the literature review in order to be able to measure the desired variables needed for the comparison of the CINMS and OdLLC case studies (Table 7). It is therefore worth noting that the answers of each category were based on web-based tools, on the literature review and on the author and other expert's opinions, particularly key stakeholders in the studied MPAs.

 Tabla 7. Indicators for the socio-economical situation and the governance status of both the OdLLC and CINMS MPAs.

		Ojo de Liebre	Channel Islands
Category	Indicators	Lagoon Complex	National Marine
			Sanctuary
	Country income status ⁴	Upper-middle-income economy	High-income economy
	Local economy	Low economy	Very high economy
	Per capita annual income	\$2,850 USD	\$31, 640 USD
Socioeconomic	Main occupation	Commerce and services, Fisheries, Tourism and Industry (salt mining)	Management, professional and related occupations; and sales and office occupations.
	High school graduate or higher (age +25)	20.42%	81.2%
	Persons below poverty level	41.9%	15.9%
	Dependence on marine resources	Moderate-high	Low
	Community engagement ²	 Advisory Council Volunteers Subcommittees Subsidy Programs: PET (<i>Temporal</i> <i>Employment Project</i>) e.g. beach cleaning PROCODES (<i>Conservation Program</i> for Development) e.g. productive or training projects PROVICOM (<i>Community Surveillance</i> <i>Program</i>) e.g. PROFEPA's surveillance adjuvants. 	 Advisory Council Volunteers (<i>Channel</i> <i>Islands Naturalist Corps</i>) Donations (National Marine Sanctuary Foundation)
	Environmental awareness ¹ (modified)	Moderate-high	Moderate
	Interaction between managers and users ²	 Advisory Council Sub-committees Workshops Subsidiary Programs 	 Advisory Council Marine Reserves Working Groups
	Corporate sustainable tools and practices ²	 · ISO-14001 · Mexican Clean Industry Certificate 	N/A

	Total costs and income	\$167,000 USD from federal	\$ 2 million USD
Political and	Ecosystem-based management ³	Yes	Yes
governance	Adaptive management ³	Yes (e.g. The creation of the Climate Change sub-committee).	Yes (e.g. Shipping strikes program)
	Compatibility between local, state, federal and international goals ³	Yes. Particularly when benefiting local communities with the allowances of use of natural resources.	Different but compatible goals. Some levels of protection do not include recreational activities in their goals, but all aim to protect and conserve marine ecosystems.
	Representation of stakeholders ensured	Advisory CouncilSub-committees	Advisory Council

(1) Pomeroy et al. 2004; (2) Marques et al. 2011; (3) Suggested in this work; (4) World Bank (TWB 2015).

 Tabla 8. Comparison of the existence, absence and neutral or mid presence of chosen variables, as a summary of the elements for each case study. Red color means existence or yes, orange means absence or no and light blue means neutral or more or less.

Variables	OdLLC	CINMS
Commercial exploitation		
Subsistence exploitation		
Surveillance program		
Enforcement		
Adequate Staff (number)		
Community involvement in establishment		
Community involvement post designation		
Public awareness		
User compliance		
Education and awareness programs for tourists		
Education and awareness programs to community		
Dependence on resources		
Proximity to large urban areas		
Amount of visitors controlled		
Development of alternative activities		No need
Jurisdictional disagreements		

The context of each MPA influenced differently the established relations between users, stakeholders and authorities, and thus, the issues of each MPA varied in significance, management and responses. Table 7 and 8 will facilitate the discussion of each MPA in section 7.

6.2 INTERCONNECTIONS' DIAGRAMS

Marine Protected Areas are usually influenced by contextual factors, actions and forces of the economic development and socio-political change (Chuenpagdee *et al.* 2013, Jones *et al.* 2013, Bennett and Dearden 2014). These driving forces interact between each other and are incentives for both positive and negative changes. The purpose of the interconnections' diagrams is to visualize how these forces are interconnected on each MPA, how strong this interconnections are and thus, which are the positive and negative elements on each system that influence conservation and management on the area.

