MARINE ECOSYSTEM-BASED MANAGEMENT IN MEXICO:
An idea traveling across borders

by

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ABSTRACT

Ecosystem-based management (EBM) has gained acceptance around the world as an integrated approach to management based on science that considers the entire ecosystem, including humans. I analyze two implementation projects of EBM in the Gulf of California (GC): one focused on shrimp fisheries and the other on artisanal fisheries, both funded by The Packard Foundation. Using semi-structured interviews of key informants, I try to understand how the idea of EBM for fisheries management emerged in the GC, how is this concept understood in that region, and the challenges that this new management scheme has faced in the Mexican context. I discuss that this idea has surged as a response to the Mexican fisheries crises as well as the external influence from donors; that it is a concept regarded to be too skewed towards science and to have an environmentalist agenda; and how the challenges for EBM implementation in the Mexican context are mostly related to governance and institutional arrangements.

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I. INTRODUCTION

Since the late 1980s, there has been a gradual decline of global fishing landings (Pauly, Watson et al. 2005). In 2003, FAO estimated using the best data available that approximately half the world's stocks were exploited either at or close to their maximum (Garcia and Grainger 2005).

Mexico's fishing resources are no different: the National Fisheries and Aquaculture Research Institute (Instituto Nacional de la Pesca y Acuilcultura, INAPESCA), the scientific component of Mexico's fishery management agency, has declared that 60% of fisheries in Mexico are being exploited to their capacity or overfished (Cudney-Bueno, Bourillon et al. 2009).

The overexploitation of fishing resources has long been recognized as a leading environmental and socioeconomic problem in the oceans (Worm, Hilborn et al. 2009). To redress it, there has been an increasing interest in implementing non-conventional approaches to fisheries management.

Marine ecosystem-based management has emerged as a way to address the current and future management challenges of the oceans, promoting a vision for healthy, productive, resilient marine ecosystems that provide stable fisheries, healthy seafood, abundant wildlife, clean beaches, and vibrant coastal communities (McLeod, Lubchenco et al. 2005).

The main purpose of this research is to study two cases that attempted to carry out ecosystem-based management for fisheries in the Gulf of California in order to understand how different actors and other elements of social, ecological, political and institutional context contribute to the outcomes and trajectory of ecosystem-based management in Mexico.

II. BACKGROUND

1. The Genesis of Marine Ecosystem-Based Management

The management and regulation of coastal and marine resources has been typically sector-based and less than adequate, posing an extraordinary challenge both to sustainable development and to environmental protection (McLeod, Lubchenco et al. 2005; UNEP/GPA 2006; ELI 2009; McLeod and Leslie 2009).

A shift of paradigm in the early 1990s, mostly propelled by the 1992 United Nations Conference on the Human Environment and Development (UNCED) and Agenda 21, highlighted that ocean and coastal management should be 'integrated in content and anticipatory in ambit' (UNEP/GPA 2006).

By the late 1990s, the United Nations through their Commission on Sustainable Development, as well as the Convention on Biological Diversity, largely recognized that integrated, ecosystem-based management was a strategy that 'promoted conservation and sustainable use [of natural resources] in an equitable way' (UNEP/GPA 2006). The definition of ecosystem-based management (EBM) has been negotiated throughout the

years and although different schools of thought have somewhat different approaches to integrated management, some core principles are the same: the recognition of interconnectedness of ecological systems and human activity; the promotion of cross-sectoral and decentralized governance that is consistent and that re-enforces planning and decision making; and the application of sound science to the planning and decision-making process through a sustained, long-term and adaptive management process (UNEP/GPA 2006).

The definition of ecosystem-based management was still nebulous by 2003 and what was regarded as a bigger challenge was the fact that there was no specific model for its use in managing coastal and marine ecosystems (Rowe and Hershner 2009). The issue of the reports of the Pew Ocean Commission that year and of the U.S. Commission on Ocean Policy in 2004 further calling for a more comprehensive, integrated, ecosystem-based approach to address the management challenges of the oceans prompted the release of a scientific consensus statement on marine ecosystem-based management. This document was prepared and signed by over 200 scientists and policy experts in the United States in early 2005 (McLeod, Lubchenco et al. 2005).

The consensus statement had the objective of providing information to policy-makers in the U.S. and it aimed to reflect a scientific understanding about marine ecosystems and the concept of EBM, as well as actions consistent with an ecosystem approach. According to the 2005 scientific consensus statement:

Ecosystem-based management is an integrated approach to management that considers the entire ecosystem, including humans. The goal of ecosystem-based management is to maintain an ecosystem in a healthy, productive and resilient condition so that it can provide the services humans want and need. Ecosystem-based management differs from current approaches that usually focus on a single species, sector, activity or concern; it considers the cumulative impacts of different sectors : 1).

The consensus specified that ecosystem-based management is place-based in focusing on a specific ecosystem and the range of activities affecting it. It also stated that EBM emphasizes interconnections within systems (recognizing the importance of interactions between many target species or key services and other non-target species); among systems (such as between air, land and sea); and integrates ecological, social, economic, and institutional perspectives, recognizing their strong interdependences. This consensus statement is still one of the most cited documents in marine and coastal ecosystem-based management literature.

Nevertheless, in 2006 Arkema et al. reviewed 18 definitions of EBM as part of their investigation of the translation of scientific principles into management practices. They searched the literature for key words commonly associated to marine or coastal ecosystem approach to management, such as ecosystem-based management (EBM), ecosystem management (EM), and ecosystem-based fisheries management (EBFM). After finding that based on the three main criteria they used to characterize EBM (sustainability, ecological health and the inclusion of humans in ecosystems), there were no significant differences in these 3 afore mentioned terms, they recommended that scientists began using one universal term to describe EBM. The underlying assumption

of their recommendation was that simplifying and standardizing terminology might advance the understanding and communication of EBM principles between academics and resource managers, and subsequently further EBM implementation (Arkema, Abramson et al. 2006).

2. Marine Ecosystem-Based Management in Practice

EBM is gaining acceptance around the world as a more comprehensive approach toward coastal and marine resource management and it has been called for by many scientists (Dayton, Thrush et al. 1995; Pitcher and Pauly 1998; Pikitch, Santora et al. 2004; Pauly, Watson et al. 2005; Daskalov, Grishin et al. 2007; Myers, Baum et al. 2007). It is an idea that has received considerable attention in theory, and it has even been adopted in principle by some entities charged with managing ocean resources (for instance, NMFS). At the same time, its scope and implications remain vague and examples of integrated approaches to marine EBM are few and far between. Such instances are essentially "learning by doing" through managing portions of ecosystems towards a subset of ecosystem objectives (the most prominent examples are the Great Barrier Reef Marine Park, the Antarctic/Southern Ocean, the Bearing Sea/Aleutian Islands and the California Coast). The absence of successful EBM implementation cases most likely reflects incomplete scientific information and the difficulties inherent in implementing large-scale management strategies within coupled ecological and socio-economic systems characteristic of ocean governance (Ruckelshaus, Klinger et al. 2008).

There are many challenges that experts identify for marine EBM implementation, such as being able to emphasize broader connections (i.e. ocean and coastal/watershed), scaling up management to scales appropriate to vast interconnected ecosystems, a lack of common vision and objectives for marine EBM (which implies a dialogue with stakeholders in order to identify what ecosystem services people want and need from the marine environment) (Agardy 2007; Leslie and McLeod 2007), and the big tradeoffs these imply in terms of ecosystem health or human well-being (Leslie and McLeod 2007). Another challenge is that ecosystems are geographically specified, when in reality, an ecosystem can be shared by two or more countries which calls for international collaboration (Sumaila 2007). In many Latin American countries, there are no institutional arrangements that allow for multiple decisions (i.e. fishing and conservation) (Arreguin-Sanchez 2007), and more generally, there is a lack of ocean governance frameworks that enable people to implement EBM (i.e. conflicting and overlapping mandates of government agencies) (Leslie and McLeod 2007). Other key challenges also include the escalating level of complexity in terms of scientific information needed to implement EBM (Ardron 2007), and a dearth of examples of success and of integrated knowledge of the real challenges of moving beyond concepts towards implementation in specific settings. There is also a need to evaluate when the goals and other elements of the vision have been achieved (there is a need of and value for adaptive management) (Leslie and McLeod 2007).

It has been recognized that 'obstacles that may prevent development and implementation of a truly ecosystem-based plan include: lack of capacity to achieve objectives; agency mandates or primary objectives that prevent EBM implementation; and lack of common objectives across a region' (ELI 2009).

