Implementation of marine reserves in Mexico

CENTRO MEXICANO DE DERECHO AMBIENTAL
CEMDA

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PROLOGUE

In the last two decades, research has generated valuable information about the threats and challenges that humanity faces, to achieve sustainability of oceans and seas.

Data are concern;

We start to notice that we are exhausting what we thought was inexhaustible: Natural Resources.

Now, we know that fisheries are exploited to the maximun of their capacity, even, many of them, overexploited; every time, water presents, more levels of pollution, solid waste and liquids; that marine ecosystems and biodiversity, inlcuding the deepest seabed, are facing problems of direct impact because of destructive fishing methods; and the global climate change produces modifications in the acidity of the sea; all this, will surely bring drastic changes in the species distribution and the fishing potential in the regions.

Mexico is a privileged country due to its extense coasts that border several oceans and seas; however, it is of little tradition and marine culture.

With 11,000 kms of coasts, developing tourism and fishing industries of great potential, it is important to ensure the sustainability of these resources, protecting the habitat and the diversity of species in sea and land. We know that it is necessary to use to the maximum, legal instruments, technical knowledge and political wills, to make of Mexico an example and model to look up to in Latin america.

This study is a valuable contribution of two civil organizations of great experience and knowledge in the subject: El Centro Mexicano de Derecho Ambiental (CEMDA) and Comunidad y Biodiversidad (COBI).

The purpose of this document is to value and spread the importance of Marine Reserves, also known as fishing refuges, to balance the negative impact of massive extraction that is done to these resources, and allow their recovery in a natural way.

Now a days and since some years ago, Marine Reserves have become an important strategy of fishing management with an approach to the ecosystem, that allows reproduction and growth of marine species, acting like sanctuaries, that at the end, benefit all of us.

I congratulate the authors and sponsors of this work, synthesizing their valuable knowledge and guiding us through their pages, to the conservation of our seas and oceans.

MANUEL ARANGO

INTRODUCTION

Overfishing, uncontrolled coastal devolpment and environmental change, are some of the threatens that are facing marine resources all over the world nowadays. These circumstances have provoqued that most of the important fisheries in a global scale are in overexploitation levels.[1] To counteract this deterioration, different models exist, within the ones, Fully Protected Marine Reserves (nucleus zones, fishing refuges, recovery zones, among others) are an option, that has been adopted in countries like Spain, New Zealand, Canada and United States.

This type of areas has also been established in Mexico, however a regulation has not been created to design, establish, evaluate and watch over these as a whole unit.

This law incoorporates, new political fishing implements, that without a doubt, will help to have a better management of marine resources. However, it grants the authority diverse discretionary faculties. This discretionary stands for disorder, legal insecurity, lack of tools to solve concrete problems, but overall reduces social creativity.

Today, marine resources, their crisis, the degradation and the continue loss of marine habitats, are concepts that are completely different from the National Legislation. However, two great legal worlds exist, that pretend to regulate the activity of society in the sea. On one side, we count with the proper conservation regulation, for example: The General Law of Ecological Balance and Environmental Protection, its multiple and varied regulations; The General Law of Wildlife; besides more than eight general laws, different decrees of Protected Natural Areas and official mexican rules. On the other hand, we have the fishery legislation, starring the General Law of Sustainable Fishing and Aquaculture (LGPAS) and an existing regulation that comes from the repealed law from two years ago, for that reason, it has no relation or consistency with the new fishing Law. However, it is fair to recognize that the Federal Government is in the final step to publish a new regulation that suits the new LGPAS, which also was a matter of analysis in this study, as a project, according to the text, which in its appropriate procedural time was published on the web by the Federal Comission for Normalization and Regulation (COFEMER),[2] as part of the process of the natural public consultation, that this type of regulations are exposed to.

Facing all this regulatory complexity and the lack of fishing politics, reality is discovered, fisheries in Mexico and the rest of the world are collapsing the product of fishing ecosystems overexploitation. This crisis reveals that the ocean is not inexhaustible and if we don´t start to implement creative, adaptative solutions, based in hard scientific data and communitary arrangements, it would be hard to solve the root of the problem .

Fully Protected Marine Reserves arise in the international level as one of the solution proposals to improve fisheries and ecology quality of marine ecosystems, in general. These reserves imply extreme limitations to all the extractive activity in geographical polygons clearly defined. So, it is looked up for all marine resources to have free areas of extractive pressure, being able to reproduce, develop and generate better dams for fishing industry and better ecosystems for conservation.

This research that the Centro Mexicano de Derecho Ambiental (CEMDA) and Comunidad y Biodiversi-

[1] http://www.piscoweb.org/topics
[2] www.cofemer.gob.mx

dad (COBI) present, tends to explore the most adequate steps for the implementation of Fully Protected Marine Reserves in The Gulf of California. At the same time, a rigorous and exhaustive analysis is done about solutions that the current legislation can offer to strenghten Fully Protected Marine Reserves agreed by the communities.

Further, it can be observed, that the principal challenges that they face, are various: attitude changes by the users of the fishery resources, and an ignorant legislation to the ecosystem problem of marine resources. Here, we can find more questions than answers, being the real purpose of this work, to look up to clear up three basic questions: What is the importance of Fully Protected Marine Reserves in Mexico?, What are the steps that need to be followed for their implementation?, How can the legislation support the effort of communities to create Fully Protected Marine Reserves?

CHAPTER I

Fully Protected Marine Reserves : A brief description

Carambola

1.1 Introduction

Fully Protected Marine Reserves,[3] are a tool of conservation and fishing management, with a focus of an ecosystem that is being impulsed in the world as one of the solutions to counteract the existing environmental crisis that oceans are facing.

Recently, an extensive heritage of scientific literature about Fully Protected Marine Reserves exists, demonstrating its benefits and weaknesses.[4] Besides, PISCO (Partnership for Interdisciplinary Studies of Coastal Oceans) innitiative, has produced a series of excellent material to spread about Science of Fully Protected Marine Reserves in English and Spanish, using examples from all the world (this material can be downloaded for free in the webpage).[5] At the same time, the guide of Fully Protected Marine Reserves exists.[6] This is why in this chapter, an abstract about the needs to establish Fully Protected Marine Reserves from how seas are found nowadays, followed by the evidence of success of use of the reserves, elements and recommendations for their design.

1.2 Background: crisis in the sea

In February 2008 a map that summarizes human impact (pollution, overexploitation, introduction of species, habitat destruction and a global environmental change) in marine ecosystems of the world was published in "Science" magazine,[7] this map demonstrated that 96% of the seas presented some kind of impact, leaving behind the Arctic and the Antarctic, as regions with a very low impact due to isolation.[8] This report in just another one, with evidence that has been generated, showing the capacity of the human being of modifying marine ecosystems in a significant way.[9] For Mexico, the estimated impact by Halper and collaborators was medium-high. For example, in the Gulf of California, recent studies reveal direct and indirect evidences of a long story (more than 400 years) of overexploitation of the natural capital and alteration of marine ecosystems (chart 1.1).

With the existing evidence, it can be said that the resilience of services provided by ecosystems to societies is getting to the most fragile point of not turning back to its natural way; due to this, is that actions directed to restore ecosystems, are urgent. The use of Fully-Protected Marine Reserves is one of the tools that has been identified by users of fishing resources and scientists, to alleviate the degradation of the marine biodiversity, caused mainly by the overexploitation of the resources. It is important to mention that this is one of the existing tools

[3] Fully protected reserves are also known as non fishing zones, fishing refuges, recovery zones, among others. They are zones where any type of extraction of natural resources exist.

[4] Gell, F.R. y C.M. Roberts, *Benefits beyond boundaries: the fisheries effects of marine reserves. Trends in Ecology and Evolution*, 18:448-455, 2003.

[5] http://www.piscoweb.org/outreach/pubs/reserves

[6] Roberts, C.M. y J.P. Hawkins. *Reservas marinas totalmente protegidas: una guía. Campaña Mares en Peligro* del WWF, 1250 24th Street, NW, Washington, DC 20037, EE.UU. y Environment Department, University of York, York, YO10 5DD, United Kingdom. 2000.

[7] Halpern, B.S., S. Walbridge, K.A. Selkoe, C.V. Kappel, F. Micheli, C. D'Agrosa, J.F. Bruno, K.S. Casey, C. Ebert, H.E. Fox, R. Fujita, D. Heinemann, H.S. Lenihan, E.M.P. Madin, M.T. Perry, E.R. Selig, M. Spalding, R. Steneck y R. Watson. 2008. Global map of human impact on marine ecosystems. Science 319:948-952.

[8] However due to global warming, the poles are melting and waters are being accessible to fishing, among other extracting forms.

[9] • Jackson, J.B.C., M.X. Kirby, W.H. Berger, K.A. Bjorndal, L.W. Botsford, B.J. Bourque, R.H. Bradbury, R. Cooke, J. Erlandson, J.A. Estes, T.P. Hughes, S.Kidwell, C.B. Lange, H.S. Lenihan, J.M. Pandolfi, CH. Peterson, R.S. Steneck, M.J. Tegner y R.R. Warner. *Historical overfishing and the recent collapse of coastal ecosystems. Science* 293: 629-638, 2001.

• Pauly, D. y J. Alder. *Marine Fisheries Systems, in Ecosystems and Human Well-being: Current State and Trends, R. Hassan,* R. Scholes y N. Ash (eds). Island Press. Pág. 477-511, 2005.

• Worm, B., E. B. Barbier, N. Beaumont, J.E. Duffy, C. Folke, B.S. Halpern, J.B.C. Jackson, H.K. Lotze, F. Micheli, S.R. Palumbi, E. Sala, K.A. Selkoe, J.J. Stachowicz, R. Watson. *Impacts of biodiversity loss on ocean ecosystem services*. *Science* 314: 787-790, 2006.

to recover biodiversity in the seas and the population of fishing resources, but there are others,[10] that need to be combined to achieve a hard protection and sustainable management of the resources.

1.3 Benefits of Fully Protected Marine Reserves

LThe theory of Fully Protected Marine Reserves is simple, basically is about closing a marine area to any type of extraction (fishing, dredging, aquaculture, mining), allowing activities that do not imply an extraction or physical modification of the ecosystem, like swimming, sailing and SCUBA diving. This fact has repercussions, like the enlargement (biomass) of individuals that live there, the ones that at the same time produce more eggs than individuals of a smaller size. When a greater production of juveniles exists, the richness of species within the reserves rises, and in some cases individuals are exported (like eggs, larvae, juveniles and/or adults) to places out of the reserves (Figures 1.1, 1.2 and 1.3). Another effect within the reserves is that diversity increases in species, recording species that in some cases were thought to be disappeared, in the ecosystem that is being preserved. When species are recovered, rehabilitation of functions taken place are promoted, (like substract, cleaning, filtering, etc.) before the effects of overfishing or alteration of the ecosystem. Also, the services that were provided by the affected ecosystem, are recovered.

When the surroundings within the reserve are recovered, species became "witnesses", to understand the effect of fishing outside the reserves, besides, they become "safe" when in other areas of the population and their respective functions disappear due to the effect of nature (natural disasters) or by actions of the human being (overfishing). *Reserves are like a savings account in a bank, where a capital is kept and it produces interests, the ones we can use for the expenses that we plan to do.*

1.4 Condition of Fully Protected Marine Reserves in the World

According to the document published by PISCO, until 2006, less than 4,500 protected marine areas existed, covering aproximately 2.2 million km^2, equivalent to 0.6% of the ocean, and only 36,000 km^2 (0.01%) are fully protected. Sizes vary from 0.006 to 800 km^2. In Latin America 24 Fully Protected marine reserves that have been identified and have been studied by scientists that have been publishing results in international magazines, but still ,100 more reserves exist. Unfortunately, worldwide, one of the main problems reserves face, is the non-fulfillment of not extracting resources from them, it is estimated that less of 5% of the reserves have an effective inspection and surveillance.

1.5 Elements that need to be consider when designing reserves

Reserves have been strongly challenged even with existing evidence, 2,3 and they are managed by some sectors, like a threat to fishing and fishermen well being. Recently the scientific community[11,12] and international agencies like the Food and Agriculture Organization for the United Nations (FAO)[13] are requesting

[10] Recently in the Gulf of California, the use of share-captures´tools is being promoted from the estimate fees. For further information about share-capttures´tools check out: Environmental Defense. Sustaining America´s Fisheries and Fishing Communities. An Evaluation of Incentive-Based Management (http://www.sustainingfisheries.com).

[11] Willis, T.J., R.B. Millar, R.C. Babcock y N. Tolimieri. 2003. Comment. *Burdens of evidence and the benefits of marine reserves: putting Descartes before des horse?*. Environmental Conservation 30: 97-103

[12] Sale, P.F., R.K. Cowen, B.S. Danilowicz, G.P. Jones, J.P. Kritzer, K.C. Lindeman, S. Planes, N.V.C. Polunin, G. R. Russ, Y.J. Sadovy y R.S. Steneck. 2005. *Critical science gaps impede use of no-take fishery reserves*. Trends in Ecology and Evolution 20: 74-80.

