

***THE ROLE OF LOCAL COMMUNITIES IN THE DESIGNATION OF A
MARINE PROTECTED AREA IN LAS PERLAS ARCHIPELAGO, PANAMA***

By

INEZ CAMPBELL

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NOMENCLATURE

AMP - Autoridad Maritima de Panama (Maritime Authority of Panama)

ANAM – Autoridad Nacional del Medioambiente (National Environmental Authority)

CBD - Convention of Biodiversity

DEFRA – Department of the Environment, Food and Rural Affairs

DI - Darwin Initiative

ICM - Integrated Coastal Zones

IUCN – International Union for the Conservation of Nature and Natural Resources

MPA – Marine Protected Area

PRA – Participatory Rural Appraisal

STRI - Smithsonian Tropical Research Institute

ABSTRACT

The Pearl Islands Archipelago has been the subject of recent studies to evaluate the richness and biodiversity of its marine resources. Reports have shown that marine environments and species are in a threatened state unless law implements an appropriate management of the area. The human population that lives in these islands is dedicated mostly to artisanal fisheries, but different reasons can be attributed to the decrease of the resources. A socio-ecological survey was conducted to understand the needs and attitudes of the local community towards the creation of a Marine Protected Area. As opposed to other studies, 92.5% of the surveyed population agreed that a management zone would bring benefits, 82.1% were concerned that the marine resources are becoming scarce and that the area needs a better management of the resources. The positive attitude of the fishermen from the nine communities proves that initial participation of local residents is the most important step for implementing new Marine Protected Area. Nevertheless, alternatives should be provided to residents, such as an organized tourism (e.g. whale watching), in which they are fully involved to compensate for fishing regulations. The results of this survey have been pivotal for the designation of the 160,167 hectares MPA and the conservation of the marine resources of Panama.

CHAPTER 1 INTRODUCTION

1.1. THE NEED FOR A MARINE PROTECTED AREA

Our coastal seas, local and worldwide, have been exposed to constant human pressures that the environment cannot fight on its own. The abundance and biodiversity that once existed in our oceans is rapidly declining according to the news we hear everyday and information found in many scientific articles and reports from conservation groups. It is estimated that 25% of all fish stocks are currently over-fished, and a further 44% are fished to their biological limits (O’Riordan 2000; Hall 1998). The marine ecosystems are the most fragile of them all and their biodiversity is becoming threatened with the increase of world population and lack of a good management of the resources. Coastal communities make use of these resources on a daily basis for their own subsistence and often as the only economic source. Many people’s livelihoods depend fully on the ocean’s products (Scholz *et al.* 2004). As population increases, so does the demand for food and land, but sometimes this demand curve grows faster than the curve of multiplication of animals and plants by natural processes. Therefore, marine areas affected by these reasons need a better management of their resources and their use.

The Archipelago Las Perlas in Panama does not escape this reality. Through many studies it has been brought to the attention of the scientific community the notion that resources are becoming scarce due to their unmeasured use. A lack of control, education and management may drive the valuable and important marine products to depletion, as have been with other resources in the past (Medina *et al* [in press](#)). The most successful management strategy for conservation is that of a Marine Protected Area (MPA). In this study, I am presenting a set of socio-ecological surveys conducted on all nine fishing communities of the Archipelago, to demonstrate that active participation of a community increases their acceptance during the conflicting creation of any new MPAs. I will show that 92.5% agreed that a MPA is an alternative that will provide long-term benefits for them. By performing these surveys on the

population the community has been shown to be involved in the extensive process that it takes to designate an MPA, instead of only imposing a set of rules, as has failed in other parks worldwide, where community's opinions were not taken into account from the beginning (see Literature Review, Chapter 2).

1.2 THE DARWIN PROJECT INITIATIVE

The Darwin Initiative is helping Panama with valuable funding to gather the scientific data towards achieving the goal of protecting the resources of Las Perlas Archipelago. This is a DEFRA (Department for Environment, Food and Rural Affairs) funded programme from the UK (www.darwin.gov.uk), that applies small grants to promote biodiversity conservation and sustainable use of resources around the world. The Darwin Initiative (DI) has funded 250 projects in Africa, Asia, Central America, Caribbean, Europe, Middle East, North America, Oceania, South America, and for the last three years, it has been helping Panama in the designation of a Marine Protected Area, in conjunction with the Smithsonian Tropical Research Institute locally.

Projects funded under the DI help developing countries address their commitments under the Convention on Biological Diversity (CBD). It is open to applications from UK institutes in partnership with organizations from developing countries that are rich in biodiversity. It funds projects that are related to issues concerning conservation and sustainable use of biological diversity, in all kinds of habitats.