The argument that EBM could help maintain an ecosystem's health and resilience to environmental change is appealing, yet not well tested. However, the fact that marine ecosystems are suffering from declines in the status of species, habitats, and ecosystem functions indicates that many previous attempts to manage individual threats in the absence of a system-wide approach have not worked (Ruckelshaus, Klinger et al. 2008).

3. The David and Lucile Packard Foundation's Marine and Coastal Ecosystem Based Management Initiative

The David and Lucile Packard Foundation (The Packard Foundation) has been dedicated to philanthropic causes since 1964, when it was established. They work 'to improve the lives of children, enable the creative pursuit of science, advance reproductive health, and conserve and restore the earth's natural systems' by investing in innovative people and organizations[1].

In 2003, the Packard Foundation launched the *Marine and Coastal Ecosystem Based Management (EBM) Initiative*. As previously mentioned, at that time, EBM was a concept that did not have a precise definition or a specific model for implementation in coastal

[1] http://www.packard.org/

or marine systems. Nonetheless, it was an idea that was aligned with the Packard Foundation's interests and there was a general belief, partly motivated by the two ocean commission reports, that sustainable use of coastal and marine systems would require an ecosystem-level approach to management (Rowe and Hershner 2009).

The goal of this Initiative was to invest in scientific activities to guide the implementation of EBM, contribute to understanding of EBM, and foster tool development and use to address specific problems. The pilot implementation of EBM was set in the priority Packard Foundation regions: the Central California coast, the Gulf of California and the Western Pacific. The Packard Foundation selected seven demonstration projects that were called 'Regional Initiatives': Palau; Indonesia (Papua); Fiji; California (Morro Bay and Elkhorn Slough); and the Gulf of California (one focused on the shrimp fishery and another on the artisanal fisheries in the northern Gulf).

The Marine and Coastal Ecosystem Based Management Initiative reflected the scientific discourse about the EBM construct, in which science could enable EBM by informing policy (Rowe and Hershner 2009).

4. Researching Marine Ecosystem-Based Management Around the World

In 2009, a collaborative effort between Duke and Brown Universities assembled an interdisciplinary team to study the emergence of EBM in the Pacific regions selected by the Packard Foundation.

My master's project is part of this research project entitled: *Exploring Ecosystem-Based Management in Context*. My contribution is the analysis of the two regional initiatives located in the Gulf of California (Northwestern Mexico).

5. The Packard Regional Initiatives in the Gulf of California

The Packard Foundation has been funding, for approximately six years, two initiatives in the Gulf of California that have focused on the implementation of ecosystem-based fisheries management. These two initiatives are very different from each other: one is focused on the shrimp fishery, the most important fishery in Mexico in economic terms; while the other focuses on small-scale fisheries, which collectively have considerable environmental and economic impacts but are largely ignored by the government.

5.1 Shrimp fisheries in the Gulf of California: An ecosystem-based management approach

This initiative is led by INAPESCA and WWF-México and is also funded by The Walton Family Foundation. The goal is to inform and transform national policy on the shrimp industry, to introduce EBM tools and principles to fisheries management decisions and to find ways by which this industry can position itself towards sustainability and competitiveness within international markets. To achieve this, among other activities, INAPESCA and WWF-México formed a group comprising a cross-section of experts that created management scenarios based on modeling of stock

dynamics, trophic relationships and spatial allocation of fleets and intended to pilot and assess the implementation of management scenarios at two contrasting places in the gulf representing the general regional reality of shrimp fisheries: the Altata-Ensenada El Pabellón coastal lagoon and the Upper Gulf of California[2].

Their conservation targets include wild shrimp stocks (three different species), habitats (shallow bottoms, coastal lagoons and wetlands), and endangered species (sea turtles, the vaquita and the totoaba).

This initiative has been very inclusive, and some of the actors are: INAPESCA, the National Commission on Fishing and Aquaculture (CONAPESCA), WWF-México, Alto Golfo Sustentable (AGS) and other NGOs, regional academic institutions (Centro de Investigaciones Biológicas del Noroeste, CIBNOR; Centro Interdisciplinario de Ciencias Marinas, CICIMAR; El Colegio de Sonora), professional negotiators and conflict solvers, seafood traders, and artisanal and industrial fishers.

The development of ecosystem-based management scenarios, their pilot implementation and evaluation, and the persuasion for adoption to be undertaken with authorities, fishers, processors and merchants is considered by this Regional Initiative to be an historic effort in the Gulf of California.

[2] These two sites have different fleet conditions, fishers' socioeconomic conditions, challenges for surveillance and shrimp quality.

5.2 PANGAS: Conectando Gente y Ciencia por la Salud de Nuestra Pesca

PANGAS, which stands for "*Pesca Artesanal del Norte del Golfo de California – Ambiente y Sociedad*" (Artisanal Fisheries in the Northern Gulf of California – Environment and Society), is an interdisciplinary consortium of three research institutions (University of Arizona, Centro de Investigación Científica y Educación Superior de Ensenada and University of California Santa Cruz), and three non-profit organizations (CoBi, Pronatura Noroeste, CEDO Intercultural) that uses social and environmental sciences, as well as traditional knowledge, to develop fisheries management strategies for the Northern Gulf of California. The region the consortium is interested in comprises the northern Gulf of California, beginning in the Colorado River delta, and continuing south to the edge of the Midriff Island Region.

The group initiated its work in 2005, with four main objectives[3]:

1. Characterize present day small-scale fisheries in the study area;
2. Develop an integrative approach for research and management of specific case studies of small-scale fisheries systems;
3. Engage key stakeholders and decision makers in the development and implementation of management recommendations;
4. Provide training for students, as well local fishers, in tools for ecosystem-based research, management, and conservation of marine resources.

[3] http://pangas.arizona.edu/en/what-pangas

PANGAS uses key commercial species as representative proxies of the region's four main types of fisheries: rocky habitat fishing/commercial diving and line fisheries; sand bottom fishing/long line; sand bottom fishing/traps; open water fishing/gillnets.

PANGAS' strategy to translate research to the development of policies and management actions centers on further building alliances with appropriate government entities; using existing political forums and local initiatives to convey research findings; working directly with selected communities and groups of fishermen in the development of *ad hoc* local management guidelines; developing with the government regional fishery management plans for key fisheries and/or areas.

The consortium is working towards providing sound scientific knowledge for the development of management outcomes.

III. RESEARCH QUESTIONS

Exploring Ecosystem-Based Management in Context focuses on the regional emergence and context of ecosystem-based management and has three main goals:

1) The development of a comparative framework to assess progress of marine ecosystem-based management at seven sites in the Pacific;

2) The documentation of the diverse narratives associated with these efforts; and

3) The generation of practical ecological and social indicators for ecosystem-based management.

Our overarching research question is:

How does the political, institutional, social, and ecological context affect the progress of ecosystem-based management in different sites?

We seek to understand how different actors and other elements of social, ecological, political and institutional context contribute to the outcomes and trajectory of EBM in different locations.

In my initial analysis of the Gulf of California regional initiatives, I was interested in how the idea of '*Ecosystem-Based Management*', coming from Conservation Biology, had traveled from the United States to the Gulf of California in Mexico. I wanted to know:

What motivates EBM implementation? And

How is EBM understood?

In an iterative process, after having conducted the interviews that inform my research and realizing that none of the respondents thought the projects I am analyzing were 100% successful at implementing ecosystem-based management in the Gulf of California[4], I considered it valuable to analyze:

What aspects of the Mexican context prevent the implementation of EBM?

By answering these questions for my master's project, my objective is to contribute to the science and practice of marine ecosystem-based management in diverse ecological, institutional and social contexts by documenting the stories emerging from the Gulf of California's EBM implementation efforts.

[4] As a matter of fact, several respondents affirmed that EBM was ***not*** being implemented in the Gulf of California.

IV. MATERIALS AND METHODS

I selected the case study framework as a research method. According to Yin (2008) this tradition of inquiry is used when the researcher is interested in understanding a real-life phenomenon in depth, but such understanding encompasses important contextual conditions because they are highly pertinent to the phenomenon of study (as opposed to an experiment, in which the phenomenon is deliberately divorced from the context, attending only a few variables).