[13] Fishing Comitee. 2005. *Protected Marine Zones and Fisheries*. 26 period of sessions. Rome (Italy, march 7-11, 2005. Document COFI/2005/8 (http://www.fao.org/documents/pub_dett.asp?lang=es&pub_id=168512), 2005.

the existance of a compromise in a worldwide level, to create Networks of Marine Protected Areas that can cover 10% of the oceans and coasts for 2012.[14] Also, they are asking for the creation of Networks of Reserves to have a hard design, considering a series of biophysic basic elements for this; including.[15]

■ Clear Objectives

It is a priority to have clear, the purpose of establishing Fully Protected Marine Reserves, this will depend on, for example, how many reserves are necessary and how much time will be needed to recover the resource within the reserves, besides, when it will be accurate to start exporting to other areas. At the time of determining the objectives of reserves, it is necessary to ask us: What do we want the reserves for?, What do we want to protect?, What do we want to recover?, When do we want to recover it?, Do we want to recover the ecosystems the way they were 10, 20, 30 or more years ago ?(Figure 1.4), among others (Chart 1.2). Some of the factors that need to be taken into account at the moment of determining the objectives of a reserve are:

• *Availability of reproductive adults*. It is important to determine if there are enough adults of species that want to be recovered and/ or protected with the capacity of producing viable juveniles within the closing season zone, this depends on the recovery of this and other zones.

• *Growing speed and reproductive age of species within the reserves*. There are species that have a rapid growth, they reach sexual maturity at an early age and produce big ammounts of eggs (species with an r strategy), meanwhile, other species have a slow growth, therefore, they can reproduce after several years of growing and producing a few offspring (species with a K strategy) (Figure 1.5).

• *Characteristics of each lifecycle phase*. In this point, it is important to determine the time of use (reproduction, feeding, growing and/or protection) of species that want to recover or protect, give to areas of possible reserves (Figure 1.6).

• *Interactions between species, like predators and preys*. For example, without the presence of a key predator, preys can increase to unnatural levels or viceversa, if there are not enough preys, there won´t be any predators.

• *Human effects before the establishment of the reserve (fishing or dredging intensity)*. There are areas that due to their intense history of use, have very low probabilities of recovery. In these cases it has to begin with a restoring program that will probably imply the reintroduction of some species and the reconstruction of the destroyed environment. For example, the introduction of serge or structures that can be attach to corals to reconstruct the main structure of the habitat.

• *Continual external effects, like pollution and environmental change*.

• *Habitat Capability of recovering after being deteriorated*. As it has been mentioned before, there are cases in the ones is necessary to rebuild main structures of the environment or even reintroduce species.

• *Level of surveillance control to prevent legal fishing within the reserve*. This is fundamental, without an inspection and surveillance effective program, probabilities of obtaining benefits of Fully Protected Marine Reserves is null.

■ Representation and repetition of different environments within the Network

All along their life, species use different environments, this is why is necessary to identify and protect each one of them (Figure 1.6). For example, Snappers form reproductive agregations in

[14] World Summit for Sustainable Development, 2002. Leaders of the world agreed to create networks of Marine Protected Areas that will represent ecosystems through out the world in 2012. This was reafirmed in 2003 on the 5th World Parks Congress and in 2004 in the COP7 of the CBD. The recommendation of the CBD is that these networks have to cover at least 10% of the oceans and coasts of the world and the World Parks Congress was recommended to cover between 20 and 30% of each of the marine ecosystems.

[15] Wells, S. In Preparation (2nd draft, 2006). Establishing national and regional systems of MPAS – a review of progress with lessons learned. UNEP World Conservation Monitoring Centre, UNEP Regional Seas Programme, ICRAN, IUCN/WCPA – Marine.

coral reefs in the Caribbean, their larvae are developed in open sea, but their juveniles, migrate to the coastal lagoons where mangroves are found, afterwards, they migrate to Marine Grass banks. Otherwise, at the moment of designing a Network of reserves, it is necessary to repeat the same environment to count with a replica of the same one.

■ Connectivity

When designing a Network of reserves, it is necessary to take into account the connectivity between selected sites (how joined they are). To determine connectivity, different methods are used, like studies in genetics, variation, modeling of oceanographic currents and/ or individual capture and recapture, in different phases of growth. It is expected that a high connectivity between selected areas exists.

■ Size, form and distance

These three characteristics are according to the necessary movement of species between different environments that they use. It has to get to a balance that among these three characteristics will bring benefits to small reserves. A big one, includes more environments and species; however, various small reserves are better than a big one. The form is given according the function, for example, feasibility to make an inspection and surveillance. A square reserve is easier to mark out than a round one. When selecting the place where reserves will be established, it is important to consider what follows:

• Include different types of habitats.

• Oceanographic characteristics like currents; these will determine where the surplus produced will be exported in the reserves.

• Sites of importance for species of interest; like reproductive zones, nurture and feeding, among others.

• Sites used by weird species, endemic or under any other category of National or International Protection.

• Previous deterioration of the habitat, with a recovery potential.

• Vulnerability to natural and human effects, including those in which Marine Reserves do not offer any protection, like pollution or global warming.

• Location of human activities.

• Preference for communities and the responsible ones of creating policies.

• Social-economical effects and opportunities that generate a reserve.

■ Reserves Implementation and design

It is recommended that reserves are designed and implemented under the BACIP (before-after control impact pairs) method.[16] This is about getting hard information about the condition of diversity before the implementation of Fully Protected Marine Reserves, to compare this information after the establishment through time, thus, it would be able to evaluate the progress of the reserves. It is important to include during these evaluations, effectiveness, biophysical, socioeconomic and governance indicators (see next chapter for further information).

1.6 Other considerations

Besides the ecological elements mentioned before, it is important to consider the next information, some of these treatys are explained in detail in the next chapters.

• Institutions and legislation support. Without a hard legislation that promotes and helps to establish Fully Protected Marine Reserves, their success can be very low. An example is: commercial divers in Puerto Peñasco (Sonora), who after a process of designing, establishing and evaluating the success of one Fully Protected Marine Reserve, in its fishing sites after four years,

[16] D´Agrosa, C., L.R. Gerber, E. Sala, J. Wielgus y F. Ballantyne IV. 2007. *Navigating Uncertain Seas: Adaptative monitoring and management of Marine Protected Areas*. http://www.public.asu.edu/~lrgerber/marinereserves.htm o http://cmbc.uscd.edu

were looted by fishermen of other comunities.[17] Unfortunately, these reserves didn´t count with a legal basis, they were *de facto*.

- Wide participation of the community in taking decisions.
- Participation of people with diverse purposes.
- Effective use of scientific information and local knowledge.
- Effective mechanisms for conflicts` solutions.
- Constant and sustained financing.
- Alternative sources of incomes for fishermen.
- Equitative distribution of economical benefits.
- Effective control and surveillance.

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[17] Cudney-Bueno, R., L. Bourillón, A. Sáenz-Arroyo, J. Torre, P. Turk-Boyer y W.W. Shaw. 2009. G*overnance and effects of marine reserves in the Gulf of California, Mexico.* Ocean & Coastal Management 52:207–218.

• Cudney-Bueno, R. y X. Basurto. 2009. *Lack of Cross-Scale Linkages Reduces Robustness of Community-Based Fisheries Management.* PLOS ONE 4(7): e6253.

CHAPTER II

Legal tools for the establishment and design of Fully Protected Marine Reserves: Argumentation and General Considerations.

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The term, Marine Reserve has different meanings according to the country, system and/ or relevant legislation in a particular case.

It is important to point out that a few legislations were designed to administrate and protect a whole ecosystem and a little less to facilitate the creation of networks or Marine Reserves Corridors.[18] In Mexico, this term is not contained in a specific way, in the environmental or fishing law.

Fully Protected Marine Reserves are sites "where some or all biological resources are protected of any disturbance".[19] Geographic surfaces in which fishing is prohibited in a total or parcial way, with the goal of recovering the demographic structure of exploited populations and acting like a resettlement site of neighboring areas.[20] In this sense, this figure is similar to a closing season area.[21]

As pointed out in the introductory chapter of this document, in planification and design, there are not only natural and socioeconomic components involved, but admininstrative and legal. This last element is the acknowlegde of the reserve existence by the authorities and the rest of the individuals, due to a legal provision, that establishes and recognizes the surface and guarantee of the areas within these, the governance of marine resources and forms in the ones authorities and the surrounding community can coolaborate with the Marine Reserve.

Fully Protected Marine Reserves can be created in an indirect way (*de facto*) or in a direct way (*de Lure*). The first one happens, when the end of creation of the reserve is not the conservation of the same one, it comes up as a consecuence of the application of a legal or authority act that restricts the transit of boats and/ or fishing activities. The direct creation is made through communitary agreements or by the initiative of fishing or conservation authorities. In these assumptions, the goal is the creation of the Marine Reserve by the conservation and protection of marine resources; the legal strenghtening gives certainty to the existence and respect of these agreements through conservation and fishing tools.

2.1. Fully Protected Marine Reserves de facto

There are places situated out of reach of the fleet because of its distance, inaccesibility or prohibitions because of security reasons, among others, that proceed as Protected Marine Reserves *de facto*. In these cases, the creation of the Marine Reserve proceeds in an indirect way, as a result of the application of legal or authority act. An example is: Islas Marías, where a penal neighborhood with the same name is located.[22] Because of security reasons, Islas Marías has a polygon of marine restriction, guarded by the Mexican Navy, this is why any boat is able to access without permission in a range of 24 kilometers.

Recently, the site was decreted as a Natural Protected Area, under the figure of Biosphere Reserve, with an extension of 641,284 hectares with three nucleus zones.[23] According to fishing, these activi-

[18] Brax, J. Zoning the Oceans: Using the National Marine Sanctuaries Act and the Antiquities Act to Establish Marine Protection Areas and Marine Reserves in America, 29 *Ecology Law Quarterly* 71, 2002.

[19] *National Research Council, Commission on geosciences, environment and resources, marine protected areas: Tools for sustaining ocean ecosystem and resources, marine protected areas: Tools for sustaining ocean ecosystems 10* (2000) disponible en http://books.nap.edu/books/0309072867/html/3.html.

[20] ESPLÁ, , Ramón, A., Valle Pérez C., Bayle Sampere, J.T. y Sánchez Lizaso, J.L., Marzo (2004),Protected Marine Areas as lega tools in the Mediterranean (Área COPEMED), Series of information and Studies COPEMED , Number 11, Marine Biology, *Department of Environmental Sciences and Natural Resources*, Universidad de Alicante, Spain, 32p.

[21] D´Agrosa, C., L.R. Gerber, E. Sala, J. Wielgus y F. Ballantyne IV. 2007. Navigating Uncertain Seas: Adaptative monitoring and management of Marine Protected Areas. http://www.public.asu.edu/~lrgerber/marinereserves.htm o http://cmbc.uscd.edu

[22] Statute of Islas Marías. Published in the Official Federation Diary , December 30th ,1939.

[23] Decree of creation of the Biosp vember 27th, 2000.

ties are prohibited.[24] The Penal Neighborhood is self-sufficient of fishing resources, however, these are intended to consumption, this is why their merchandising is prohibited.

Another interesting example is the establishment of security measures in the Sonda of Campeche, by which surveillance is increased in vital facilities of the country. These goods are given under the agreement whereby Marine (SEMAR), Transportations and Comunications (SCT), Agriculture, Rural Development, Fishing and Feeding (SAGARPA) Departments, establish security measures in Campeche,[25] as an anticipation to possible terrorist attempts that could affect oil infrastructure in the country and create an environmental contingency because of hydrocarbons to marine ecosystems.

The quoted agreement anticipates a zoning of the area where the Sonda is found, so it considers the anticipated areas to surfaces where no activity is allowed, only the required one for exploration and oil production[26] only the fast and uninterrupted traffic of fishing ships in route to their fishing areas, situated out of these, are authorized.[27] The exclusion areas are not allowed in ship traffic unless they are required for the platforms operation.[28]

In synthesis, there are Fully Protected Marine Reserves created in an indirect way as a consecuence of the application of the legislation or authority act, which objective is not conservation, protection or resettlement of marine resources, but the establishment of National security measures,[29] risk to individuals and /or public health,[30] traffic,[31] among others.