6.2.1 OJO DE LIEBRE LAGOON COMPLEX

In OdLLC there is a strong relationship of cooperation and coordination between CONANP (MPA managers), ESSA (external ally) and the community (Figure 7). This has been in part due to: (1) the existing high dependence on resources from the community, (2) the isolated location of Guerrero Negro, (3) the CONANP's intelligent perspective when realizing that for conserving adequately the natural resources they have to help simultaneously the community that depends on those resources, and (4) the willingness of ESSA to help conserve the area where it is immersed.

The way external factors have influenced the system is reflected in Figure 7. An example of this is the positive and strong interconnection between "*Influence of other conservation designation*" and "*Adequate conservation of resources*". This was seen in the 90's when thanks to other international conservation designations in the OdLLC, a lot of pressure was put on the government for stopping the expansion of the salt work, resulting in an adequate protection of the natural resources of the area (*see section 5.1.2 for further detail*).

On the other hand, there are some weak connections that need to be strengthened like the one between the incentives "*political will for effective enforcement*" and "*reinforcement of user rights*" reflected in some fishermen complains on the over-protection of resources by CONANP and the need of issuing more fishing permits. Similarly, another weak connection is the one between "*scientific input*" and "*adequate conservation of resources*", which might have been one of the reasons why no one noticed on time the change of temperature in the current that affected the Mano de León clam population. Nevertheless, after this event, CONANP is working on a project for installing physic-chemical sensors in the lagoons, which will help increase the scientific information input for having a more adequate management of resources.

As discussed in section 5.1.3, the support that CONANP has on the community has been reflected back on the community's general acceptance and support to CONANP's management decisions. This can be seen in the interconnections of Figure 7 between the cycle of "MPA managers' community support" – "Enforcement of benefits for locals" – "Building trust / social capital" - "Community's support of management decisions" and back to "MPA managers' community support". This chain of interconnections, together with the one between "External important

allies" (in this particular case referring to ESSA) and "Adequate conservation of resources" are the most important in the OdLLC system as they have been the basis for obtaining positive conservational outcomes (See section 5.1.3 for further detail).



Figure 6. Web of incentives in the OdLLC system. The figure shows all the interconnections between the community (blue), the manager actions (pink), the external inputs (purple) and the political context (brown). The symbol \rightarrow indicates a one-way interaction with one factor influencing another one and the symbol \leftrightarrow indicates a two-way interaction with two incentives reinforcing each other. The thick arrows represent a strong influence and the thin lines a weaker one. **Adapted from Jones et al. 2013.*

6.2.2 CHANNEL ISLANDS NATIONAL MARINE SANCTUARY

In the CINMS it can be noted from the interconnections between the different incentives, that for instance, weak linkages like those between "*community support of management decisions*" and other incentives such as "*social capital*" or "*participative structures and processes*" are not due to a poor environmental awareness or disinterest but rather to the fact that it is highly complicated to involve a community as big as an diverse as the one in the Southern California Region (Figure 8). Nonetheless, increasing public participation could be a key area of improvement as discussed in section 5.2.5.

The strongest interconnection comes from the "scientific input" and the "adequate conservation of resources" as this recurrent feedback helps facilitate the implementation of an adaptive management, helps preventing possible environmental stressors and therefore, it helps making the system more resilient. CINMS also counts with strong legal mandates and political leadership, but with a weak interconnection with cross-jurisdictional integration not because it does not happen, but because given all the overlapped jurisdictions it requires more effort and according to involved interviewees, it is the most complicated part of the management.