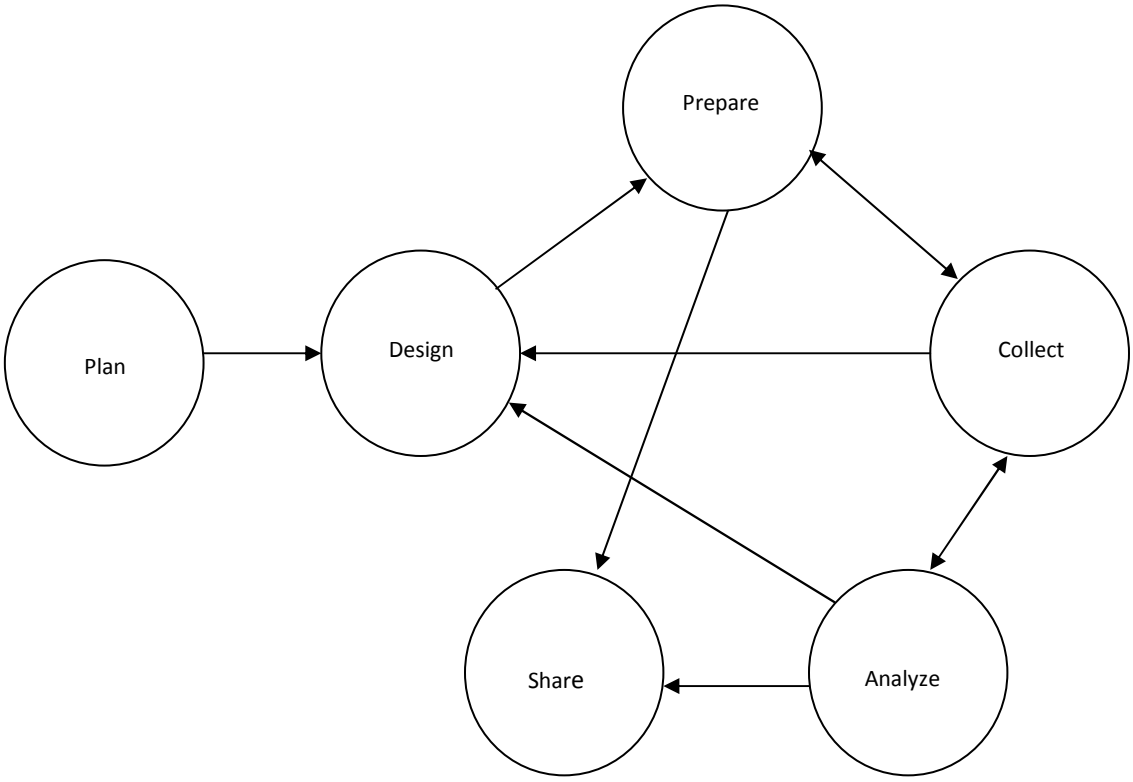

Figure 1. As noted in my research questions, doing case study research is a linear but iterative process (taken from Yin, 2008).

I used two different methods to collect data: archival research and semi-structured interviews. As a starting point, I explored and reviewed pre-existing documents related

not only to the two regional initiatives, but also about general themes such as the Gulf of California, fisheries and marine resources management in Mexico, marine protected areas, and non-governmental organizations. Hammersley and Atkinson note that in literate societies, 'ethnographers need to take account of documents as part of the social setting under investigation' since these are 'an integral feature of [their members'] everyday life and work' (Hammersley and Atkinson 1995 : 158).

Subsequently, as a research team (*Exploring Ecosystem-Based Management in Context*) we prepared an interview guide which we pretested with people that have vast experience in the Gulf of California (see Apendix I for the final version of the interview guide). Unstructured and semi-structured interviews consist of open-ended questions broadly relevant to the research topic that allow interviewees to direct the flow of conversations to themes and explanations they consider most significant. Unlike completely free-wheeling informal conversations, unstructured interviews are 'based on a clear plan that you keep constantly in mind', and they rely on a written interview guide that directs the topics and chronology of the interview (Bernard 1995 : 209).

Once it was approved by the Institutional Review Board (IRB), we identified and contacted all the relevant actors to set up interview dates. Our recruitment methods included existing personal contacts, the contacts of the EBM implementation teams at each site, internet research and snowball sampling: we asked key respondents for referrals to mediate against a bias of only speaking with those seen as 'friendly' to

policy change or progressive environmental policies. My research is heavily focused on in-depth interviews with scientists, activists, and managers participating in ecosystem-based management research and implementation.

We began the dialogue by soliciting ideas from each implementation project on what *they* would be most interested in learning from our research, in order to identify what research areas are most critical from their perspectives and how we can most effectively contribute to their efforts and build capacity (particularly in terms of social science research) at each site.

An anthropologist from Brown University and I conducted a field visit during the summer of 2009. We spent three weeks traveling around the Gulf of California region and we interviewed 22 people: 5 from the academic sector, 5 from the government sector and 12 from the NGO sector.

Before I continue, I should note the limitations of my research. My colleague from Brown University and I planned to interview more government officials who are familiar with the two implementation projects subject to this study, and that hold decision-making ranks within their agencies; however, because of time constraints we were unable to do so. We were only in the field for a few weeks and our visit coincided with the prelude to the opening of the shrimp fishing season. This meant that authorities were unavailable to take our calls or grant us an appointment, as they were

occupied both with logistics and setting up the pilot implementation of a catch shares project in Sinaloa (I will revisit this in the 'Results' section).

Another limitation is that we did not interview any direct local users of fishing resources mainly because these two projects were conceptualized by scientists and conservation practitioners and so we deemed more relevant to focus on them and on experts of the region. That being said, interviewing fishers should be considered as an area for future research.

The interviews were conducted both in English and Spanish (depending on the respondent) and they were recorded with a digital device. The interviews focused on EBM emergence, the actors involved, perceived and actual outcomes, and the larger context of each site. Throughout our interview process, we guaranteed the confidentiality of our respondents by identifying them only by their category (i.e., as a scientist) and geographic location and not their specific role, title, or place of work.

We proceeded to transcribe the interviews and I analyzed their content with NVivo 8, a qualitative data analysis software. I then coded the interviews. Coding enables data retrieval so that one may begin processes of analysis, and analytic coding also enables asking questions to the data (Morse and Richards 2002). At first I used predetermined themes such as 'EBM definition', 'Challenges', and 'Facilitating Factors'. After coding under these major themes, I observed new emergent themes and coded for them as well. Examples would include 'Governance', 'Progressive Agencies' and 'External

Influence'. I will use quotations to illustrate key points that emerged throughout my analysis.

V. RESULTS

1. An overview of the context: The Gulf of California

The Gulf of California, also known as the Sea of Cortez, is located between the Baja California Peninsula and mainland, in the northwestern part of Mexico (Fig. 1). This semi-enclosed sea is considered one the most productive and diverse marine ecosystems in the world (Enriquez-Andrade, Anaya-Reyna et al. 2005).

Figure 2. The Gulf of California is located in the Northwestern part of Mexico, surrounded by the states of Sonora (1), Sinaloa (2), Nayarit (3), Baja California Sur (4) and Baja California (5)[5].

[5]Modified from: http://www.cet.com.mx/intercet/imagenes/downloads/mapas/mexico_dp.gif

1.1 The biophysical context

The Gulf of California is 1,130 km long and 80-209 km wide, covering an area of approximately 230,000 km^2 (Lluch-Cota, Aragon-Noriega et al. 2007). It hosts a vast variety of coastal and marine environments and habitats which range from tropical mangrove forests and coral reefs to hydrothermal vents with biotic communities supported by chemosynthesis. Its oriental shores are formed mostly of sandy beaches, large coastal lagoons that supply large amounts of fresh water, and open muddy bays. Its occidental coast is mostly rocky, with some pocket beaches and practically no drainage (Lluch-Cota, Aragon-Noriega et al. 2007).

The Sea of Cortez is the only large evaporative basin on the Pacific Ocean (Roden, 1958 in Lavín, Durazo et al. 1997). Its climatic conditions range from temperate to tropical (Roden 1958; Badan-Dangon et al. 1991 in Lavín, Durazo et al. 1997).

The rich pelagic waters of the gulf are renowned for supporting abundant marine life. Species diversity is influenced by seasonal oceanographic conditions. The largest percentage of diversity is found in the southern gulf, which is a largely stable tropical environment year round. Diversity decreases gradually when moving north, where marked seasonal changes occur (Brusca, Findley et al. 2005).