2.2.Reservas Marinas *de Iure*

In these assumptions, the goal of the creation of Fully Protected Marine Reserves is conservation and protection of marine resources.The legal tool gives certainty to the existence of communitary agreements and guarantees its performance. The legal frame for their creation is of two types: On one side, the ones contained in the legislation and conservation dispositions, and on the other; the ones contained in the fishing legislation. According to the environmental frame, are the following ones:

- Protected Natural Areas

Protected Natural Areas (ANP) are zones in the National territory, over the ones the nation practices its sovereignity and jurisdiction, where the original environment has not been modified significantly by the human activity or that require preservation and restauration, subjects to the provided regime in the General Law of Ecological Balance and Environmental Protection.[32]

The mentioned legislation doesn´t have a definition of Fully Protected Marine Reserves, the tendency in our country lies in the use of environmental laws of land protection, as an extension to marine environment. In this sense, fishing restrictions can be established in nucleus sites or marked ones in the declaration of Protected Natural Areas and develop in the Management Program.[33] The National Comission of Fishing and Acuaulture (CONAPESCA), The Marine Department (SEMAR) and The Federal

[24] Articles XI, Fraction III and XIII, fraction VI of the Decree of creation of the Biosphere Reserve Islas Marias, which forbid the exploitation and use of wild flora and fauna species in the nucleus and buffer zone.
[25] Published in the Official Federation Diary on september 11th,2003.
[26] Article I of the Agreement with the one the Departments of Marine, Comunications and Transports, Agriculture, Rural Development, Fishing and Food, establish measures of security in the border of Campeche.
[27] Ibid.
[28] Ibid.
[29] Within the main restrictions, we find defense areas, sensitive borders, navy bases, mining camps, etc.
[30] In this area there are rests of radioactive material, drainage, munitions, approval sites of explotion, oil platforms, electric cables, refineries, electric stations, ship constructions, among others.
[31] Examples of this are restrictions in ports, marines, docks and sailing channels, etc.
[32] Article 3, fraction II of the General Law of the Environmental Protection and Ecological Balance.
[33] Article 60 of the General Law of the Environmental Protection and Ecological Balance.

Agency of Environmental Protection (PROFEPA) will be the authorities in charge of inspection and surveillance in the area.

The creation of a Protected Natural Area and its zoning, has been the most used tool for the establishment of Fully Protected Marine Reserves, however, restrictions and limits imposed by The National Comission of Protected Natural Areas (CONANP) about Fishing within the polygon of the area, should be countersigned by CONAPESCA.[34] This action causes incommunication between authorities and delays the decisionmaking in a conservancy matter.

■ Marine Ecological Ordinance Program

The Marine Ecological Ordinance Program (POEM) is the representation, in an informative geographical system, of the environmental effort units and its ecological guidelines and strategies.[35] This program establishes guidelines and forecasts to the ones, sustainable use of natural resources should be submitted to the sustainable use of natural resources, the maintenance of environmental goods and services, as the conservation of ecosystems and biodiversity in the Mexican Marine and Federal Zones.[36]


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The Marine Ecological Ordinance Program contains the determination of ecological zones and ecological guidelines and startegies applied in this studying area . The elaboration of these programs is in charge of the Federation, through SEMARNAT, in coolaboration with the involved States and Municipalities.

This tool has not been used with all the involved advantages. A good oportunity to develop this planning tool, is the recent elaboration of the Marine Ecological Ordinance Program of the North Pacific, where ecological guidelines and criteria that contain buffer zones and percentages of Fully Protected Marine Reserves, should be provided.

As a summary, the Marine Ecological Ordinance Program has the ordered uses by sector and its feasibility to develop fishing and aquaculture. The probability to include limited fishing criteria exists. However, the concensus among the various actors is almost impossible, this impedes the decree of the Program.[37]

■ Critical Habitat

One legal tool for the strenghtening of the creation of Marine Reserves is about the declaration of a critical habitat. The Environmental and Natural Resources Department (SEMARNAT) has the labor of conservation and protection of endangered marine species , for example: chelonian (sea turtle), marine mammals and any vulnerable populations. Besides the establishment of special management and conservation measures of critical habitats and refuge areas to protect aquatic species, with the interest of users and other people involved.[38]

[34] Articles 11, 12 and 13 of the Organic Law of the Public Federal Administration.
[35] Article 3, fractions XVII and XXI of the Regulation of the General Law of the Environmental Protection and Ecological Balance in terms of Ecological Regulations.
[36] Articles 51 and 52 of the Regulation of the General Law of the Environmental Protection and Ecological Balance in terms of Ecological Regulations.
[37] Look up. Bojórquez-Tapia, L y Eakin, Hallie (2008), Conflict and Collaboration in Defining the *Desired State*: The Case of Cozumel, Mexico, Arizona State University.
[38] Article 60 of the General Wildlife Law

According to the critical habitats for wildlife conservation, they are established when talking about specific areas:[39]

• Within the surface in which a specie or population in risk is distributed at the moment of being listed; in the ones essential biological processes are being developed for their conservation.

• Because of deterioration processes that have decreased drastically their surface, but that they still shelter a significant biodiversity concentration.

• In the ones that exists an ecosystem in risk of disappearing, if the factors that have taken it to reduce its historical surface, continue acting.

The declaratory has at least: an objective, actions to fullfill, a recovery plan, coordination mechanisms, special management and conservation measures, that will need to be considered in the management plans of the Environmental Management Unities (UMA´s) that could be developed, as well as the surface and determination of the polygon in UTM coordenates[40-41]. The use of this figure, has no´t been experienced yet.

■ Refuge Areas to Protect Marine Species.

SEMARNAT is in charge of the regulation and application of relative measures of the refuge areas to protect marine species.[42] These areas can be established for the protection of:[43]

• All native species in wildlife, that develop in a marine environment. Chelonians, marine mammals and marine species in risk.

• Those native species in wildlife that develop in a marine environment mentioned in the corresponding document or the corresponding declaratory.

• Those native species in wildlife that develop in a marine environment, not specifically excluded on the document mentioned above.

• Specimes` populations, species or groups of native species in wildlife with specific characteristics that develop in a marine environment, that can be affected in a negative way because of the use of some environments.[44]

The verifying studies should include general information, diagnosis, physical descriptions of the area, justification and socioeconomic features. In case that the surface of any of the refuge areas match with the polygon of any Protected Natural Area, they should be compatible with the respective protection program, the general objectives established in the corresponding declaratory and in the management program of the Protected Natural Area involved.[45]

Until now, there has only been a decree of a refuge area with its own program for the protection of the Vaquita Marina. In this, the management and necessary conservation measures are pointed out, focused on the solution of detected threatens, actions and activities that have to be accomplished in a short, medium or long term, as well as the conditions for the fulfillment of any public or private work or the activities that can affect the protection, recovery and re-establishment of the natural elements.[46] It Is here, where narrow circumstances for fishing and aquaculture can be established.

Nevertheless, the experience with the refuge area of the Vaquita has not been totally successful. The poor coordination of the involved authorities has been the result of actions that block a progress for protection of this endangered specie.[47]

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[39] Article 63 of the General Wildlife Law
[40] *Universal Transverse Mercator*
[41] Article 72 of the Regulation of the General Wildlife Law
[42] Article 9, fraction XVII of the General Wildlife Law
[43] Article 67 of the General Wildlife Law
[44] For example, populations found affected by certain fishing implements.
[45] Article 68 of the General Wildlife Law
[46] Article 72 of the Regulation of the General Wildlife Law .
[47] The critical that has been made is that while CONANP took away fishing permits through the program PROCODES; CONAPESCA granted new permits as a commitment to fishermen. So, agreements between the fishermen community and inspection labors and surveillance have been a little.

■ Management Units for Wildlife Conservation

It is possible to protect marine endangered species, their ecosystems and genetic resources, through the Units of Management for Wildlife Conservation (UMA´s), these are in registered properties and facilities, that work with a management approved plan, within the ones, there is a permanent follow up of the habitat`s condition and of populations and specimens distributed there.48 SEMARNAT is the authority in charge of promotion, registration and technical supervision of the UMA´s establishment.[49]

The UMA´s have as a general objective, the conservation of the natural habitat, populations and specimens of wildlife species. A particular purpose is the restauration, protection, maintenance, recovery, reproduction, resettlement, reintroduction, research, rescue, guard, rehabilitation, exhibition, recreation, environmental education and sustainable use.[50]

This is why, The National System of Management Units for Wildlife Conservation, was created and looks up for:[51]

• Conservation of biodiversity and the natural wildlife habitat, like the continuity of evolution processes of wildlife species in the national territory. .

• The Creation of biological corridors that connect the management units for conservation of wildlife among them and the Protected Natural Areas, in a way that guarantees and potentiates the flow of specimens of wild species.

• The promotion of restauration, recovery, reintroduction and resettlement activities, with the participation of social, public or private organizations and others interested in biodiversity conservation.

• The development of productive and alternative activities for rural communities and the fight of traffic and illegal appropriation of specimens, parts and wildlife derivatives.

SEMARNAT has the obligation to develop the National System of UMA´s in zones with influence of the Protected Natural Areas, with the purpose of reinforce buffer zones and give continuity to ecosystems, involving local inhabitants in the execution of the program mentioned above, within the properties; giving priority to the non-extractive use, about endangered or threaten species or populations.[52]

For their administration, UMA´s should have a management plan, which is only the technical operative document, that describes the program and activities for the management of particular wild species, their habitat and the establishment of goals and indicators of success in relation to the habitat and populations.[53]

The Plan`s content is the following:[54]

• Specific objectives: goals in a short, medium and long terms and success indicators.

• The physical and biological description of the area and infrastructure.

• Sampling methods.

• Calendar of activities.

• Habitat, populations and specimen management measures.

• Contingency measures.

• Surveillance mechanisms.

• Media, forms of use and tagging system to identify specimens, parts and derivatives that can be used in a sustainable way.

The creation of UMA´s has use and conservation objectives and in the management plan, measures of the habitat management are included, within the ones, fishing restrictions can be apply.

Fishing zones can be created through the use of UMA´s, digesting the intention of creation of a refuge

[48] Article 3, fraction XLIV of the General Wildlife Law.
[49] Article 9, fraction XI of the General Wildlife Law.
[50] Article 39 of the General Wildlife Law.
[51] Article 46 of the General Wildlife Law.
[52] Article 47 of the General Wildlife Law.
[53] Article 3, fracción XXXII General Wildlife Law.
[54] The management plan should be done by the responsible technician, who will be responsible with the principal of the registered unit of wildlife conservation and habitat, in case of granting the authorization and registration. See article 40 of the General wildlife Law.

zone network of the biological corridors, however, the use of this model does not guarantee its success, without the necessary management and financing plans, resettlement activities can not work out.

Right now, it only exists the marine UMA of the Sea Cucumber, a protected specie, by the Mexican Official Rule NOM-059-ECOL-1994. This tool has the benefit to grant exclusive rights about the exploitation of this specie, it promotes the responsible use of the sea cucumber and reduces illegal catch.[55] Nevertheless, the problem lies in the establishment of good organizational structures of the comunity and the acceptance of good use practices.

2.3 Convention on Wetlands of International Importance (Ramsar)

Ramsar sites are wetlands that accomplish some of the criteria developed by The Convention on Wetlands of International Importance (Ramsar), that provides the framework for national action and international cooperation in pro of conservation and rational use of wetlands and its resources.

Mexico ratified the mentioned Convention on December 20th, 1984 and published this treaty in the Official Federation Gazette on January 24th, 1985. As a consecuence, it assumed to handle the compromise of encouraging the Ramsar sites´conservation and take the appropriate measures for their custody.[56] The rational use and sustainable management of Wetlands to avoid an overexploitation of its resources and provide a social and economical solid base, for the conservation of the their territory.[57]
A tool to create marine reserves is The Ramsar`s management plan, its objective is to establish actions to preserve populations of species of wetlands and the recovery for threatened species;[58] Also, the compromise to have a periodical review of such plans, to corroborate the vality of their objectives, priorities and actions.

Fishing legislation in Mexico[59] does not consider in any of its parragraphs, models of fully protected reserves. However, ther are some legal models that are not completely aimed to have the same legal effects of fully protected reserves, but they can provoque a total closing season for fishing.

Further, an analysis about political fishing implements and some other mechanisms that can help us create fully protected reserves is done.


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[55] Sea Cucumber UMA in Loreto Bay. More info see López Espinosa de los Monteros, R. y Mariano Meléndez. Sustainable use of Marine Resources in the PNBL: aquaculture, sea cucumber (Isostichopus fuscus) y programas de empleo temporal, disponible en http://www.cec.org/files/PDF/BIODIVERSITY/Loreto/March%202/6-Paper-Lopez.pdf

[56] Article 4 Ramsar Convention.

[57] Article 3 Ramsar Convention

[58] Recommendation 2.3 . Appendix: *Framework for the application of the Convention on wetlands of International Importance, specially as a habitat of Seabirds* (Ramsar, 1971), may 1984.

[59] It is important to point out that the expressed comments in this documents, come from the analysis of the LGPAS as a regulation framework of fishing in Mexico, and the regulation of this law. This last one mentions that nowadays the writing of this document is not published in the regulation of the LGPAS in the Official Federation Diary still. This is the reason why the document was checked on the webpage of the Federal Comission of Better Regulation, after a public consult, this is the final product of the process of elaboration of the own regultion by SAGARPA and an almost final document being published by the President of Mexico in the Official Diary.

CHAPTER III

Tools for fishery legislation for the creation of Fully Protected Marine

Fernado Ochoa

3.1 Fishing Ordinance Program

Only three articles of the General Law of Sustainable Fishing and Aquaculture (LGPAS) regulate the Fishing Ordinance Program (POP), article 4, fraction XXV,XXXVII and XXXVIII. These three precepts go from the definition of the POP until the description of its content. This limitation, obligates us to make different parallels between the POP and the Ecological Regulation of the Territory. Both seem to be similar models with an independent genesis, that are meant to coexist and feed back in a natural symbiosis.