Figure 7. Web of incentives in the CINMS system. The figure shows all the interconnections between the community (blue), the manager actions (pink), the external inputs (purple) and the political context (brown). The symbol \rightarrow indicates a one-way interaction with one factor influencing another one and the symbol \leftrightarrow indicates a two-way interaction with two incentives reinforcing each other. The thick arrows represent a strong influence and the thin lines a weaker one. **Adapted from Jones et al. 2013.*

7. Discussion

The economic situation of a place is a driving force for the way people relate to the environment. For instance, if there is a dependence on resources for subsistence, the values and particular interests of the activities happening inside a MPA will be different than those for a person whose interests are mainly recreational. This relationship can be in either case positive or negative for the environment depending on the combination of contextual factors such as: community's environmental awareness, stakeholders-managers relationship, community's diversity, number of population influenced by the happenings in the MPA, diversity in occupational activities, and vulnerability of the system, mentioning a few.

On the other hand, the involvement of the authorities and managers with the local communities, the awareness of their local needs and problems, and the support they can give to the population are key elements for the way communities will approach to resources, for the level of complexity when solving problems, and for the outcomes of both the management and conservation actions.

Therefore, in a MPA governance system, the way the community, political, management and external incentives are interconnected is of great importance as it talks about the stability and resilience of the system which can eventually lead to success (Jones *et al.* 2013) (Figures 7 and 8).

7.1 Ojo de Liebre Lagoon Complex

In the case of OdLLC, the economy of the area is very weak as the monthly average income of an economically active person is of \$ 237 USD, compared to \$860 USD in Mexico, which is three times higher. Even though the commerce and service sector creates more jobs, it is in fact fishing and tourism that are most valuable in monetary terms. Both are considered to be activities of subsistence in Guerrero Negro and as both depend completely on OdLLC's natural resources, the management decisions in the MPA are of great relevance to the community.

With a small population of just 13, 054 inhabitants and being isolated from the big cities of Baja California Sur (770 km from La Paz and 920 km from Cabo San Lucas), even though the population did not participated in the designation process of the area due to the highly centralized existing political system in Mexico, the CONANP has established a tight, supportive and communicative relationship with the community, resulting in the high stakeholder's involvement, awareness and endorsement of most of management decisions.

Since within REVIBI's goals, we can find the aim of having both productive and ecotouristic activities while conserving and protecting the ecosystems, part of the high community's cohesion is due to the fact that REVIBI's staff live and work in the town, that they know first hand what the problems are, and thus, CONANP does not focuses only on the protection of resources, but furthermore, it creates programs for supporting the environmental awareness of Guerrero Negro's inhabitants. Thereupon, REVIBI managers have such presence in the community that the population's dependence on resources does not create a depredation mindset on the users but rather, one of awareness and protection.

The socio-economical situation of the place, together with OdLLC's geographical isolation, have created a closed system where the issues that arise are easier to solve internally by the ESSA-CONANP-community triad than taking them to the county seat 220 km across the desert. In fact, the inter-actor cooperation is such, that most of the interviewees imagine that the area will be better in ten years from now. According to them, given their context, changes will happen slowly but it will result in a more environmentally aware community, more of the needed infrastructure, and with an increase in marine resources.

Nonetheless, in spite of a general compliance of the regulations from the community; there are situations that threaten the industry-conservation-community balance, because the population has a high dependence on the resources. An example of this is the collapse of the highly valuable clam fishery Mano de León that, according to several interviewees, lead to an increase of illegal fishing due the need of finding an alternative income. Moreover, besides putting a stress on other fishing resources, it creates friction between the actors as for instance, even though the Mano de Léon collapse is attributed to a change in water's temperature and a pathogen that affected the whole population, some fishermen blame ESSA's brine residuals as guilty of the deaths, whereas other blamed CONANP's over-regulations, explaining that the closed season created an over growth of the clam population and thus, the organisms died of suffocation. Despite the fact that the OdLLC case study is an outstanding example of inter-actors coordination and cooperation, community's environmental awareness, and a proof that conservation and industry can not only coexist but also benefit from each other while benefiting the community; it is also very vulnerable to changes given the economic state in which the population is immersed. Thus, it is highly desirable to create projects that can help transform the state of fishing and tourism as activities of subsistence, and that can counteract with the impacts of unusual events like the collapse of the highly valuable Mano de Leon fishery, which causes not only a stress on other fishing resources, but that creates tension in the ESSA-CONANP-community triad.