There are 665 species of marine flora, consisting mainly of macroalgae and sea grasses (Aburto-Oropeza and López-Sagástegui 2006). The fauna is highly diverse, comprising at least 5,969 named species and subspecies: 4,854 invertebrates and 1,115

vertebrates (891 fishes, 224 non-fish vertebrates). Of the 224 non fish vertebrates, 181 are birds, 36 are mammals (31 cetaceans, 4 pinnipeds and 1 bat) and 7 are reptiles (including 5 species of turtles). At least 26 species of seabirds breed in the Gulf of California; the gulf is a feeding and breeding area for cetaceans, although there are also several resident stocks of cetaceans and one pinniped stock. Sea turtles either feed or nest in the region (Lluch-Cota, Aragon-Noriega et al. 2007) .

Over 900 islands make the region ideal for endemism: there are 770 endemic species and some authors estimate that there are more than 4,000 invertebrate species that remain undescribed (Brusca, Findley et al. 2005).

1.2 The socio-economic context

Although the population density is still low, the demographic growth in the Mexican northwest is higher than the national average, mainly propelled by the cross-border economic disparity (Stoleson et al. 2005 in Cartron, Ferrusquía-Villafranca et al. 2005). This growth is particularly conspicuous in coastal communities, where growth is directly related to the search of economic alternatives resulting from the exhaustion of sources of income in the agriculture and husbandry sector, which is to say that the region's population comes from recent migration and diverse cultural origins (Luque-Agraz and Gómez 2007).

The region of the Gulf of California comprises approximately a quarter of the Mexican territory and over 8% of the total population. The contribution per capita of the

inhabitants of the Gulf of California is 5% higher than the national average (Carvajal, Bezaury-Creel et al. 2005). Moreover, 9% of the GDP is attributed to the region mainly due to fisheries, tourism and port activity (Ulloa, Torre et al. 2006).

1.2.1 Tourism

The geographic position of the Gulf of California is a key factor in tourism: it is the closest access to the sea for residents from Arizona and other landlocked states in the U.S., and it is a destination preferred by Californians (Ulloa, Torre et al. 2006). The main drivers of this economic activity are recreational fishing and ecotourism. Every year, there are more than 4.8 million visitors and revenues reach almost US$2 billion (Aburto-Oropeza and López-Sagástegui 2006).

1.2.2 Agriculture and animal husbandry

Half of the irrigation crops in Mexico are located in the Ecoregion of the Gulf of California. Most of the agriculture in the area uses modern technology and fertilizers intensively. It is estimated that 40% of the national crop production comes from the region (mainly from Sonora and Sinaloa). The main crops are wheat, garden produce and oilseed. In animal husbandry, there is an estimated 500,000 heads of cattle (Ulloa, Torre et al. 2006).

1.2.3 Fishing and Aquaculture

Fishing is the most important human activity in the Gulf of California, and the area is recognized as the country's main source of fishing resources accounting for about

50% of the national fishery production, generating over 50,000 jobs, and involving about 26,000 boats of which 90% are small-scale boats (Ulloa, Torre et al. 2006). The most important products are shrimp, squid (a relatively new fishery), anchovy, tuna and sardines (Carvajal, Bezaury-Creel et al. 2005).

The shrimp fishery is the most important of the country in terms of income and employment, representing nearly 40% of the total national fish production value, and generating over 30,000 direct and indirect jobs (Lluch-Cota, Aragon-Noriega et al. 2007). There are two fleets that depend on this resource: one operating *pangas* (small operating boats, also known as *dories*) in coastal lagoons and shallow waters, and another, fully industrialized, comprised of trawling boats working over the continental shelf. This fishery is also the most controversial and problematic in the country. On the one hand, it is considered to be overcapitalized, and ecologically aggressive due to the effects of trawling. On the other hand, this fishery still represents the main source of income for many coastal communities around the gulf (Lluch-Cota, Aragon-Noriega et al. 2007).

The Gulf of California also hosts 94% of all the shrimp farms of the country, which represents 95% of national production of farmed shrimp in Mexico (SAGARPA 2002a, De Walt et al. 2002 in Ulloa, Torre et al. 2006).

There are both a small pelagic fishery and a large pelagic fish industry. The first one targets mainly sardine (*Sardinops caeruleus*) whereas the latter targets mainly tuna (yellowfin *Thunnus albacares*, and skipjack *Katsuwonus pelamis*), billfish (striped marlin

Tetrapturus audax, blue marlin *Makaira nigricans*, black marlin *Makaira indica*, sailfish *Istiophorus platypterus*, and swordfish *Xiphias gladius*), mahi mahi (*Coryphaena hippurus*), and around 40 species of sharks including the genus *Mustelus*, *Carcharhinus*, *Alopias*, *Sphyrna* and *Squatina* (Lluch-Cota, Aragon-Noriega et al. 2007).

Small-scale fisheries are very important in the gulf. They exploit approximately 70 species of bony fish, elasmobranches, mollusks, and crustaceans for an annual catch of nearly 200,000 ton (Enriquez-Andrade, Anaya-Reyna et al. 2005). The artisanal fishermen use gillnets, hooks and lines and traps. There were over 20,000 *pangas* registered some years ago (Cudney-Bueno and Turk-Boyer 1998).

Another important fishing sector in the Gulf of California is the recreational fishery. The catch has been estimated at 17,000 individuals per year for marlin and sailfish, plus some 54,000 smaller fish like tuna and mahi mahi. This activity creates employment in many fields that has a direct impact on the local economy (Lluch-Cota, Aragon-Noriega et al. 2007).

1.3 The institutional context

This section will focus on the institutional framework in which fisheries in Mexico operate because both regional initiatives are about an ecosystem-based management approach to fisheries in Mexico.

Even though fisheries management has been centralized in the past, in 2007 the Mexican government enacted a new sustainable fisheries and aquaculture Law (Ley

General de Pesca y Acuacultura Sustentables, LGPAS), introducing decentralization as one of its primary goals (Cinti, Shaw et al. 2010).

The government agencies that share authority in fisheries management in Mexico are the Department of Agriculture, Animal Husbandry, Rural Development, Fisheries and Food (SAGARPA), and the Department of the Environment and Natural Resources (SEMARNAT) (Fig. 2)[6].

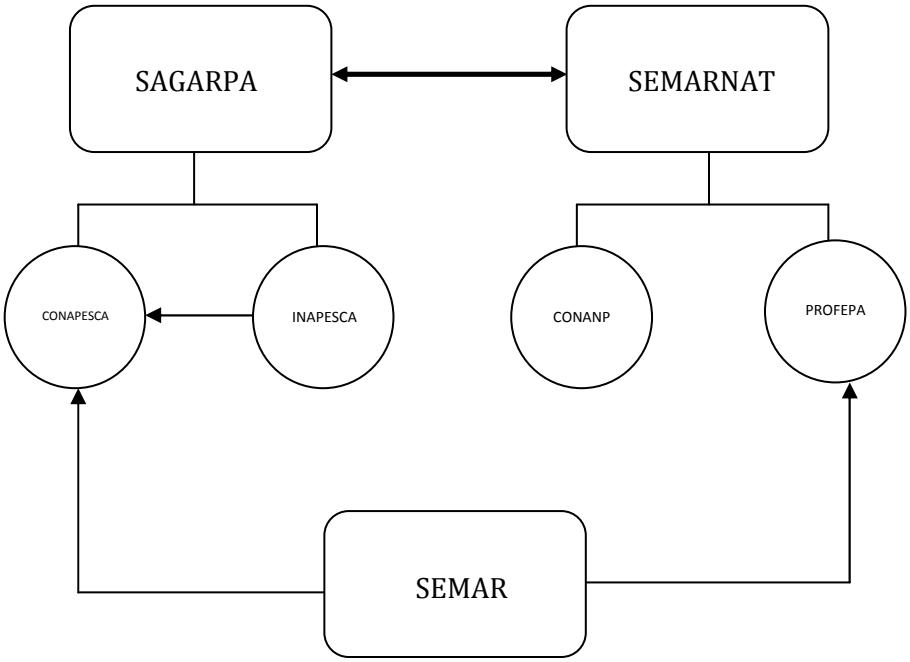

Figure 3. Federal agencies involved in fisheries management in Mexico (adapted from Cinti, Shaw et al., 2010).