Article 4, fraction XXV from the LGPAS defines the POP as follows:

A group of instruments, which objective is to regulate and administrate fishing, inlcuding sustainable use of fishing and aquacultue resources, based in the availability of fishing resources, historical information of extraction levels, uses and development of potential activities, fishing and aquaculture capability, reference points for the management of fisheries in order with the Ecological Regulation of the Territory.

Of this definition we can extract three elements. The first one, the POP, which is an instrument related to other implements, is a group of legal mechanisms that are articulated between themselves through the POP to achieve the influence of the use of fishing resources. It is clearly stated that the POP is a useful and basic planning implement, able to coordinate the multiplicity of legal strategies that the decision maker , a public official, or any other determined comunity has the power of achieving the regulation of fishing and finally use fishing resources in a sustainable and rational way.

The second element in the POP`s definition, is that the object is regular , besides, administrates fishing activity, so, it develops in a sustainable way, basing the principles of fishing politics on article 17 of the LGPAS. As the POP, is a planning implement that has to have a clear objective, to try to administrate fishing activity, so it can be developed in a sustainable way, this is why values or guidelines are prescribed on article 17.

Principles of fishing politics are guidelines, that the legislator described, in the LGPAS with the purpose of being obligatory and work as ideological concernings for everything that has to do with the execution of fishing politics. In an environmental matter, the LGEEPA also regulates on article 15, the principles of environmental politics. Raúl Brañes,[60] points out that these values of environmental politics correspond to what has to be done in environmental regulation. Therefore, it is valid to say that, principles of fishing politics respond to what to do in matters of fishing politics.

In fraction XXV, article 4 of LGPAS establishes that the objective of the POP will be based, in the availability of fishing resources, historical information of extraction levels and fishing capabilities. Therefore, it is clear that the POP can have specific regulations for each site, like fishing reserves, among others.

Finally, the third element that comes from the definition of POP`s is that these implements have to be elaborated "... in a congruent way with the Ecological Regulation of the Territory" (POET). This sentence determines with clarity that the POP is dependent of the POET and that the content should be congruent with the POET; therefore, if the POET mentions any opposite precept of the POP, this can not revoke the POET, because in this circumstance, the POP will not be congruent, so it will be opposite to the definition, clearly announced by the legislator.

As a support to the argument, in the paragraph above, it is important to mention that in any part of the environmental legislation, it is mentioned that the POET should depend on the POP, therefore, the POP has to be congruent with the POET which is the most hierarchical implement.

Article 37 of the LGPAS, establishes that the POP must contain the following elements written out:

"I. *The precise delimitation of the area that the program includes;*

[60] Brañes Raúl, *Booklet of Environmental Mexican Laws*, Fondo de Cultura Económica, Second Edition, Mexico, 78p, 2004.

II. *An exhaustive and updated list of the users in the region;*

III. *Fishing resources liable to use; and*

IV. *Published and Sanctioned Management Fishing Plans ".*

Fraction I, establishes that the POP`s must contain as a first element, a geographical determination. This will determine a spacial validity matter; meaning, the geographical area in the one the program will supply its legal effects.

Fraction II, requires the authority to create a users` updated and exhaustive census. It is important to mention that the term users doesn´t concern fishermen with a permit or licensee only. Therefore, it is evident, that the legislator term includes every person that uses the geographical zone, already bounded according to the fraction above; for fishing purposes and every person with or without a fishing permit. It is important to remark this element; nowadays, there are any official stadistics that determine the exact illegal fishing, existing in the country. Therefore, fishing authorities do not know with certainty the real fishing effort.

Fraction III, article 37, points out, that it is a necessary requirement for the POP to include the description of fishing resources, liable to use. The detailed management of each specie will compete with the management fishing plans. Therefore, the POP has the function to coordinate the fishing activity with a more ecosystematic vision and in a wide geographical zone, where fishing activities have been harmonized, even between the POPand the POET. Discovering the POP as a fishing planning implement and a bridge between the implements of fishing and environmental politics.

Finally, fraction IV, article 37 of the LGPAS establishes that the POP integrates the published and sanctioned fishing management plans. It can not exist a POP without a PMP, both contain specific regulations of the specific management of fisheries.

Article 38 of the LGPAS points out that, when authorities elaborate the POP´s should be aware that fishermen can incoorporate the sustainability criteria desribed on article 14 of the LGPAS, in the management of fishing resources, pointing out what follows:

"ARTICLE 38.-" Authorities support the creation of controlled mechanisms of the own producers, supported by the traditional knowledge of management systems, where they exist and will promote the creation of communitary groups that contribute to protection and administration of such resources, under the guiding principles of the present Law".

This article is clear when pointing out that authorities should support that POP´s incoorporate management strategies, that promote fishermen self-control. It can be pointed out, that the LGPAS is inciting fishing authorities, in their fishing strategies and through the POP, to incoorporate implements like Fully Protected Marine Reserves. As seen in chapter II, the most adecuated form to create a Fully Protected Marine Reserve, is through a participating process from where strategies can be extracted, so they can generate self-control on behalf of communities and stimulate them to execute an intelligent fishing of the fishing resource, thinking about the long term, more than in a simple fishing, breaking so, the commons` tragedy.

The regulation project of the LGPAS, points out on article 70 that for the POP creation, there has to be a creation of a Fishing Regulation Commitee without minorizing the mechanism of integration, only describing this as a consultative commitee, in charge of providing scientific and technical information; however it is clear that the final decision corresponds to CONAPESCA.

Article 70 prescribes that POP´s must contain expressive opinion to manage measures that will contain, incoorporated criteria of regionalize management, conectivity aspects, socioeconomic characterization and fleet mobility.

It is very clear that due to POP´s planning instruments, with a very clear geographical design and because of its basic characteristics, to coordinate the aplication of legal instruments´ multiplicity, with other implements like PMP´s and refuge zones, they can create effects of Fully Protected Marine Reserves through the determination of geographical zones in which political fishing criteria for such zones is, no fishing.

3.2 Fishing Management Plans

PMP´s are only regulated in one article of the LGPAS, the four fractions of article 39 and articles 70, 71, 72 and 73 of the LGPAS regulation. Therefore, we are facing the same problem and a low explicit law, it is necessary to make an an analysis, almost word by word, to be able to unravel the maximum possibilities that a PMP can offer to regulate fishing activities.

Management plans are part of the Fishing Ordinance Programs. However the existence of PMP´s is possible without being intimately linked to to a POP. In this sense, it´s interesting to watch that the PMP´s are autonomous implements in relation to POP´s, therefore, a lot more vesatile in their use and aplication. They should be used in less complex situations.

PMP´s contain four elements, the same ones that can be joined in three main items: The objective of the declaration of the PMP´s; the descriptive elements of the fishing problematic; and finally, the elements that are looking up to find management mechanisms to solve, regulate, administrate or take over the fishing problematic.

According with the objective of the PMP´s, this must be determined by the National Council or State Fisheries[61] and must be referred to the creation of fishing diagnosis and refernce points for its management. To be accomplished, they should include strategies, tactics and responsibilities of involved fishing sectors.

Article 72 of the regulation of the LGPAS project, points out that the described strategies in the paragraph above, can include catching fees, maximum catches or any other system aimed to generate a management of the cooperative fishing resources between the authority and the communities. Also, the management can be adaptive, this is why PMP´s should be managed periodically. The laxity in this article, opens up the possibility of incoorporating marine poligons totally closed for fishing, as soon as this measure is presented, as a linked strategy to a reference point for fishing management.

On their behalf, the State and National Fishing and Aquaculture Commitees are regulated by articles 22 and 23 of the LGPAS, where it is pointed out that crossed forums are, to provide politics, programs, projects and implements for support, promotion, productivity, regulation and control of fishing and aquaculture activities to increse competitiveness of productive sectors.

These commitees are integrated by federal agencies related with fishing subjects, representatives of social organizations and fishing sector producers.

The LGPAS doesn´t specify mechanisms through the ones National and State Fishing Councils would create, live and extint. There is no disposition, that allows to point out how many members form it or how it is governed.

This indefinition can carry serious risks, for example; commitees can be conformed unbalancely, giving more importance to authorities, minimizing fishermen`s representation, or even, eliminate the presence of other people involved in the productive chain and environmental organizations, that will represent a genuine interest and counterbalance.

The LGPAS establishes clearly, that National and State Fishing Councils, should have sessions, at least one per year and have within their functions to determine objectives of PMP´s.

The second item of elements of PMP´s is conformed for those who are asigned to perform a diagnosis of the fishing problematic. As an example, the biological description of the fishing resources to manage; the identification of the catching cycle and fishery state, the description of socioeconomic indicators of benefit populations due to fishing and the impact on them, finally, the identification of the geographical area to manage.

The diagnosis requested by the authority has to be developed with the objective of identifying overexploitations and inadequate practiques in a determined geographical zone.

Finally, the third item of elements, tends to look up for solutions to the problematic found in the item described above,

[61] As an agreement with article 71 of the regulation project of the LGPAS, the objectives of the estate fishing commitees, set that they should be with the pointed objectives by the Fishing National Commitee.

conformed by administration rules of the area and the authorized fishing equipment. These last marked elements give a great opportunity, so through the use of creativity and science, different methods and management mechanisms of fishing resources can be created. One of the elements that can be placed in the PMPs are no fishing zones.

However, the law doesn´t point out the procedure of creation, nor its phases, nor methods or any additional disposition that allows us to identify the way these processes are led, people involved in each case will be the ones to identify and design such processes. This is the reason why this publication looks up to explore the most adequate ways to create this type of implement, just at the moment that fishing commitees design PMP´s objectives.

Article 73 of the Regulation Project for the LGPAS establishes that PMP´s should contain explicit references about ecosystems of the applied geographical area and expressed considerations to reduce incidence of the not objective overexploitation of fishing resources.

3.3 Fishing Permits and Concessions

The LGPAS established that to develop fishing activity, it will be necessary to obtain fishing and aquaculture permits and concessions. The differences between both implements are sutile but clear. This is a brief comparative of the differences:

Concept	Permits	Concessions
Legal Foundationnnn	Article 41	Article 40
Regulated Activities	I. Commercial Aquaculture; II. Aquaculture to promote; III. Didactic Aquaculture; IV. Commercial Fishing; V. Fishing to promote; VI. Didactic Fishing; VII. Sport- recreative Fishing, except the one done from land; VIII. Fishing jobs, necessary to base concessions`requirements; IX. Fishing done by foreigners when declared as an excess in the exclusive economical zone; X. Fishing oversea or in foreign jurisdiction waters in boats with mexican flag and plate, and approval in International Agreements of which Mexico is part of. XI. Colocation of set fishing implements in waters with federal jurisdiction; XII. Recollection of reproducers in the natural environment; XIII. The introduction and resettlement of alive species in bodies of water of federal jurisdictionl; XIV. Unload or transport in foreign ports, captured species by fishing boats with Mexican flag, XV. XV.Disembark commercial fishing products in any presentation in Mexican ports by foreign fishing boats.	I. Commercial fishing; and II. Commercial Aquaculture
Time	From 2 to 5 years.	From 5 to 20 years.
Allowing transfers	No	Yes
Information Required	No	Yes

Concessions and permits are given by the National Comission of Sustainable Fishing and Aquaculture (CONAPESCA) per boat or fishing unit effort ,[62] according to the next element:[63]

1.- Concessions and permits should be liable to the methods given by the public interest, according to social equity principles and scientific information.

2.- CONAPESCA should give preference to indian communities and inhabitants of local communities that use fishing equipment approved by the authority.

3.- Finally, CONAPESCA should take consent of indigenous communities when giving concessions and permits that can affect their rights.

Fishing concessions will be granted by the area, fishing resource or specie. Also, the process for its granting is formed by the next five steps:[64]

I. Will evaluate the technical, administrative and financial ability of the applicant;

II. Will evaluate the applicant`s career according to the official rules and other dispositions, inlcuding the environmental protected ones;

III. Will give more importance to applications of inhabitants of local communities and to the ones that have a social and ecoomical benefit impact in the region;

IV. Will inform about the aplication of this request, to the Fishing and Aquaculture State Council, who will be able to make an opinion about the received application and will count with fifteen natural days to make knowledge of it to the Department, and

V. Once the decision is taken, the Ministry of Agriculture and Fisheries will publish the concession in the Official Federation Gazette, at the expense of the applicant.

Also applicants should satisfy the content requirements under article 48 of the LGPAS. The concessions last between 5 and 20 years, these can be extended even for 50 more years.

Finally, to be able to transmit the asigned rights in the fishing concession, the expressed authorization on behalf the fishing authority will be required.

As written in the comparative square above, permits will last maximum two years. To obtain them, applicants should be accepted by the fishing authority, checking if they have the necessary equipment to fish. These permits can be extendible but can not be transfered, this implies an unbeatable barrier for the implantation of payment catching schemes in Mexico. The requirements to obtain them are written on article 52 of the LGPAS.