7.2 Channel Islands National Marine Sanctuary

With a radically different socio-economical context, the CINMS is immersed in an area of a very strong economy, where the average of the per capita annual income is 11.1 times higher that in OdLLC, and where fisheries account for only 0.03% of the total income by place of work. Consequently, there is no existing dependence on natural resources for subsistence and the interests on the network of MPAs in the CINMS is mainly for recreational use.

The population of the Southern California Region is more that a thousand times higher than Guerrero Negro's over 23 million people, and different from the isolated OdLLC, the area where the CINMS is immersed encompasses eight metropolitan areas including Los Angeles, the 13th largest metropolitan area in the world. As it can be expected from such a populated area, the community is very diverse and thus, since the CINMS attempts to both conserve the resources and facilitate all public and private uses of the resources, management can get complicated to satisfy everyone's interests. This was the case when the network of MPAs was created in the Sanctuary as despite there were different alternatives offered, some fishermen where not happy with restricting certain areas of the Sanctuary. Nevertheless, it was the conflict created during the designation process what called the attention of more actors resulting in the involvement of a bigger part of the stakeholders in the process.

Given that what happens in the CINMS does not affect directly the life of the community, the way the population gets involved in the Sanctuary is completely different than in OdLLC. While in the OdLLC the community participates in activities that benefit directly the MPA like surveillance, beach cleaning, and increasing tourists' awareness; in the CINMS the community that gets involved is mainly the one interested in environmental education and volunteering through the Naturalist Corps, and also those that represent certain sectors in the Advisory Council.

In terms of management, the involvement of so many agencies complicates sometimes the coordination and management itself, different from OdLLC where all responsibility lies mainly in CONANP, and in CONAPESCA in terms of fishing permits. In contrast, the CINMS has at least four institutions that are directly related to the management of marine resources dividing the jurisdiction by depth and distance; and more than five additional institutions involved indirectly on the marine management.

CINMS has the advantage of being located in one of the most studied areas in the world. The scientific input was not only present during the designation MPA process, but there is also constant scientific input through the monitoring programs which result in the publication of reports of the state of the Sanctuary every five years. This is one of the great advantages of the Sanctuary, as it helps making more informed decisions and facilitates the adaptive management.

7.3 Defining success

According to the combination of the literature review and the answers of the interviewees, a successful MPA needs to meet the ecological, socio-economical and management factors mentioned in Table 6. These factors can be located at different times along the MPA designation and management processes. Table 9 shows these factors allocated according to the time from the MPA implementation, and furthermore, it shows which elements are still needed on each case study. **Tabla 9.** Important factors that define success of a MPA along time according to the interviewed actors from the CINMS and the OdLLC, together with the repeated elements from the literature review. The figure represents the OdLLC, whereas the figure represents the CINMS. The color green indicates that the element is present in the MPA, the yellow that it is more or less present, white that there is no available information and the red that the factor is weak or not present at all.



Despite that is always place for improvement; both CINMS and OdLLC are examples of Marine Protected Areas that are on the path of achieving success in the terms defined by their own actors. On their own contextual issues, they have overcome situations that have increased the resilience of the system and strengthened the interconnections between incentives as shown in Figures 6 and 7. Currently, it is hard to see ahead to the successful outcomes of both MPAs, but some elements are starting to be noticed like the recovery of the lobster fishery in CINMS or the increase in the number of the whales arriving each year in the OdLLC.

In the case of the CINMS, it is clearer to note that an ecological success is more likely to be achieved in the future since some elements are starting to be seen such as an increase in fish abundance and improved habitats. However, there is a social failure in the sense that there is a lack of broad participation in management practices. Even though CINMS was an example of the inclusion of community representatives in the designation process, this has not continued in the post-designation period. Increasing the inclusion of the community would be desirable in order to increase the governance measures that strengthen the resilience of the MPA. Strengthening the resilience is achieved by enhancing the complexity of the interconnectedness and interactions that occur between system elements (actors, rules, species, habitats).