SAGARPA, through the Commission on Fisheries and Aquaculture (CONAPESCA), is responsible for fisheries regulations, their enforcement and fisheries

[6] http://www.semarnat.gob.mx/Pages/inicio.aspx; http://www.sagarpa.gob.mx/Paginas/default.aspx

management tools such as fishing permits, authorizations or concessions[7]. The National Fisheries Research Institute (INAPESCA) is in charge of generating the scientific information that will drive the policies created and enacted by CONAPESCA; however they do not have authority to create or implement policies themselves. One of their main responsibilities is the National Fisheries Chart (Carta Nacional Pesquera, CNP), which is a document that includes cartographic as well as written information regarding the availability and conservation status of fisheries and aquaculture resources in order to inform and make recommendations to CONAPESCA[8].

SEMARNAT, through the Attorney General for Environmental Protection (PROFEPA)[9], regulates the use of species under special protection and may approve their harvest through a species-specific permit that grants exclusive use rights within a certain area following a management plan (Basurto and Cinti 2009). The National Commission on Protected Areas (CONANP)[10] helps conserve Mexico's natural heritage and it is in charge of establishing and managing marine protected areas.

CONAPESCA and PROFEPA are enforcement agencies; however they are unarmed, and so, the Navy (SEMAR) provides support as needed.

At the local level there are different state departments (i.e. the Secretary of Fisheries and State of the state of Sinaloa); however they do not have authority to issue any kind

[7] http://www.conapesca.sagarpa.gob.mx/wb/
[8] http://www.conapesca.sagarpa.gob.mx/wb/cona/cona_actualizacion_de_la_carta_nacional_pesquera
[9] http://www.profepa.gob.mx/profepa
[10] http://www.conanp.gob.mx/

of permits or licenses that would allow harvest of fishing resources. They tend to provide support to fishermen through social programs such as acquisition of new boating equipment or programs to build technical capacity (Basurto 2009).

Fishing permits (granted by CONAPESCA) are the most widely used management tool to regulate access to marine resources (Basurto and Cinti 2009; Cinti, Shaw et al. 2010). Other instruments include national standards (Normas Oficiales Mexicanas), which are species-specific or time-specific and usually entail closures (temporal or permanent) and gear or size restrictions (Cinti, Shaw et al. 2010).

However, it is widely known that the limited capacities of the government in fisheries management, in addition to corruption, growing immigration rates to the coast and the elevated costs for fishers to organize and to participate in collective-action processes promote a *de facto* situation of open access (even if entry to a fishery requires a license issued by CONAPESCA) (Basurto and Ostrom 2009; Cudney-Bueno, Bourillon et al. 2009; Cinti, Shaw et al. 2010).

Environmental legislation in Mexico has quickly grown in the last 20 years and it appears that it has the necessary legal instruments to ensure the conservation of biodiversity and ecosystems; however, as stated by Székely et al. (2005): '*the real challenge is not the continuous enactment of laws, administrative rules, norms, or provisions, but the strengthening of the country's rule of law to ensure that effective enforcement and*

implementation of environmental legislation becomes the rule rather than the exception, as is the case now.' (Székely et al. 2005 in Carton, Ceballos et al. 2005).

2. Circumstances leading to the implementation of EBM

I will begin by looking at what people recognize as the impetus for the implementation of EBM in the Gulf of California. During the interviews, we asked directly to our respondents: *What was the motivation for implementing EBM in this region?* To which, people who are main actors in both projects identified the influence of the Packard Foundation:

I should explain something before…how PANGAS really started. Because I think it's important to know and to make that connection. When we were in this phase of data gathering and empowering local communities, local fishermen for the management, Richard Cudney, myself, and Sergio Knaebel -that by then was the Packard Foundation program officer for the Gulf of California- were talking about how the work in Kino and the work in Peñasco and the work that Pronatura was doing in the Bahía de los Ángeles could be magnified, could be taken to a larger scale. And one of the things that we agreed upon was that we needed to understand better these connectivity issues on the north part of the gulf, because that's the area that by then we work mostly in this area (sic). [AC3, PANGAS]

Although this quote does not address the Packard's Foundation EBM program influence directly, it speaks to the fact that Packard has been engaging in conversations regarding connectivity and a wider ecosystem perspective with stakeholders in the region. As another respondent observed:

The funders are on board with ecosystem-based management and they are trying to have people think in terms of ecosystems as opposed to species... I would say Packard would like to have people see problems from an ecosystem perspective... [SC2, Academy]

Other respondents addressed this question by linking directly what their project is set out to do with what the Packard Foundation was funding at the time:

In 2005-2006, Packard started promoting ecosystem-based management approaches. So, I would be lying if I didn't say that we used this opportunity (funding was our motivation)… [AC18, Shrimp]

And also:

Um… I can't say that can I? (laughs)… the motivation was an opportunity. The first thing was an opportunity from the foundation saying there is this possibility – then I talked to Miguel Angel Cisneros and the Upper Gulf was – shrimp is the main fishery – we were dealing with issues of the vaquita and we needed to know, we needed to gain better understanding of what were the effects of the ecosystem on the most valuable resource and vice versa effects of the fishery on the ecosystem to see if that science would bring a better management option, no? So it was kind of natural for us to pick that up… [AC17, Shrimp]

However, there are other underlying triggers for the implementation of EBM. INAPESCA has declared that 60% of the Mexican fisheries are being exploited to their capacity or are being overexploited (Cudney-Bueno, Bourillon et al. 2009). Several respondents alluded to the fact that fisheries in Mexico are in 'crisis':

A professor that taught me years ago used to say that we use most of the renewable resources, particularly fisheries resources, as non-renewable resources. As if we were mining for fish instead of fishing. And that's exactly what goes on. When you see the amount of fisheries that have collapsed in the Gulf of California and the general trend for most of the fisheries in the Gulf of California – that statement really hits the point. [AC8, PANGAS]

Looking at the trends and the history of the resources, which are getting scarce, and there is more people who would like to make a living through fishing or aquaculture… I can envision, paired with this inclination towards better conservation and management of the resources, some change in resource management… [The fishing resources] have ups and downs, but the trends we have seen in the state [of Baja California], and which are very likely to be going on around Mexico, are that landings are decreasing… [GO15, Government Baja California]

…Another thing that I think will propel taking management to different plateaus is that the resources are being degraded, and so when natural resources are in crisis, then the users demand better management. Before they are 'oh no, here they come bothering us again,' but when the resources are gone they will say 'ay! There're gone!' and I believe a lot of the resources are already in that stage… [AC12, local NGO]

Two respondents, who have been involved with local NGOs for a long time, were very adamant about the changes they have seen throughout their careers:

…I've seen fisheries collapse in ten years. Totally disappear. Commercially extinct in ten years. And not one. I've witnessed at least four or five in the gulf. So, it's…if you have fishermen that have been active for three decades, they've seen a lot of changes, they've seen things are going downhill…. [AC3, PANGAS]

… in Bahia de los Angeles 7 fisheries [have] already collapsed historically, all of them were sport fisheries, high value, and most of the catches in the present come from species of lower value…. [AC8, PANGAS]

It is clear that respondents understand that the state of fishing resources in the Gulf of California is dire; that current management strategies are not working and that there is a need to explore innovative options. However, it is also clear that marine ecoystem-based management was chosen mainly because of the Packard's Foundation influence.

3. How is EBM understood?

The definition of EBM is not entirely shared with all the actors of the region. Everybody gave a personal interpretation of what this concept means, which does not always include humans. This suggests that people's understanding of the idea of EBM has nuances. Even though there is a consensus statement -which I referenced above- that explicitly defines ecosystem-based management and was signed by leading scientists in the field, nobody we interviewed mentioned this document. It is important

to highlight that respondents recognize that people don't know how to do EBM, even if they intuitively understand what it means:

I believe we have not defined very well or very deeply what ecosystem-based management implies. I think we all say: ok, you consider species interactions and interactions with the community, right? But we don't know how "to eat it". That's where we are, in defining the strategies to make it implementable, this concept that in theory sounds interesting. [AC19, local NGO]

The subject is brand new, you realize this, right? There is not a well accepted definition because as a matter of fact, there are very few tools to determine how an ecosystem works… We don't know how many [consequences of our extractive activities there will be] and how will they play out in time and space. I honestly still don't understand very well how we are going to do ecosystem-based management. [SC11, Shrimp]

First, we thought that there was one implicit objective – to learn what EBM is. This is something that people are struggling with – how do you do EBM? [GO6, INAPESCA]

Moreover, a comprehensive EBM strategy is regarded as practically impossible to put into practice. Implementers of these projects have negotiated the limitations and boundaries of their projects to make them manageable:

In the literature, EBM is recognized as valid; something that we can't do is thinking about controlling all elements that make up the ecosystem, I mean, if one thinks about the global management of an ecosystem we would have to do it in terms of management of fishing fleets, tourism, and other things that in reality is not possible. Even within fisheries it's very hard to decide on a multispecies level… [SC1, Shrimp]

…We decided to focus on rocky reef species because the list of small-scale fishers in the northern gulf fish a huge list of species – just impossible – so we decided to focus on the rocky reef and swimming crab… [AC20, PANGAS]

Throughout our conversations with practitioners, government officials and scientists, we found out that at the same time these EBM projects were in process, a

catch shares (individual transferable quotas, or ITQs[11]) program was being developed for the shrimp fishery in the Gulf of California. This program was an initiative of WWF-Mexico with the Environmental Defense Fund (EDF) that quickly became popular with CONAPESCA, the government agency in charge of fisheries management. This has meant that the implementation of an ecosystem-based approach to the management of the shrimp fisheries (both industrial and artisanal) has been pushed back, almost to the point of oblivion, by government agencies. The interviewees recognized that part of the reason the catch shares has been so well accepted by the government is that CONAPESCA sees it as a strategy to diminish social conflict in the shrimp fishery in Sinaloa, where tensions between small-scale and industrial fishermen have been increasing. Although we did not explore further about the catch shares program (whether it is feasible or not given the context et cetera), we were able to discern that EBM is perceived to have explicit environmental goals (as opposed to being economically oriented) and to be very scientific. Some examples of what people mentioned include:

.... EBM is more of a science-based approach providing information to the ITQ project… In summary, we see the ITQ project as more operational, more short-term to provide a means to reduce conflicts. The other is more science-based, asking 'what about the ecosystem'? In the quota system, we are looking more at the shrimp itself rather than the ecosystem. [MC, INAPESCA]

[11] Both CONAPESCA and EDF officially refer to the catch shares program as a Limited Access Privilege Program (or LAPP); however, our respondents used 'ITQs.'

Catch shares was perceived [by the government] as a real solution while EBM was perceived as a scientific toy. [AC17, Shrimp]

In the context of the Gulf of California, it appears that ecosystem-based management is still a fuzzy concept, it is considered to be difficult to implement, heavily based on science and with a specific environmental agenda behind it.

4. Roadblocks of EBM in the context of the Gulf of California

As I mentioned before, several respondents affirmed that EBM was not being implemented in the Gulf of California and none of them thought the EBM projects were being 100% successful. What exactly have been the challenges to the implementation of ecosystem-based management in Mexico?

According to the perspectives and experiences of the respondents, the answer is an array of issues that are mostly related to the institutional structure and governance. As one of the respondents puts it:

…we think that most of our problems in Mexico have little [to] do with management and a lot to do with governance – in the sense that if governance is the scenario where management works, then that scenario is broken, so no matter how many good management proposals you throw into the system, the system is broken. [AC17, Shrimp]

Most of the respondents recognized politics and economics as important obstructions to the emergence of EBM. Fisheries management decisions in Mexico are not regarded to be based solely on science:

… [To translate science to policy] we have a border. As scientists, our recommendations are limited to technical aspects. If you can't fish anymore, that's our recommendation: that there shouldn't be any more fishing. The managing agency has more criteria to base their decisions on,

if the community has no food, etc. and the technical is just one of the many criterion they use to decide if they will issue a permit or not… [GO10, INAPESCA]

…I think that not even in the most advanced or established fisheries like small pelagic, sardines, I don't know if ecosystem considerations are considered (sic)… – actually I don't think so, I don't think so. In most of the cases not even biological considerations are used – it's only – everything is market-driven…. [AC8, PANGAS]

…Some of the decisions are made based on social or political pressure, and dismiss the scientific background. And PANGAS is a project that really tried to go the other way around and say, we have the science that makes the case for this decision, so we would like to see this decision taken, not totally the opposite. And sometimes that's the case, when you have a fishing community, leaders, politicians, local groups, putting a lot of pressure on the government saying: we need more permits, we need more boats, we need more effort, even though probably the signs say that's not a sensible, that's not an intelligent decision because the fishery's gonna (sic) keep collapsing. So that's probably one of the biggest challenges. [AC3, PANGAS]

A good example of the pressures the Fisheries Agency (CONAPESCA) has to deal with is what a park ranger mentioned in his interview:

If you have a small [fishing] community… you pretty much know everybody and the proposal would be to lobby at high political levels in a way that CONAPESCA issues permits to those [fishermen] who don't have them. The National Fisheries Chart says that you can't give any more permits in the Gulf of California, but we argue that you are not issuing more permits. These people were here before the National Fisheries Chart. We are not increasing effort; we are making people to be in compliance. [GO9, CONANP]

Regarding information used in management decision-making, the respondents were able to identify a plethora of concerns. There is not enough basic information of the life history of species or their critical habitat, or catch data for small-scale fisheries; there is hardly any interdisciplinary efforts to gather information, and a key issue for the lack of success of one of the projects was that people in the Fisheries Research

Institute (INAPESCA) were extremely reluctant to share crucial information to feed the models the EBM approach to shrimp fisheries intended to test.

Some of the fisheries scientists we interviewed suggested that because the shrimp fishery is the most important in the country in economic terms, there is plenty of information for decision-making. Nonetheless, access to the data is limited at best and impossible at worst. The general perception is that these databases are created by government scientists that work on them for years, which creates two problems: 1) scientists acquire implicit ownership of this information, and 2) they use it to gain power. This power was used in negotiations for obtaining resources and recognition with some of the project implementers:

The scientists from [INAPESCA] were reluctant to give data to scientists outside the [INAPESCA] for them to publish when they had nothing to gain. So it took months of negotiations for them to release the data…It was a way for government scientists to protect themselves from outside scientists who are perhaps better paid, perhaps better trained in tools to make most of the data and publish more, so the deal eventually was… we will get you financial resources to buy equipment so you can better process your data in-house. We will give you training on modeling techniques so you can understand and you will be part of the authoring of any publications that will come. [AC17, Shrimp]

This also speaks of another well identified challenge to the implementation of ecosystem-based management in Mexico, which is that government agencies lack financial and human resources. As one of our respondents puts it:

…the other challenge is not the fact that the government isn't open or inaccessible, but that they're under-funded, under-powered, under-staffed, under-…they're completely over-extended. [AC16, PANGAS]

Like in many other contexts, this translates in very little enforcement and very little surveillance. The government is viewed as absent:

In many of these places, and you heard today, the government presence is zero. The governance is really low. It's like the law of the jungle there. It's like the Wild West. [AC3, PANGAS]

The last information I have is that the whole state of Baja California has only 7 inspectores de Pesca, people that go to the field to check permits. Imagine 5-7 officers for the entire state with reduced budgets for gasoline per diem –and the same happens with protected areas. Yosemite or Yellowstone has a staff of almost 500 people. The entire staff of the entire National Commission of Protected Areas was 440 this year in all of Mexico – one of the top 5 mega diversity countries. So we may have the best environmental law but the administration is very limited in their capacity to use that [AC8, PANGAS]

Participative approaches to surveillance have proven to be difficult because communities are tight: sometimes illegal fishers are related or are close friends with those doing surveillance activities. People do not tell on each other, and this fosters the opportunity for illegal fishing to continue:

[T]his [is] perhaps the best example of why the government structure is broken - because this illegal fishing doesn't get denounced because perhaps it's my own brother doing it... [AC17, Shrimp]

The *de facto* situation of open access in the Gulf of California is also considered to hinder the implementation of EBM:

All the management is in the hands of the communities themselves and there is no centralized management because the Mexican agencies in charge of governing marine resources are so understaffed and they can only focus on one or two resources – one of which is shrimp, the other sardine. So most of the coastal management is left to the users themselves and since there is no clear rights as to who owns the resources most management takes the form of open access. [SC2, Academy]

…One of the root problems is that access rights are not yet settled. So, until we resolve the problems associated with access rights, there will always be problems with EBM in the seas of Mexico, just as centralization is a root problem… [AC21, PANGAS]

Another big institutional challenge is the fact that enforcement in the Gulf of California requires at least 3 agencies: CONAPESCA, PROFEPA and SEMAR; and within a natural protected area, an extra agency should be considered (CONANP). Various interviewees also mentioned the conflicting mandates of the two agencies in charge of fisheries management as a challenge for EBM implementation.