Concessions and permits can be extincted because of expiration, revocation, nullity, end of a term and rescue.[65]

Expiration will perform when the licensee does not perform the protection activities by the permit without a justified cause or stopping such activities for a period of more than 3 consecutive months. Also, expiration will perform when the licensee doesn´t acquire or build the necessary facilities to prosecute fishing protected activities. However, the fishing authority, if requested by the applicant, can determine the causes by the ones expiration will not be applied, even when updating the requirements written above.[66]

Expiration rules are very relevant, because it is common to pretend to create Fully Protected Marine Reserves de facto through communitary agreements, not running the fishing protection rights, and leaving them for permits or concessions. However, according to expiration rules, every permit or concession not executed will lose its validity. The fact that the fishing authority has the faculty to point out, (according to its free determination), when expiration cases won´t be applied. Therefore in a specific moment, fishing authority can agree not to apply expiration in idle permits and concessions with reasons to conserve and resettle marine resources. It is important to point out

[62] Article 46 of the LGPAS
[63] Article 43 of theLGPAS
[64] Article 47 of the LGPAS
[65] Article 53 of the LGPAS
[66] Article 54 of the LGPAS

that in every situation, it depends on the free will of the authority, leaving us in a fragile risky scene.

Nullity will be applied when the ecosystem is being affected or it´s being placed in an inminent risk, reason why the fishing authority should give out a judgement that motivates such disposition. This way, nullity can be applied when the licensee or distributor exceeds the excercise of rights, protected by the permit or corresponding concession, or when violating or breaking what was established by the LGPAS, regulation and any other fishing legislation. Finally. these are cause of nullity, to incur in loss or commercial contest and commercialize obtained product by illegal means (lack of permission, exceed the allowed fee, nonfulfillment in sizes, in not allowed areas or with illegal fishing equipment, etc.[67]

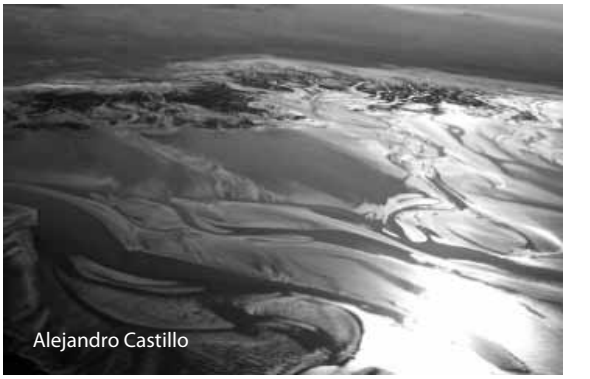
Permits and concessions will be automatically extinct when the term of its validity is fulfilled.[68] So, it will perform the rescue in every moment, always, when the fishing authority, produces causes of public interest, when the fishery has a status of overexploitation and after giving a judgement for INAPESCA to accredit that the particular is not ensuring the fishery maintenance.[69]

It is important to mention that the person that incurs in an expiration or revocation, can not own a permit or concession for a period of four years.[70]

Even though permits and concessions are implements thatdo not generate protected reserves. It is important to mention that the lack of absence in their granting, will allow to generate such zones. Apart from the creation of PMP´s, POP´s, Refuge Zones and closing season zones, is very important that such implements are reforced with geographical zones, where no permits are granted, and because of inspection actions and decisive surveillance that can even unchain the loss of concessions and permits.

3.4 Refuge Zones

Refuge Zones are found to be hardly regulated in only two articles from the LGPAS and in less than four disected articles by the regulations` project body from the LGPAS. Regarding the LGPAS, the first article that refers to refuge zones only, is the definition of the term, and second, is a healing in face of its nonfulfillment. The asigned articles in the Regulations Project from the LGPAS give a better idea about this implement, but definitely it doesn´t achieve to design its legal nature completely.


Alejandro Castillo

Once the facing limits, have been mentioned, we can proceed to analyze the few information there is about refuge zones in the LGPAS

According to its definition, the law establishes:

ARTICLE 4.- For effects in this law, what follows, is understood:

LI. Refuge Zones: The limited areas in the federal jurisdiction waters, with the principal purpose of conserve and contribute, naturally or artificially to the development of the fishing resources, according to its reproduction, growing and recruitment, as well as preserving and protecting the surrounding environment.

[67] Article 55 LGPAS

[68] Article 57 LGPAS

[69] Fraction II of article 59 of the LGPAS establishes: II If the particular doesn´t guarantee the maintenance of the same in a term based by INAPESCA. The just written fraction contains a mispelling, so it is not clear the mainteinance of circumstances . However a court will be the one to determine the real significance in such fraction.

[70] Artículo 58 de la Ley General de Pesca y Acuacultura Sustentable.

From the definition written above, it is clear that the objective of refuge zones is to create geographical poligons with the purpose of conserve and contribute the development of fishing resources and their environment. Therefore, it is evident how refuge areas and LGVS are different between them, in refuge zones the purpose is to protect fishing resources, while in refuge areas the purpose is to protect endangered species.

This difference in focuses, is because the LGPAS is a fishing regulation and the LGVS, is about the legal framework of the natural resources conservation. However, it needs to be mentioned that they are two poles that tend to touch in between, because both figures are meant to protect the fishing or wild species environment, depending the case, therefore, both end up including one and other or vice versa.

Article 38 of the Project of Regulation of the LGPAS establishes that the refuge zones will only be used to preserve overexploited fishing resources. Also , these zones should be consigned in a PMP or in the National Fishing Letter. If a refuge zone is created, the PMP should have as an objective, the conservation and restauration of commercial overexploited species, as mentioned above. However, within its margins, commercial and sport fishing activities can be done.[71]

Even though in appearance, Refuge Zones are the closest figure to marine reserves found in the fishing legislation in Mexico, the fact that they allow fishing activities avoids, that this figure forms itself like the fully protected and closed fishing poligons, that provoque a redoubling and remedies of marine ecosystems.

Article 132 of the LGPAS establishes clearly the infractions to this law:

XIX. To extract, to capture, to posess, to transport or trade with closing season`s species or with size or weight, inferior to the minimum specified by the Department, or obtained them from refuge or resettlement zones or sites;

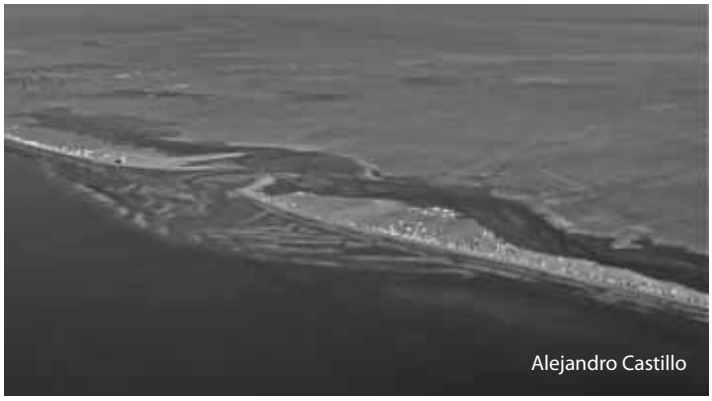
According to fraction XIX, written above, it can be concluded that refuge zones are non fishing zones where any type of extraction of fishing resources is forbidden. However, procedures of creation, modification and administration are unknown.

3.5 Closing season zones

Closing season zones do not constitute an implement of fishing politics, however, the PGPAS has dedicated 5 articles in which clearly establish, that authorities have the faculty to impose them and penalties to whom violate closing season zones, without doing any precision about the mechanism for their determination, basics information for their creation o modification. This represents a very significant empty space.

In general terms, it can be said that, closing season zones are:

The admininstrative act on which it is forbidden to fish in a period or specific zone, this is established with agreements or official rules, with the purpose of taking care of the reproductive and recruitment processes of a specie.[72] Also, closing


Alejandro Castillo

[71] Article 87 Regulation Project of the LGPAS
[72] Article 4 fraction XVII
[73] Article 8, fractions V y XXIII and article 13 fraction XV subappendix f)

season zones can be established by federal and local authorities in their specific powers.[73] These closing seasons, can be decree by specie, geographical, temporal or permanent zone. For their creation CONAPESCA will require a judgement made by the INAPESCA, the objective of protection of species in a reproductive, incubation, growing, recruitment period will be determined or because the maximum degree of exploitation has been reached.[74]

As it can be seen, closing season zones of geographical zones are the ideal implement for the implementation of Fully Protected Marine Reserves, because these are the ones that allow to decree geographical poligons, excent of fishing activities. However, there are none:

"..about species with special protection by the NOM-059-SEMARNAT-2001 the SAGARPA should coordinate with SEMARNAT to impose closing season zones.[75]

It is significant that without caring about the brief regulation about closing season zones, its violation turns out to be very hard, even when self-consumption fishing doesn´t require a fishing permit or concession, it is subject to not fishing resources according to closing season zones.[76]

[74] Article 135 of the LGPAS
[75] Article 9 fraction V.
[76] Article 72 LGPAS.

CHAPTER IV

Framework to establish, design and evaluate communitary Marine Reserves: steps and elements

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Recently, there are publishings with international acknowlegdement, that have as an objective to provide a theorical and practical framework with steps, elements, learned lessons and reccomendations to the interested ones, in the use of networks of protected marine areas and Fully Protected Marine Reserves.[77] However there are a few efforts to present a process that attends and involves little by little the whole designing process, establishing and evaluating the main affected and benefit ones, when creating fishing communities reserves. In most cases, the design and establishment of these networks is due to a decisions` system from up to down or by outside promoters of coastal communities. Most of the existing materials to establish fully protected communitary reserves, are from islands in the Southeast Pacific, through the legal framework of knowledge of the Locally Managed Marine Areas.[78] In this region of the world the establishment of reserves is relatively easier, because in fishing communities, exists a more than 100 years tradition in which tribes or families own marine territories. Even, some of them have forbidden fishing sites due to a tradition of espiritual matters.

In Mexico and the rest of Latinamerica, the establishment of communitary marine reserves is complex, due to the attribution of fishing and conservation authorities to promote and establish Fully Protected Marine Reserves in any of their legal designations (nucleus zone and/or refuge zones, among others).

As follows, the framework[79] presented by Community and Biodiversity A.C. has developed through the experience of 10 years, promoting, designing, establishing and evaluating Fully protected Marine Reserves with fishermen in Mexico. The process of steps and key elements for their achievement, as a group with coastal communities is described. It is important to point out this adaptative framework and how it has to be followed as a general guide, making the changes, the user considers necessary in agreed to its specific situation.

4.1 Presentation of marine reserves concept.

The first step that needs to be taken to establish networks of fully protected marine reserves, is to present the concept (How do they work?, When are the benefits of the restauration of an ecosystem and fishery observed?,What responsabilities are gained? How are they designed and established?, How much do they cost?, among other questions) to the users of the marine-coastal biodiversity (for example, fishermen, tourists, researchers, managers, government). This is made through a teorical-practical workshop that lasts between three and five days,[80] to

[77] Bunce, L., P. Townsley, R. Pomeroy, R. Pollnac. 2000. Socieconomic manual for coral reef management. Australian Institute of Marine Science, Townsville, Queensland, Australia. 264 p - IUCN World Commission on Protected Areas (IUCN-WCPA) (2008). Establishing Marine Protected Area Networks—Making It Happen. Washington, D.C.: IUCN-WCPA, National Oceanic and Atmospheric Administration and The Nature Conservancy. 118 p - Laffoley, D. d'A., (ed.) 2008. Towards Networks of Marine Protected Areas. The MPA Plan of Action for IUCN's World Commission on Protected Areas. IUCN WCPA, Gland, Switzerland. 28 p - Pomeroy, R.S., J.E. Parks, L.M. Watson. 2004. How is your MPA doing? A guidebook of natural and social indicators for evaluating marine protected areas management effectiveness. IUCN, Gland, Switzerland and Cambridge, UK. xvi+216 p - Roberts, C., J. Hawkins. 2000. Fully Protected Marine Reserves: A Guide. Endangered Seas Campaign, WWF-US, Washington DC, and University of York, UK. 131p - Staub, F., M.E. Hatziolos.2004. Score card to assess progress in achieving management effectiveness goals for marine protected areas. The World Bank. 30 p - TNC (The Nature Conservancy), World Wildlife Fund (WWF), Conservation International (CI), Wildlife Conservation Society (wcs). 2008. Marine protected areas networks in the Coral Triangle: development and lessons. TNC, WWF, CI, WCS, United States Agency for International Development, Cebu City, Philippines. 106p

[78] Learning Framework of the Locally-Managed Marine Area (LMMA) Network (2003) or in Philippines (www.lmmanetwork.org).- Beger, M., A. Harbone, T. Dacles, J.-L. Solandt, G.L. Ledesma. 2004. *A framework of lessons learned from community-based marine reserves and its effectiveness in guiding a new coastal management initiative in the Philippines.* Environmental Management 34:786-801.