The first stage of this project involved scientific data gathering on the most relevant scientific issues, including marine and land habitat mapping using remote sensors and Geographical Information System, the description of hard and soft benthonic communities, marine pollution, and fisheries, to mention few. But as expressed by Foster & Lemay (1989), the participatory approach is the best way to ensure community relevance and gathering of information. Their needs must be heard in order to receive an understandable acceptance and cooperation to safeguard the resources.

1.3 THE ARCHIPELAGO OF LAS PERLAS

The Archipelago of Las Perlas, located in the Pacific side of the Isthmus of Panama, is a group of approximately 255 islands and islets that hold a widely documented biodiversity of fish, corals, invertebrates, and it is also a preferred nursing ground for humpback whales and other species of whales every year. Data recently gathered show an increasingly negative effect of the fisheries on coral reefs and species.

Overexploiting the resources can put to an end the important resources that residents use every day for their economical subsistence. Artisanal fisheries, if they are performed in a properly manage form can last for years, but if fishing licenses continue to be given to large and international vessels, the resource will continue to decrease to its depletion. Therefore, fishermen villages will lose their subsistence and the functioning of the ecosystem.

Throughout history, the Pearl Islands have been made famous not only by the “Survivor” TV show which brought tourism in past recent years. Half a millennium ago Panama was the primary destination of many colonial exploiters of the valuable and precious pearl. As we will see in the following section, it was a resource that almost fell into extinction, as happened to the Scallop (*Argopecten ventricosus*) decades ago, when depleted by the larger commercial shrimp boats (Medina *et al* in press). The irony of its disappearance is that its fishing activity lasted for almost five years and disappeared without a trace, to which the fishermen said: “It just swam to other waters” (Medina *et al* in press). Evidence of this massive collection remains on the beaches of Casaya Island (Fig. 1). The shells were discarded on the beach after the meat was taken out, and in some instances underwater but near the coast. In some other places, as Contadora, the shells are widely used for decoration. I was told that this fishery was common not only for residents but that fisherman from the city would arrive to the area as well, with trawler boats and take them in immense amounts per day. The over-extraction of this species must have overcome their rate for reproduction. It is now the time to avoid overexploiting of more resources and to face the real causes of their depletion.



Figure 1. Scallop shells in a beach at Casaya Village.

1.4 Case Study: History of the pearl fishery in the Archipelago and its decline

During the fieldwork, I met with a very nice old man who was very concerned about the current situation of the fisheries decline. We spoke for long hours about what he used to do when a young man: Pearl-Oyster fishing. His emphasis was not of a scientist, but of a fisherman with a passion that existed no more not because of his age, but because of the decline – almost extinction – of the Pearl Oyster in the Archipelago. His story enlightened me to make a case study and take these oysters as an example of what can happen to other resources that are currently being overexploited, just as happened to *Pinctata maza tlantica*, when the boom for it made it almost disappear from the waters of the Archipelago.

A report by Galtsoff (1950), tells a very illustrative full picture of the pearl fishery of that time, and it does corroborate with the stories told by this senior fisherman. This report was requested by the U.S. Department of State in 1947, and demanded a shellfishery expert to make a study of this fishery in the Pacific

islands of the Republic. Other studies also mention the importance of the Pearl fishing in Panama (Shirai 1979), as part of the region stretching from Baja California to Peru with important populations of *P. margaritifera* and *P. mazatlantica*.

In the 16th century, the times of discoveries and territory settlements by Spaniards in the New World, the pearl extraction was at its boom mostly in the Atlantic side of America. The discovery of large pearl banks in the Archipelago of Las Perlas in Panama is attributable to Vasco Nuñez de Balboa. In those times, men could gather about 96 ounces of pearls in four days (Galtsoff 1950). The local Indians were astonished at the fact that these conquerors were after the pearls of the oyster which, for them were worthless because they could not be eaten. The fishery increased in value consequently and more ships came to retrieve the precious gem. Intensive fishing of this resource of course led to a fast decline of the pearl. Galtsoff could not find the yield records of the fishery for the 18th and 19th centuries, and there are only records since 1907. According to what the senior fisherman told me during the interview, the fishermen would collect almost 300 oysters per day and per boat to see how many of those carried pearls, and the estimated the cost of one with a “grape shape and size” would be more than \$1,500.00.

From that time on, the retrieval of pearls were no longer made in great scale by the explorers, but from the communities scattered along the Archipelago. This type of fishery provided an income, because pearls were sold at high prices on demand by private yachts that ordered certain size of pearls, for example, the famous mother-of-pearl. The issue with this high expectation is that oysters continued to be taken out in order to look for the pearl, and then the shells discarded. Even during the years of forced inactivity from 1939 to 1943 due to World War II, it had no beneficial effect to the oyster population. In 1944-45, when the fishery was resumed, the local residents found the pearl oysters extremely scarce, to the point of diagnosing the population found as “very sick and nearly dying” (Galtsoff 1950).