In the case of OdLLC, the ecological positive outcomes can be seen in the increases on the number of whale arrivals, and by its isolated location the low level of human disturbance. Nevertheless, there is a need to increase the scientific input in order to keep monitoring programs that can help assess the changes on the area and adapt decisions based on that. On the social part, the social inclusion is exceptional as there is a high involvement of the community in the MPA in terms of stakeholders' participation, communication with managers and support to most management decisions. However, even though these characteristics would define OdLLC as a social success, there is also a high vulnerability on the system as it can change fast due to the high dependence on resources. The ecological gains are prone to decrease unless social issues and concerns are adequately addressed.

8. Conclusions

The socio-economical and political contexts of both CINMS and OdLLC, together with their histories, have shaped and keep transforming the conservational outcomes of these MPAs. Based on the actors' perspective of what a MPA should accomplish in order to be successful (Table 6), both marine reserves are on a good track for achieving success as both present most of these factors. Nonetheless, these positive outcomes are subject to change if some issues are not attended to.

In the case of Ojo de Liebre Lagoon Complex, the main elements that have helped the area to present positive conservation outcomes are: (1) CONANP's approach to management of resources by supporting the communities that depend on them (*e.g. the implementation of subsidiary programs where the communities benefit economically and the reserve benefits in actions they would not be able to complete with the number of staff they have*); (2) The community's general support of management decisions and actions; (3) ESSA's support for both conservation actions and general issues related to the community (*e.g. maintenance of urban infrastructure*) (4) Size of the community and its remoteness which has allowed the industry-environment-community triad to form; and (5) The environmental awareness at a local and regional level.

Nevertheless, the systems balance is highly vulnerable as large part of the community depends on the marine resources for subsistence. Increasing the occupational available options for the community would help reducing this vulnerability that is presented when there is a socio-economical crisis, like the one presented after the collapse of one of the most valuable fisheries, the clam Mano de León. If this vulnerability is reduced through the broadening of employment options, the stress on other marine resources will decrease, the positive relationships between community, managers and industry representatives will remain or even escalate, but mainly, fishing and tourism will not be activities of subsistence anymore. If what threatens conservation in OdLLC is presented only when there are crisis given that there is a general environmental awareness; then helping the community is the most fortunate approach for conserving the highly valuable ecosystem that OdLLC is; because in a scenario of surviving vs. protecting natural resources it is not difficult to choose which has a priority.

On the other hand, the elements that have helped the Channel Islands Marine Sanctuary to have positive conservation outcomes are: (1) Involvement of representatives of different sectors on the planning process (*agreement on MPAs goals and objectives*); (2) Use of scientific input since its planning process and along the years (*e.g. five year reports*); (3) Successful implementation of strong legal mandates and (4) Creation of a network of MPAs.

Nevertheless, the complex governance setting complicates at times the coordination and cooperation between agencies, being the biggest challenge for the management of the Sanctuary. Furthermore, the lack of inclusion of the community in the post-designation management practices is a key area to make improvements, as it would balance the distribution of power in such a top-down setting.

9. Recommendations

In order to conduct a more complete study it would be important to include ecological data of the state of the system, as available. This information should present an assessment of the changes of the health of the ecosystem through the years in order to evaluate the changes that have occurred. With this information, it would be desirable to analyze the strength of the relationships in the MPA by studying if there is a significant difference between socio-economic variables chosen for each site and ecological outcomes of the MPA. For instance, it could be possible to determine if the percent of people involved in fishing would have a significant impact on the effectiveness of conserving resources, or if the mean years of education, or the number of the population, or any other socio-economical factor would impact the conservation of the area.

Analyzing the contextual factors of other ecoregions and other MPAs would help increasing the understanding of how the socio-economic and political context of a place can affect conservation. By studying a larger number of MPAs, it would be possible to identify the common elements of the contextual factors that lead to positive outcomes in different areas immersed in similar situations. Once identified, these influential factors can be key for helping to take preventive actions in other MPAs and thus, help avoiding them from being ineffective.

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