[79] Ezcurra, E., O. Aburto-Oropeza, M. de los A. Carvajal, R. Cudney-Bueno y J. Torre. 2009. Pág 227-252, Chapter 13. Gulf of California, México. En: Ecosystem-Based Management for the Oceans, K. McLeod y H. Leslie (eds). Island Press. 368p

[80] In the workshop, all the exposed information is done in Power Point. Exposers ahould be people with experience of different years in the subject and work dynimacs with fishermen. Each participant should be given in a dossier with printed presentations and other material, as well as a diploma.

the one, fishermen, service workers, natural resource managers, government institutions representatives, NGO´s, academics and researchers assistance.

In the workshop, theorical foundations are presented, to preserve marine biodiversity and to manage fishing resources under an ecosystem`s perspective instead of specie by specie; experiences in the world about the establishment of Fully Protected Marine Reserves are exposed, besides the aspects that have to be included in their design to be successful; the different tools to evaluate the operation and legal frameworks, as well as existing administratives in the country, where networks of reserves are going to be established. During the workshop, practical and hypothetical exercises have to be included, to design and establish them, using as examples the sites where participants come from. Also, the discussion becomes richer at the time of checking the successful studying cases and the ones that were not.

COBI organized a workshop in 2003 for communities in the Northeast of Mexico,[81] where eight fishermen and 11 biologists of six cooperatives, two guvernamental agencies and five non guvernamental agencies and five non guvernamental conservation organizations.[82] In 2007 and 2008, four workshops were given, one in each country (Mexico, Belize, Guatemala and Honduras) of the Mesoamerican Reef. In these workshops more than 100 people were qualified. The presented modules in such workshops are down described. For people interested in, it is recommended to promote Fully Protected Marine Reserves in these modules, as trying to consider the pertinent changes.

a. *Introduction and standard basic concepts.* Background, objectives and rules of participation are presented in this part of the workshop. (Chart 4.3). As well as basic concepts that all the participants should know; even when biologists or fishermen work in nature, we use a different form of language refering to it (elements and relationships). One of the problems that we have observed in the field, is the lack of understanding between both parts. On one side, biologists use terms, thinking that fishermen and people in general know, understand and use in their daily life. On the other side, fishermen, for example, use a different understanding about time, they measure it from events that they remember, not necessary in specific years. Phrases like "On that time...", they can refer about yesterday or even decades behind.

Here, it is explained: What is a graphic?, How are they build and what types exist?, What is a specie and a population?, How are measurments done and what typed of care have to be taken according to statistics?, and What is the scientific method?

b. *Fishing Impact in marine ecosystems.* In this module, it is presented, through examples of different parts of the world,[83] how fishing activities have dismanteled different functions and structures in marine ecosystems throughout the history of


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[81] The participant communities were: Isla Natividad, Bahía Magdalena, Cabo Pulmo, Loreto, Bahía de Kino y Puerto Peñasco.

[82] Torre, J., A. Saenz-Arroyo1, L. Bourillón1, M. Kleiberg. 2005. Fisher fund: an initiative to encourage community-based marine reserves. International Marine Protected Areas Conference, Geeolong, Australia. Extended Abstracts. 389pp.

[83] An example of a ecosystem in the Seagrass forest in the East Pacific, in this, the extintion of the Steller cow and the decrease of population of sea otters are shown, also an example of the tropical ecosystem in the Carribbean, including the seal hunt, manatee, turttles and agregations of predating fish.

humanity. Different concepts are being discussed, like the value of marine ecosystems, from a direct exploitation point of view, their legacy, existance, vulnerability of species, niches of species and trophic relationships. Apart from, the importance in the use of a historical perspective about how resources were before their exploitation. Unfortunately, we are forgetting that what we believe is natural nowadays, is not necessary as resources have always been.[84] Also, it is presented, how the human being has been "eating" each trophic level, from big predators until primary producers.[85] At last, it is discussed how to define objectives, goals and results that want to be obtained; meaning, What do we want to restore from the ecosystem?

c. *Use of Fully Protected Marine Reserves.* In this third module, theory and evidence of Fully Protected Marine Reserves as successful instruments of conservation, restauration and fishing management. Using as a guide, the document ***Science of Fully Protected Marine Reserves,***[86] other published examples and cases in the field; effects of the recovery of species and ecosystems within Fully Protected Marine Reserves, were published, speaking on terms of growing diversity, biomass, size and density of species in temperate and tropical environments. It is argued, how much time it is required to achieve this recovery, according to the natural history of species (fecundity, hermaphroditism), size and connectivity between reserves. Also the spillover effect is discussed. This module concludes with strategies of elements and steps to develop a local network of marine areas successfully protected.

d. *Evaluation of Fully Protected Marine Reserves. In module 4,* identification of indicators (biophysic, socioeconomic and governance) that can be use to maeasure successful effectivity in reserves, are included, according to planned objectives and goals.[87] Elements that have to be taken into account, when a monitoring program is being developed, in a Fully Protected Marine Reserves Network and basic techniques of biological monitoring (underwater census) are checked. Through cases of study, it is exposed how fishermen have to be involved and trained in monitoring reserves.

e. *Legal Framework of Fully Protected Marine Reserves.* Module 5, includes a revision of the legal and administrative framework in Mexico, for schemes of fishing administration (fishing concessions and refuges) and conservation (nucleus zones, Protected Natural Areas). In case the workshop is done in another country, a lawyer or specialist to expose the legal and administrative framework for the establishment of these reserves, is requested.

f. *Practical Excercises.* During the course, the opportunity for the participants to apply what they learned through a design of a hypothetical Fully Protected Marine Reserves network, in their regions is given. Teams are organized by site and preferently they have to be: a fisherman, a biologist and a person from the government. At the beginning it is been asked, to enlist species that have been overfished in their region, as well as their possible functions in the ecosystem, answering the following: What do you think that has been lost with the declining of these species? With this information and what has been exposed in the course, participants develop three or four types of hypothetical reserves network for each region. Each one of these, is designed with a specific objective and to be evaluated from different points of view (ecological, social and economical) to get to a final,

[84] (shifting-baseline), concept created by Dr. Daniel Pauly en 1995 (Anecdotes and the shifting baseline syndrome of fisheries. Trends in Ecology & Evolution 10(10): 430.

[85] (Pauly D, Christensen V, Dalsgaard J, Froese R and Torres F (1998) "Fishing down marine food webs" Science, 279: 860-863.)

[86] PISCO (Partnership for Interdisciplinary Studies of Coastal Oceans). 2008. Science of Marine Reserves (2da. Edición, Versión para Latinoamerica y el Caribe). 22 pp. (www.piscoweb.org)

[87] Pomeroy, R.S., Parks, J.E. y Watson, L.M. Cómo evaluar una AMP. *Manual delndicadores Naturales y Sociales para Evaluar la Efectividad de la Gestión de Áreas Marinas Protegidas.* UICN, Gland, Suiza y Cambridge, Reino Unido. xvi + 216, 2006, p. (htpp//data.iucn.org/dbtw-wpd/edocs/PAPS-012-Es.pdf).

more convenient solution. For this evaluation, the multicriteria method of analysis is used[88] with a simple and participative format. Once the best alternative is selected, they are asked to develop a monitoring program to identify which will be the necessary strategies to put into practice in this hypothetical case. The results are presented in plenary sessions by the participants.

g. *Cases of study and other material.* Throughout the workshop presentations of cases of study of Fully Protected Marine Reserves are made. Cases of communitary monitoring and themes of interest (reproductive agregations, ecoregional planification, economical alternatives, among others) in the site, region or country where the workshop is given. All this is exposed by the instructors and participants of the workshop.

h. *Conclusions.* In the final part of the workshop, a summary of the exposed material is made, with the presentation of escential steps and elements to achieve Fully Protected Communitary Marine Reserves. Also, an evaluation of the participants.

4.2 Evaluate the interest of the group about the use of Fully Protected Marine Reserves

At the end of the workshop, most of the participants return to their communities with many clear ideas and at the same time with big doubts and question marks: How do I start a Fully Protected Marine Reserves` network?, Do they want us to stop fising?, How much does it cost?, Are they going to execute me if I continue saying we should stop fishing?, Grandpa, I remember we used to take out a lot from the sea?, Do I have that much work, appart from starting something like this?, Does it sound complicated?, among other questions. However, The experience has taught us that fishermen, biologists or handlers, are the ones that start impulsing the idea of Marine Reserves within their community or institution at a certain time.

For example, after the 2003 workshop, the biologist of the Cooperative in Isla Natividad, propose to the Surveillance and Administration Councils, that people in COBI were going to explain them the concept of: Fully Protected Marine Reserves. They agreed and in 2004, there was a meeting with the members of these councils.

In the meeting, in a very summarize way, they presented what is seen in the workshop (2-3 hours): What are Marine Reserves? How are they established? What is it needed in human resources and finantial terms?

This exact type of meeting has been held with managers of other Cooperatives in Bahía Magdalena (Pacific) and in Puerto Morelos (Mesoamerican), among others. If there is more interest on the members, the managers of each cooperative, speak to them and request to have the same presentation during any annual assembly.

Following the example of Isla Natividad, in 2004 this island was visited again and during an assembly, the concept of: Fully Protected Marine Reserves, was presented to their 85 members.

However, not all the communities are willing to implement Fully Protected Marine Reserves immediately, in general, it is not for a lack of interest,

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[88] The multicriteria analysis is used to choose the best way, using qualitative and quantitative qualifications. Voogd, H. 1983. Multicriteria evaluation for urban and regional planning. London.

but for a lack of common elements identified, like: a) Organization and consistency of the group interested in, b) the creation and legal establishment of the group, c) documents that endorse that they own the fishing equipment, fishing permits, among others, d) human and finantial resources and e) unwillingness from the government agencies.

This is the moment when there has to be an evaluation of the possibilities of success in a Fully Protected Marine Reserves Network without having these elements solved. That´s why there is a plan to start solving them with each group involved.[89]

4.3 Design of alternatives and establishment of Reserves

When necessary elements exist, to create a Fully Protected Marine Reserves Project, a working group is formed by members of the Cooperative, Biologists and Handlers. It is important to include fishermen with several years of experience, that remember, what was like, the fishery several decades ago, to incoorporate the historical component of the state of the resources.

Through a series of meetings, expected objectives and goals are identified (What do we expect to recover and protect?), different criteria are defined to evaluate different alternatives, the best one is evaluated through a multicriteria method and indicators to measure effectiveness according the identified and selected goals chart 4.4). A plan and financing strategy is elaborated with the group.[90] During this process, different field trips are made, to evaluate the logistic needs to do the project. Also, there are meetings with the directive assembly to present the done advances in the construction of the project. A critical point is that alternatives of network reserves should be voted by the assembly, to define the starting closing date of extraction activities in the selected areas. Also it is crucial to define if these reserves will be just a test, will rotate or if they will be permanent. For example, for Isla Natividad in 2005, was voted Fully Protected Marine Reserves Network, but was until February 2006 that the offcial closing of the area started and a coolaboration agreement, where the reserves were being tested and in 2011 the results will be evaluated to determine if they were going to be opened or closed or expanded was signed. In other cases, like the Reserve de la Biosfera Isla San Pedro Martir, the nucleus zone was established from workshops with the main users of the island and the commercial divers in Bahía de Kino. In the case of Fully Protected Marine Reserves for ornament species of the cooperative Mujeres del Golfo en Ligüi, this network was designed with this group of fisherwomen, it is established in the fishing permit that the cooperative has to renew every year.

Once the reserve´s networks have been defined (areas and time), the plan and finincing strategy, an agreement between the coperative and the group supporting the initiative (government or non guvernamental organization) is signed. In case that in the initiative, guvernamental authorities in charge of marine resources conservation and management are not involved, it is necessary to present them the project.

4.4 Training to evaluate Marine Reserves

Once indicators have been selected (biophysical, socioeconomic and governance chart 4.5) to measure effectiveness in Fully Protected Marine Reserves, it is important to identify those that can be done by the users, researching institutions, Non guvernamental organizations, the government or in coolaboration between the different groups.

[89] RARE along with organizations of the Northeast part of Mexico, has implanted the Fishing Advisors Program (Fishers Fellows), who work in fishing communities to help solving basic problems that fishing groups have to achieve a sustainable fishing, like the organization, permits acquisition, among others (http://rareconservation.org/news/article.php?id=45)

[90] In the financing strategy thera hs to be a budget that includes all the expenses to achieve the success of reserves, like capacitation, monitoring equipment, divers`salary, inspection and surveillance equipment .

In the specific case of underwater monitoring, in the ones COBI has adquired more experience, the first thing that has to be done is the identification of candidates to receive training, being the following, the main characteristics to be selected: a) the Cooperative has to choose them; b) to have an interest and commitment to do this monitoring (at least once a year) in the established dates, for a period of at least two years; c) to prove a wide experience Scuba diving and d) know how to read and write. In these training , fishermen of the communities are not the only ones to participate, also students, managers, people from the gobernment and non guvernamental organizations are interested in getting involved with the project. At the same time of this selection, adecuate methods have to be identified for the ecosystem where they will work to feed the selected indicators. This has to be with the coolaboration of research groups with an enormous experience in the use of methodology. [91] Also during this stage, the necessary materials for the training are being prepared and adapted.