There is an absolute divorce [of agencies], even if they live in the same space, in the same place, we are talking about two different things, right? Two authorities that even clash with each other and the legal framework is not interwoven and they are clashing. [AC22, NGO]

The interviewers recognized the limitations of the social context as an important factor regarding the implementation of EBM: there are no other economic alternatives for a fisherman, which in turn causes a policy problem in terms of who gets excluded from a fishery that is overcapitalized and overexploited, such as the shrimp fishery. The government is very ill prepared to face this (and it recognizes this as true):

One key challenge – and that is having (sic) to do with policy – we need to reduce the number of boats. A big question is 'what are we going to do with those going out of the fishery?' [GO6, INAPESCA]

Some respondents mentioned that it is difficult to think about management strategies that are too environmental oriented to be successful in a context where there is poverty, mainly because governments' priorities are focused on more pressing issues:

At present the federal government struggles with [the] social component – social problems. In Mexico, poverty and other social problems are primary for the government before they can

even think about the conservation of ecosystems. In Norway, they wouldn't be so focused on the social context, I bet. [AC18, Shrimp]

To summarize, the challenges the respondents identified for the implementation of EBM for fisheries in the Gulf of California are mostly related to governance and institutional arrangements. Although basic scientific information needed for fisheries policy making is yet to be generated, decisions in fisheries management are not solely (nor greatly) based on science, but based on social and political pressure. The scientific information that the government has is not easily accessible to users outside the government. There is little governance as authorities are over-extended and enforcement appears to be inefficient, partly contributing to a *de facto* open access scenario in fisheries. And lastly, it would appear that the government's general priorities relate more to the public well being by dealing with poverty issues, as opposed to environmental issues.

VI. DISCUSSION

"EBM hasn't moved too far beyond the state we were in 15 years ago, when I remarked that ecosystem management was like the joke that everybody laughs at but nobody really gets."
– Tundi Agardy, 2007

From the responses of the interviews I performed this summer, it is clear that ecosystem-based management is not working as a strategy to redress the current management scenarios that have led to the overexploitation of many fisheries in the Gulf of California. If the main underlying premise of the EBM Initiative from the

Packard Foundation was that science could enable EBM (Gold, Rhemus et al. 2003), then the production of science and knowledge should have been enough to set this idea in motion in Mexico; yet my results indicate otherwise. An interesting question is: why choose EBM as a strategy in the first place?

As my results demonstrate, there are two main reasons: the first one is the sense of urgency to do something about the current state of the fisheries in the gulf. The second reason is the influence of the Packard Foundation. From some of the responses, it is clear that funding for EBM implementation projects provided both an opportunity to promote change, as well as an opportunity to access funds. This kind of interaction between donors and recipients of grants is not unique to these two cases, nor is it unique to the Gulf of California.

Most of the respondents and implementers of these two regional initiatives come from NGOs. I use the term 'NGO' to refer to any non-profit organization which is independent from government, and that is a 'value-based organization which depends, in whole or in part, on charitable donations and voluntary service' (Lehman 2007). Thus, private foundations are important financial sponsors of NGO activities around the globe (Reimann 2006).

It is not uncommon that northern donors supporting southern NGOs view them as producers of international public goods, such as environmental protection and conservation (Meyer 1999; Frazier 2006), and although NGOs may be somewhat

regulated by governments, they typically are only responsible to their donors. Relationships with international donors do alter the incentives that NGOs face: if the objectives of major donors differ from those of the NGO, and managers behave opportunistically, the public goods provided will tend to be subject to international tastes or somebody else's objectives (Meyer 1995). Thus, NGOs become a transmission channel for two meta-languages: donor fashions and new managerialism. They move resources, authority and concepts from donors to recipients, and return images, information and legitimation from recipients to the donors (Townsend, Porter et al. 2002).

My intention with this statement is not to say that the objectives of the actors involved in the design and implementation of the regional initiatives in the Gulf of California completely differ from those of the Packard Foundation. In fact, it was very clear that there is a genuine interest to promote better fisheries management practices that are both socially fair and environmentally sound. What I am hoping to showcase is that these case studies selected a very specific approach of solving a problem (ecosystem-based fisheries management), and it was vastly influenced by the ideas of an external entity (the Packard Foundation) because NGOs tend to behave opportunistically (the Packard Foundation was funding EBM implementation projects).

It would be reductionist and probably inaccurate to say that the Packard Foundation was the sole external motivator in bringing the idea of EBM to the Gulf of

California. Various respondents were professionally and academically trained in foreign institutions, and this most likely has played an important part as well. A good analogy is the case that a couple of respondents shared with us regarding marine protected areas (in fisheries). This idea was 'imported' from the literature by one person who was trained in Europe and it has become the preferred conservation tool of a local NGO.

An additional factor is that the concept of EBM comes from Conservation Biology and most of the practitioners in the region involved in the Packard EBM implementation projects come from a natural sciences background, as opposed to a social sciences one; so it is a concept that probably resonated within that community.

Using this last paragraph as segue way, I would like to move on to how EBM is understood. Some interviewees tended to be more biased to the biological and ecological side of its definition. EBM is regarded as a concept almost impossible to implement partly because people are unsure as to how to do it; it is considered to be too skewed towards science; and it is viewed as an environmental approach to management. This shouldn't be surprising, as the consensus statement itself was signed by mostly ecologists and natural scientists. It *is* an environmental approach to management (Crowder 2010). It is worthy to recognize then, than this term is not neutral, although the terms we use never are (Cornwall and Brock 2005).

What is interesting (and relevant) to note, is that EBM's reputation in Mexico is not favorable for its implementation. The perfect counterexample is the ITQs project: in less than a year, CONAPESCA and other partners (WWF-México and Environmental Defense Fund) implemented a pilot catch shares project in a coastal lagoon in Sinaloa for the shrimp fishery because ITQs were perceived by CONAPESCA as something tangible and driven by economics that would help reduce social conflict (again, whether this is true in practice or even in theory is another paper in and of itself).

EBM is considered an elusive concept in other places of the world as well, and has been recognized by experts -such as Tundi Agardy (2007)- as 'merely a buzzword' that hasn't moved too far in the last 15 years.

Borrowing from development theory, buzzwords are now recognized to be important, as they help to shape the policy agenda (Standing 2001 in Cornwall and Brock 2005). They are ideological constructions difficult to disagree with, because they have little discursive closure (Cornwall and Brock 2005). This is true for the case of EBM. However, as I mentioned before, it is this 'fuzziness' that has posed real challenges to its implementation.

Going back to the EBM initiative of the Packard Foundation, under the premise that the implementation of ecosystem-based management was being hindered by "gaps in scientific understanding of how to manage coastal-marine systems, the failure to effectively incorporate scientific understanding into the decision-making process, and

the failure to include in the scientific process the stakeholders whose support will be essential to action" (Gold, Rhemus et al. 2003), there was a heavy focus on improving knowledge in the demonstration projects (Rowe and Hershner 2009). The very basic information for decision-making in fisheries management in Mexico is deficient; however, even with the best science available, decisions are not ultimately based on scientific information but on other factors, such as political and social pressure.

Indeed, it is difficult to argue against the notion that we should try to have a greater scientific basis for environmental policies; however, the concept of EBM is subject to a wide range of institutional and administrative challenges that have largely been ignored in the literature until fairly recently (Imperial 1999) and so they should be reviewed more closely.

In the case of the two demonstration sites subject to my analysis, the most cumbersome challenges are in fact associated with governance and institutional arrangements. The government is perceived as "absent" in part because it lacks enough resources to carry out its mandate appropriately. Enforcement is inefficient because it needs to be carried out by at least 3 agencies, which have different levels of authority and somewhat opposing mandates. These issues in turn promote a 'de facto' open access scenario in the Gulf of California, particularly in small-scale fisheries.

If governance involves making trade-offs, it is important to recognize that EBM is as much as a question of science and designing effective policies for managing natural

resources as it is a problem of governance involving multiple organizations located at different levels of government (Imperial 1999). The lack of emphasis on these important institutional questions has decreased the effectiveness of the Packard EBM implementation projects.

While improved management of resources may result from changing institutional arrangements and improving interagency collaboration, there are often greater incentives not to collaborate, share information or develop consistent policies (Imperial 1999). In the context of the Gulf of California, it is clear that transaction costs associated with EBM are extremely high: there are asymmetries of power and information.