Training for underwater monitoring is divided in three modules. In the first one, the certification of participants in SCUBA diving with a recognition of any international company.[92] This is made when most of the fishermen have many years of experience, diving with a compressor type "hooka", which is not a safe and confortable equipment to do evaluations. Working members are numerous, it is needed:, a compressor and a boat with two crew members that manage the equipment and engine, besides one or two SCUBA divers. But with a SCUBA diving equipment, many divers can go to the same sampling site, depending on the boat`s capacity. Besides, with the compressor there is more risk in having an accident (commercial divers do not use decompression charts, when using a compressor) and the management of monitoring equipment (transects, chart data, among others) is more difficult when thereare hoses of various divers in the water. In some projects of Fully Protected Marine Reserves, it is necessary to have a compressor, to fill up SCUBA diving tanks, so it is important to train the monitoring participants in the use of these compressors.

In the second module, a first aid course of one or two days is given, by a specialist in Emergency First Response theme, in this one, it is taught how to recognize problems that can cause accidents and primary and secondary attention. Also, they work with possible field scences, because they learn how to make an emergency evacuation plan.

In the last module, is where participants are taught how to make census. They learn the selected methodology, adapted to census (transects, quadrants and cylinders) and the list of invertebrate species and fish[93] being censed (abundance and size). Also they are taught to evaluate distribution and complexity in environments (substract, rugosity, profile). During the course, theorical and practical exams are done. Evaluations start until the paticipants and counting and measuring in a uniform way in the classroom and in field. The third module is always repeated before each annual evaluation.

In is important to emphasize that even when there is a commitment from the participants of being in every monitoring throughout time, it has been seen that it is not possible due to work, illnesses or personal matters. This is why it is necessary to keep on training new generations depending how the project requires it.

One of the advantages in having people trained in SCUBA,[94] in the communities, is that these

[91] For example, for monitoring of Giant sea grass (Macrosystis spp.) in the region of Isla Natividad , the modified methodology used is from Reef Check (www.reefcheck.org), or in the North of the Gulf of California through the initiative PANGAS (www.pangas.arizona.edu) PISCO methodology was adopted (www.piscoweb.org).

[92] Professional Association of Diving Instructors (PADI, www.padi.com), National Association of Underwater Instructors (NAUI, www.naui.org, Scuba Schools International (SSI, www.divessi.com).

[93] Species are taught with a scientific name and fishermen do not have a problem learning them, even when they believe it is difficult to learn them.

[94] Self Contained Underwater Breathing Aparatus.

can support in the obtention of other indicators. For example, in Isla Natividad, the effect of spillover in the reserves using avalon larvae recolectors with the Hopkins Marine Station (Stanford) and the trained divers team in monitoring, have been coolaborated very close with this project. Other case is the diving team in Bahia de Kino, who has been trained in the placement, retreat and use of oceanographic equipment and the identification on invasive algae. Through this trainning, fishermen stop to fish for some days, data species to fish. In some cases the same divers look up for a higher level in SCUBA, as a divemaster or instructor.

4.5 Monitoring

The first activity within the monitoring, is to determine the base line of reserves and control sites, because it is the first "photography" of how diversity and species were before the no fishing or extracting effect started. The base line is the point of reference to know if the resources are increasing, decreasing or do not present any change through time. A base line has to be established for all the biophysical, socioeconomid and governance indicators selected. Close to this point, databases and analysis[95] to apply can be designed. Also periodicity is determined if the methods require changes. Monitoring protocols have to be simple documents, where it has to be described on detail how a monitoring of each indicator, including equipment, material, logistic and necessary security, data bases, analysis and sampling methods have to be done.

4.6 Communication

Communication is a mayor element for the success of Fully Protected Marine Reserves´ projects. The process of communication and results has to be done through all required levels. The advances to the group of fishermen or other users are presented anually, in assemblies of cooperatives or in councils for assesors of Protected Natural Areas. Also there have to be periodical meetings with authorities in charge of management and fishing conservation of resources.

Also it is important to inform about results in a national and international level, through publishing to general public and in scientific magazines with arbitration, in congress and other type of meetings. Results have to be use to propose those modifications required in regulations, to achieve the conservation of biodiversity and sustainable management of fisheries.


COBI/ Arturo Hernández

[95] Recently COBI and Ecotrust developed a program in internet to capture and analize data obtained through submarine census, named EUREKA. (www.eurekamarine.org).

Opinion

COBI

A fishing management, based in science, adaptative criteria of connectivity and market, represent a great challenge for mexican legislation.

From the modification of the LGPAS of 2007, different spaces have been opened to implement audacious and creative measures that generate an ordered fishery, based in scientific data and a strong sense of competivity and professionalism of the fishing sector.

Fully Protected Marine Reserves represent one of the strategies that is urgent to implement, facing the clear degradation and collapse of fisheries in the country.

During all this work, we were able to observe how mexican legislation has no´t been able to give a clear answer, to all the needs of creating geographic zones fully closed for fishing activities.

It is clear, the fact that to achieve effects of Fully Protected Marine Reserves is necessary to give a hand to complex strategies, where social, scientific, economical and legal components figure in a very important way, or it would be very difficult to implement a Marine Reserve in a successful way.

The involving of fishing communities represents a great challenge and an important complexity. However, during this document, we were able to see how at the end of the day, fishermen communities can, in many cases, adopt a fishing restriction as severe as Fully Protected Marine Reserves, if with this, they can achieve in a medium or high range, benefits impossible to obtain in another way.

Legal challenges that exist to create Fully Protected Marine Reserves cause that communities choose for de facto solutions, that if they do have great achievements in ecosystems, their effects are pending of how solid and durable has been the communitary agreement.

Lack of a solid right to allow communitary agreements to trascend to more permanent schemes, that can allow to make strong arrangements and advances, that little by little can build communities.

It has to be recognized that most part of the challenge is how to face and split legal duality in where we live in.

Proper regulation of conservation and fishing regulation coexist in the same space, with the same people involved and an undivided interaction among the natural resources that protect. So, things end up being two twins that when facing backwards, with antagonic visions, end up confused in one: Marine Resources.

To achieve that conservation of marine resources is directed to a more rational, responsible, optimum and competitive fishing. It is needed that the solution doesn´t depend in one focus, but on the fruit of multidisciplinary focuses, where no one has complete answers and will always be necessary to count with the coolaboration of all the sectors to be able to implement Marine Reserves Networks to mantain and improve the quality of fisheries, and in general, of all marine resources in the country.

It i`s urgent to have a legal revision, where the Fully Protected Marine Reserves figure establishes wherever any extractive activity is forbidden. If this revision does no´t start soon, Mexico can face in a very clear and strong way, the degradation suffered by our seas as a consecuence of overexploitation of fishing resources.

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Charts and Figures

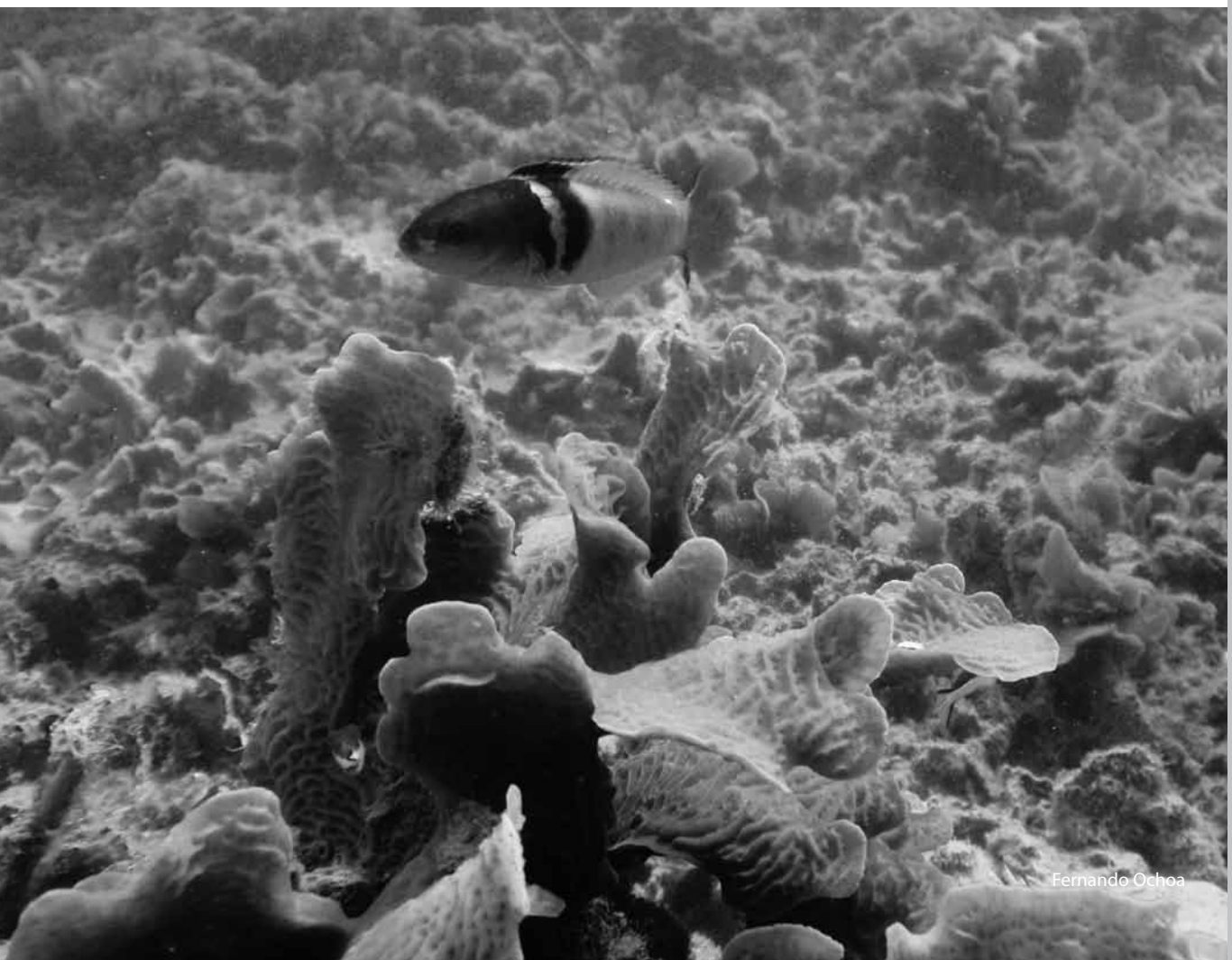

Chart 1.1 Examples of the deterioration of marine resources in the Gulf of California.[96]

• Drastic changes in the species abundance, specially megafauna, between nowadays and centuries XVI-XIX
• Decrease of species in the tidal zone from the expedition in 1940 by Steinbeck y Rickets
• Decrease of fishing resources since the 1950s in the Gulf of California
• Decrease of reproductive and breeding environments because of a decrease in the flow of the Colorado River
• 93 % (25) of ornamental official fisheries in the Gulf of California are deteriorated or in their maximun capacity of overexplitation
• Increase in populations of species of a low trophic level, like jellyfish

Chart 1.2 Examples of objectives to establish marine reserves.

• To resettle intense fishing site
• To recover environmental service
• To improve catches in a long term
• To protect biological diversity of ecosystems, of species and populations
• To assure to preserve a natural proportion of each ecosystem, specie and population
• To protect coastal zones of environmental disturbance.
• To understand a better use of the human being in the ecosystem and avoid the ecosystems` collapse
• To protect cultural diversity
• To create "natural aquariums" for tourism
• Like, tools for environmental education

[96] Lluch-Cota, S.E., E.A. Aragón-Noriega, F. Arreguín-Sánche, D. Aurioles-Gamboa, J.J. Bautista-Romero, R.C. Brusca, R.Cervantes-Duarte, R.Cortés-Altamirano, P. Del-Monte-Luna, A. Esquivel-Herrera, G. Fernández, M.E. Hendrickx, S. Hernández-Vázquez, H. Herrera-Cervantes, M. Kahru, M. Lavín, D. Lluch-Belda, D.B. Lluch-Cota, J. López-Martínez, S.G. Marinone, M.O. Nevárez-Martínez, S. Ortega-García, E. Palacios-Castro, A. Parés-Sierra, G. Ponce-Díaz, M. Ramírez-Rodríguez, C.A. Salinas-Zavala, R.A. Schwartzlose y A.P. Sierra-Beltrán, 2007, *The Gulf of California: review of ecosystem status and sustainability challenges*. Progress in Oceanography 73: Pag. 1-26.
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Chart 4.1 Examples of objectives to establish marine reserves.

• The workshop is informal but respectful.
• Each participant should listen and respect others ideas, there are no bad ideas.
• It is possible to interrupt any presentation to make questions, you just have to raise you hand.
• This is an informative and participative course, it is not a meeting to criticizea fishing, among others.
• Courses are a commitment of x days of work.
• To protect coastal areas from environmental disturbances.
• Mobiles, use only outside, turn off if possible.
• Have fun and learn from one and other.
• What other rule is missing?

Chart 4.2 Examples of criteria to select marine reserves and control sites.

• Total Number of Species	• Presence de ambientes frágiles durante el monitoreo (corales, algas, pastos)
• Species number under any protection	• Value or percentage of the extracted product by the selected area
• Number of key species (commercial, predators, among others)	• Size of the selected areas as controls or reserves
• Density and abundance of Key sapecies	• Not a monetary value (recreational) of each selected area
• Number of covered environments, ecosystems and substracts	• Feasibility of monitoring, currents, waves, deepness and visibility
• Number or coverage of critical environments	• Acceptance between members of the community.
• Presence of currents for dispersion or larvae retention	• Presence of illegal fishing
• Resilience to environmental changes (El Niño/La Niña)	• Feasibility of doing inspection and vigilance

Chart 4.3 Indicators to measure effectivity in Fully Protected Marine Areas, taken from Pomeroy et al (2006).

Biophysical indicators	S12 Number and nature of markets.
B1 Abundance of Key Species	S13 Acknowlegement of users about Natural History
B2 Structure of populations of Key Species	S14 Distribución del conocimiento con base científica hacia la comunidad
B3 Distribution and complexity of the habitat	S15 Percentage of users in a leadership position
B4 Composition and structure of the community	S16 Changes in conditions of ancestral and historical monuments
B5 Successful recruitment within the community	Indicadores de gobernabilidad
B6 Integrity of the trophic web	G1 Level of conflict per resource
B7 Type, level and fishing	G2 Existence of a management body and taking decisions.
B8 Water Quality	G3 Existence and adoption of a management/ effort plan
B9 Areas that show up signs of recovery	G4 Local understanding of rules and regulations
B10 Areas with a reduced or null human impact	G5 Existence of an adeccuate legislation
Socioeconomic Indicators	G6 Availability and asignation of administrative resources

S1 Use patterns of marine resources	G7 Existence, aplication and contribution to scientific reaserchings.
S2 Values and local beliefs of marine resources	G8 Existence and activity of communitary organisms
S3 Level of Understanding of human impact in resources	G9 Degree of interaction between administrators and users
S4 Perception on availability of food coming from the sea	G10 Proportion of capable users in the sustainable use of resources
S5 Perception on resources`extraction	G11 Level of capability, given by users participating in management and effort
S6 Perception on not associated values to markets or use	G12 Level of participation and satisfaction of users in activities and processes of effort and management
S7 Material Lifestyle	G13 Level of proportion of users in vigilance and monitoring
S8 Human health quality	G14 Clearly defined inspection processes.
S9 Distribution of familiar income according to its source	G15 Inspection coverage
S10 Occupational homes`Structure	G16 Degree of propagation to promote compliance
S11 Infrastructure and business in communities	

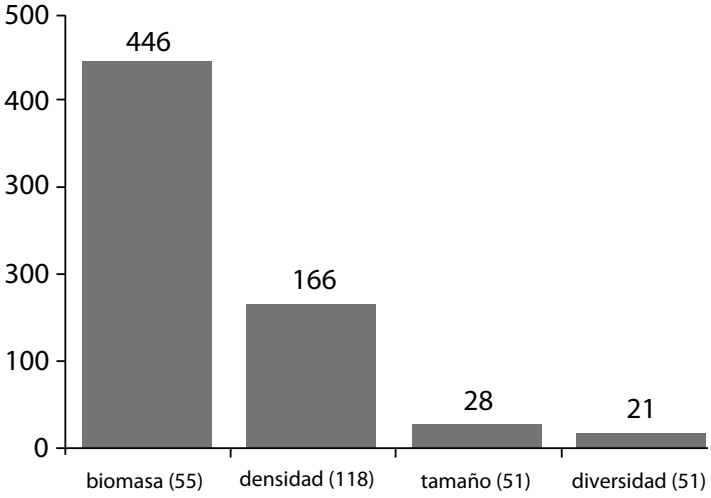

Figure 1.1 Average changes in algae, invertebrates and fish within marine reserves in different parts of the world (the number of used reserves for analysis) This figure is modified and simplified from PISCO (2008).

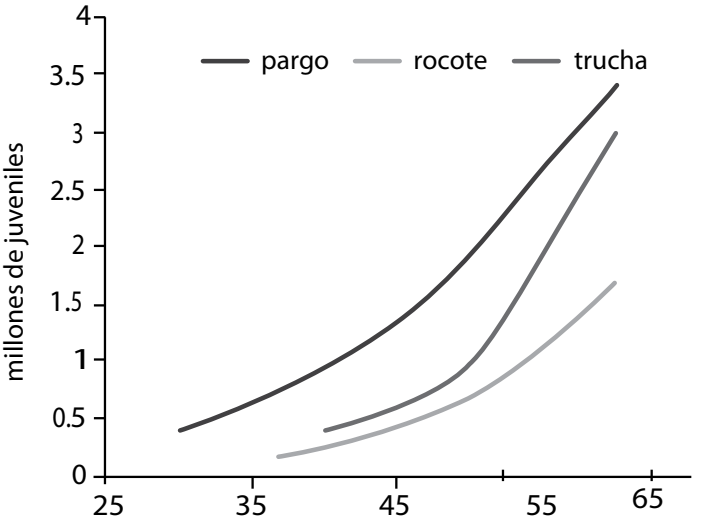

Figure 1.2 Production of juveniles of the Grey Snapper, Bermillion Rockfish and Reef Trout according to size (cm). This figure is modified from PISCO (2008).

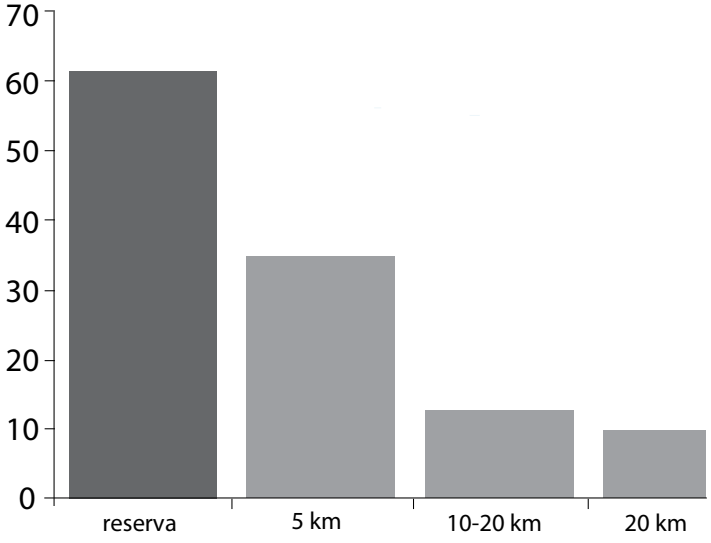

Figure 1.3 Biomass (kg/hectare) of the Nassau Grouper within a marine reserve in Bahamas, in different distances. This figure is modified from PISCO (2008).

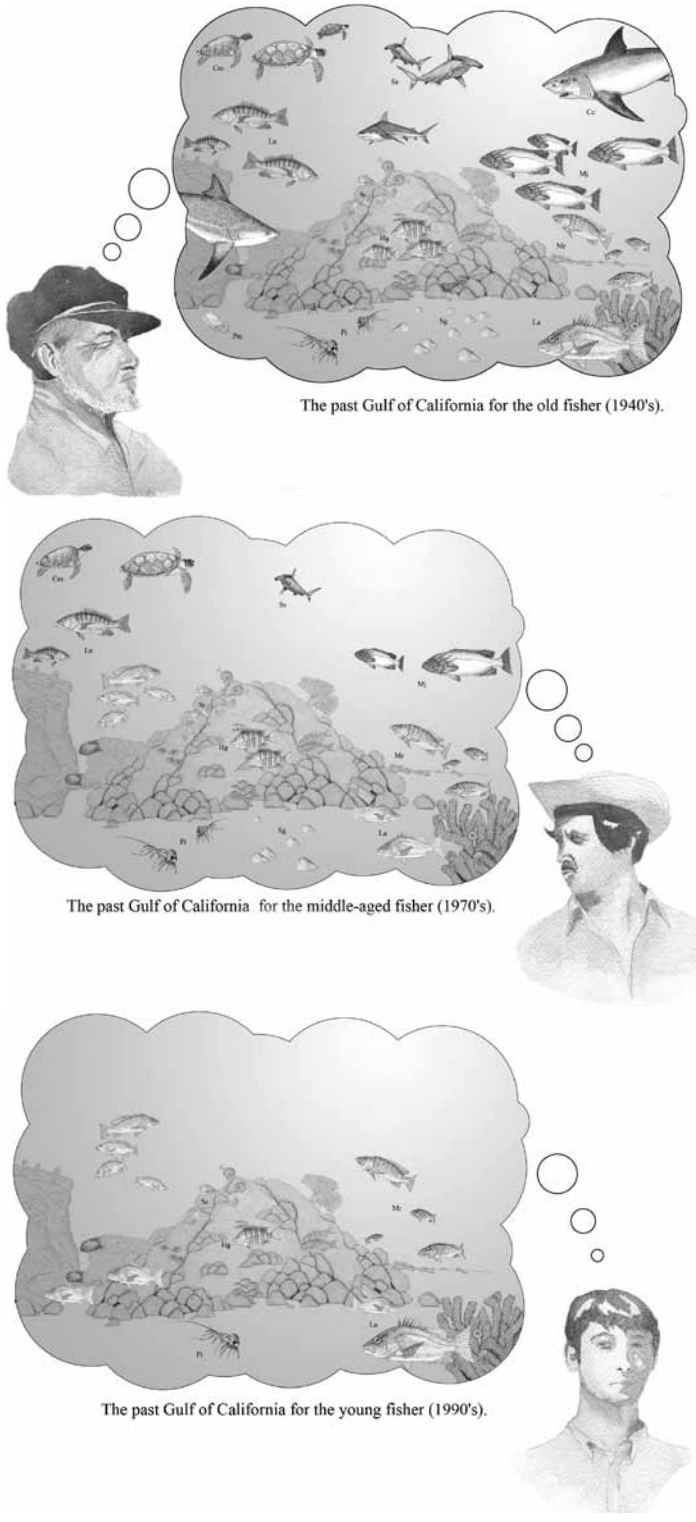

Figure 1.4 What do we want to recover with Marine Reserves? The ecosystem of 70, 40 o 20 years ago?. Figure based of Sáenz-Arroyo et al.[97] Graphics by A. Randall and P. Thiriet, 2005.

[97] Sáenz-Arroyo, A., C. M. Roberts, J. Torre, M. Cariño-Olvera y R. R. Enríquez-Andrade, 2005. *Rapid environmental shifting baseline among fishers from the Sea of Cortez*. Proceedings of the Royal Society 272: 1957-1962.

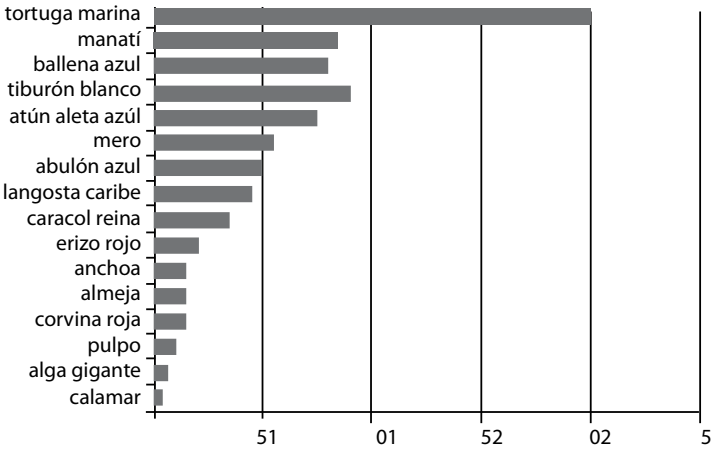

Figure 1.5 Age (years) when some marine species reach their sexual maturity. This figure is modified from PISCO (2008).

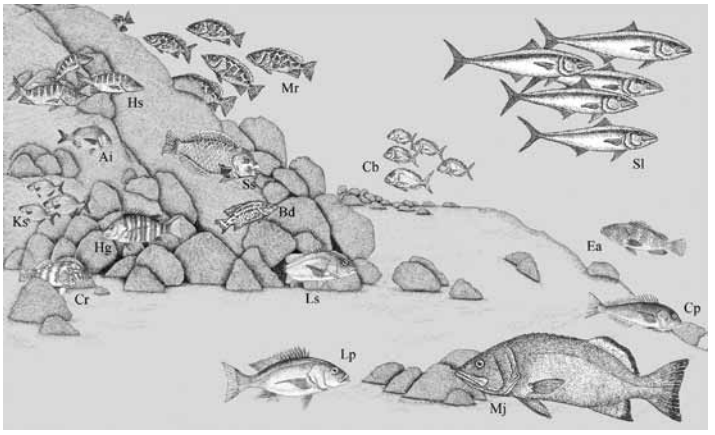

Figure 1.6 Representation of different environments and fish in coastal and oceanic reefs in Loreto Bay. Based in graphics by Juan Chuy.

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