A good example is the 'turf wars' between researchers at INAPESCA and the researchers and practitioners in the project related to EBM approaches for the shrimp fisheries. It is recognized in the literature that the tendency of an organization to defend its turf is a type of strategic behavior that can result in significant transaction costs (Bardach 1996). It is interesting that more than a decade ago, this type of conflict was already anticipated to occur when implementing ecosystem-based management; however, practitioners in the EBM demonstration project were still unprepared for it.

As grim as this overview of the challenges may seem, there are some opportunities that bode well, if not for EBM, at least for new, more holistic approaches to fisheries management. The most important of all is that both authorities and users seem to be ready for a change of current management scenarios.

According to respondents who work closely with fishermen, resource users understand ecosystems and connections: although fishers do not use the term 'EBM', it is a concept that is "*intuitive*" and that "*resonates*" with them. Interviewees mentioned how fishers believe that it is not only important to manage fishing sites, but also the nursery, reproductive and feeding grounds of fish. They (the fishers) also recognize inter-species relations and how ecological systems are linked to institutional and management systems. Ultimately, according to the people we interviewed this summer, interconnections make sense to resource users.

Moreover, authorities in fisheries management have a more progressive attitude than in the recent past: the head of the Fisheries Research Institute (INAPESCA) is widely spoken of as the champion that has helped promote EBM in the gulf; and the fact the CONAPESCA has taken a risk by implementing a different management strategy through a catch shares pilot project is a clear signal that the government is more open to new alternatives to 'business as usual.'

The new Sustainable Fisheries and Aquaculture Law is also regarded as a facilitating factor for bringing about change, as it is a law that is trying to have a more holistic view of fisheries management, and that considers implications to the environment; furthermore, it is also exploring ways to decentralize management.

Through this research, it is not hard to see that external agencies can influence how resource management in different places is undertaken. Marine ecosystem-based

management has not been effective in the Mexican context, but it is clearly because what the Packard Foundation's Program set out to do was mostly to increase the knowledge base to inform policy; however to bring about change it is necessary to consider other aspects of the context, such as governance and institutional arrangements.

VII. CONCLUSIONS

"Is our pursuit of the ideal of EBM process blinding us to simpler, but still good, solutions?"
- Jeff Ardron, 2007

Through this research I was able to answer three important questions regarding the implementation of marine ecosystem-based management in the Gulf of California. The call for EBM in the region comes mainly from two factors: the sense of urgency to do something about the dire state of the fisheries, and the influence of the Packard Foundation. Financial resources dedicated specifically to the advancement of EBM efforts provided an opportunity to bring about change, as well as an opportunity for the projects to access funds.

EBM's reputation in Mexico is not conducive to its execution. It is regarded as a concept almost impossible to implement partly because it is a concept not well understood in practice, it is considered to be too skewed towards science, and it is viewed as an environmental approach to management, which proved to be detrimental when engaging the government.

The challenges these projects faced were related to governance and institutional arrangements. The government is perceived as "absent" in part because it lacks enough resources to carry out its mandate appropriately. Enforcement is inefficient because it needs to be undertaken by at least 3 agencies, which have different levels of authority and somewhat opposing mandates. These issues in turn promote a 'de facto' open access scenario in the Gulf of California, particularly in small-scale fisheries, that make very difficult to implement a holistic management strategy.

The main underlying premise of the EBM Initiative from the Packard Foundation was that science could enable EBM did not hold to be true in the Mexican context as the production of science and knowledge were not enough to set this idea in motion in Mexico. However, although the context in the Gulf of California is not adequate for the implementation of such sophisticated management strategies as EBM, there are positive indicators that things are changing. These factors are creating new opportunities to move towards a more sustainable future, it is only a matter of finding simpler but more implementable solutions.

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IX. APENDIX

Interview Guide and Questions

(Introduce project. Key points to hit: Our group is interested in how context impacts the translation of an idea (EBM) in particular places. In other words, we are interested in hearing your opinion about what aspects of the institutional, political, social, and ecological contexts helps or hinders EBM in the Gulf of California)

(Prompt: Tell me something about yourself and how you got here?)

Date: _____ Name of Interviewer: _____

Location: _____

Age: _____

Gender: _____

Place of Birth: _____

Educational background: _____

Background on interviewee connection to ocean and ecosystem-based management

1. How long have you lived in this area? What brought you here?
2. How has this place changed since you've arrived? (probe: Are the ecological conditions/social conditions getting better or worse over time?) How did you find out about these changes? (scientists told you/personal observation/peer network)
3. How do you use the coast/ocean (or its resources)? How is it important to you? In what ways (Probe: Socially, Culturally, Economically?)
4. On this map what ocean places matter to you? Why? What habitats and species are most important to you? Why? (Larger issue: what scale are you interested in)
5. Have these marine resources changed over time? In what way? Why? How did you find out about these changes? (scientists told you/personal observation/peer network)

6. (Is anything being done to combat the changes? Laws/regs/mgmt regulations in place? Controls/restrictions on marine resources? Are those having a positive effect? Note: This question is similar to the management tools question -)
7. (Probe: Who else uses the resources here? How? (probe: outsiders)? Do any of these people/activities impact the resources? Do your activities impact the resources?)

How did Ecosystem-Based Management emerge at the site?

8. What is your role in coastal and ocean management efforts in the region? Has it changed over time?
9. What was the motivation for implementing EBM in this region? (probe: How did your group begin working on ecosystem-based management?) (Interesting: whether or not the way they talk about EBM matches the threats they addressed above)
10. Were any particular people or groups pushing for EBM? (I think this might be interesting as a social network question: Which particular groups were the most influential in establishing EBM as an agenda item? (List) Are these the same groups now? (List)
11. There are lots of definitions of EBM. What is your working definition of EBM? Is this a shared definition in the region?
12. How were the boundaries of EBM identified? Have they changed over time? Why?
13. What are the objectives of EBM? Which particular people or groups identified them? (Are these the right objectives? Is there disagreement over the objectives? Have they changed over time?)
14. Are there any individuals or groups actively resisting the implementation of EBM?
15. What does implementing EBM entail? (Prompt: To what extent did implementing EBM require changing authority/institutions involved in these areas and to what extent did new institutions need to be designed/new roles need to be assigned?)
16. Prior to the implementation of EBM, what was going on in terms of coastal management? (marine protected areas/customary tenure systems?)
17. What is the relationship between EBM and previous or co-existing approaches to marine management? (In what ways are these approaches complementary or

conflicting? In the case of Mexico, we need to ask: What is the relationship between your EBM project and other EBM approaches in the region?)

18. Is what you are doing here ecosystem-based management? Why or why not?
19. What if anything are you doing differently than before?

Opportunities and Barriers to implementation (i.e., How does Ecosystem-Based Management interact with histories, cultures, management institutions already in place?)

We are really interested in how ecosystem theory translates into practice.

20. What are the challenges to implementing EBM here? (Prompts: What do you think is specific to this context? Political/social constraints? Have there been any conflicts in implementing EBM here? Why? What types of conflicts? Have these impacted the outcomes? Have these conflicts been resolved?
21. What are the opportunities/possibilities for implementing EBM here? (Probe: considering the challenges, what do you do about them?)
22. So we have this idea that context is important in terms of implementing EBM, but in your opinion how important are local contextual factors to being able to implement EBM? (Probe: Are there lessons that you've learned here that are generalizable or are they context specific? How are they thinking about context: Is context something that needs to be overcome to get EBM? Or is context a benefit?)
23. Can you think of a project that is successfully implementing EBM? Why? How do you know about this project? What particular lessons have you implemented in your site about the project? Have these worked?
24. What are the specific policy changes or management tools are you are using here? Which are working and which are not working as well?
25. What kind of information is needed to support EBM? Is that information being collected?
26. How are you integrating the social, ecological, etc data that you are collecting to inform EBM?
27. What are you most pressing information needs? Can these be addressed? How?

Outcomes

28. So we've talked about all of these challenges, but overall has EBM been successful in this region? Why/Why not? (probe: what would it take to be "successful"?)
29. Have there been any expected outcomes of this project so far? Have there been any unexpected outcomes? (Prompt: Positive and negative. Prompt: Are there particular groups you think have benefited and any that have not?)
30. What does the future of EBM look like in this region? Do you think marine management will be substantially different 10 years into the future than it was 10 years ago? Why?

Conclusion

31. Are there questions that we should have asked that we didn't ask? Anything else you want to tell us? Anyone else you think we should speak to?