During those years, Galtsoff (1950) made a study to investigate whether the reasons of its disappearance were accurate. The explanations given by the local inhabitants at that time were:

- 1) Oysters were destroyed by some unknown disease (e.g. red tides appearing as a result of Humboldt Currents)
- 2) They were poisoned by the dumping of explosives and poisonous gases,
- 3) They were killed by some specific poison or germ secretly placed near pearl grounds by Japanese fishermen in retaliation for Japan's defeat in World War II.

After a thorough study of all the aspects about the oyster, he concluded that none of the above exposed reasons had anything to do with its depletion. The oyster population that was left was so small that it could not support the fishery, and the amount of dead shells surpassed the amount of live shells. He concluded that continued over fishing was the most probable cause of the depletion of the pearl-oyster grounds in Panama. The decline started after 1925, but also history tells us that the Spaniards abandoned the area in the 16th century because they found better areas somewhere else. This supports the testimony of a senior fisherman, who participated actively while young and saw how overexploitation of the oyster fishery almost collapsed.

During my interview I was told that nowadays oysters are only caught with the purpose of consuming the meat. If a pearl is found, then they make contact with someone who has placed an order many months ago, but due to its disappearance it is no longer an activity that will provide a strong family income (Fig.2).



Figure 2. Fisherman opening oyster shells at Casaya Village.

This case study supports my strong belief that good management of the resources that the Archipelago of Las Perlas provides must be implemented promptly. Only by following the right procedures of participation and of involving the local community, for their understanding that is needed to protect our valuable marine resources, will we avoid this story from repeating itself on lobsters, queen conchs, octopus, and the snapper fishery that are already threaten.

1.5 OBJECTIVES

1.5.1. General

This dissertation sets out to evaluate the perception of nine local communities of fishermen regarding the implementation of a Marine Protected Area.

1.5.2 Specifics

- ❑ To involve the community in the first stages of the process for the implementation of an MPA by making a comprehensive assessment of the problems that the fishermen are facing with the resources and considering their traditional input for the solution.
- ❑ To evaluate the knowledge of the local residents in terms of marine education and conservation, and their knowledge of the status of biodiversity and abundance of marine resources in the Archipelago.
- ❑ To make an overall study of the past and present fisheries development and techniques with a particular case study to show how resources are being affected.
- ❑ To understand the needs of the local community in order to accept the limitations that a Marine Protected Area may involve.
- ❑ To evaluate what are the values they consider to be the most important of the islands, especially the benefits they obtain from tourism as alternative to fishing.

CHAPTER 2 LITERATURE REVIEW

“Highest priority should be given to reducing the two greatest disturbances to planet Earth: the growth of human population and the increase of resource use. Unless these disturbances are minimized, science will become powerless to assist in responding to the challenges of global change, and there can be no guarantees of sustainable development”.

O’Riordan makes reference to this paragraph by Dooge *et al* (1992)(see O’Riordan 2000, p.31) to describe how the alarming increase in population is threatening our living resources, and that unless we decide on a strategic management of them, nature will not be capable of sustaining them for a longer period of time. More and more, biologists are getting convinced that it takes more than scientific data to stop the environment from declining, and all research must be oriented into management conservation issues (Mascia 2003).

2.1 MARINE PROTECTED AREAS (MPAs)

Marine Protected Areas, or MPAs, are defined as: “Any area of intertidal and subtidal terrain, together with its overlying waters and associated flora, fauna, and historical and cultural features, which has been reserved by legislation to manage and protect part or all of the enclosed environment“ (Foster & Lemay 1989). In the recent years MPAs are increasingly becoming more and more popular to solve situations in coastal communities that are threatening to exploit or harm the marine habitats (Scholz *et al.* 2004). Especially when local communities are dedicated to fisheries as a way of survival, MPAs are the best sustainability management strategy (Oracion *et al.* 2005).

They are the best way to guarantee an appropriate use of the resources of a coastal community, by protecting them from overexploitation and damage due to human activities, such as fishing, pollution, and excessive tourism. Local communities survive in these environments by making use of these marine

resources but most of the time, lacking the appropriate knowledge to sustain the environment that provides them with the goods.

As explained by Mascia (2003), the success of the use of science for human activities is recognizing that conservation is about people as much as it is about species or ecosystems. Especially in the case of development and management of protected areas, social issues and biological facts must be considered hand in hand. Education also plays a very important role for local residents to understand that it is not a government imposition, but a way to help them and future generations to maintain a sustainable stock for their own consumption, for business and for tourism.

Protected Areas development history draws back to the early 20th century. The first record of a legally protected area was in 1898 in Mexico, in an area called Bosque El Chico Conservation Area (Budowski & MacFarland 1982). In the particular place of Central America, a report made by MacFarland and Morales (see Budowski & MacFarland, 1982 p. 553), they describe that between 1969 and 1981 the total area protected went from 193, 500 to 615,000 sq km. This shows the increasing awareness of that time, but also the designation using different categories or reasons to protect an area. As stated in this same report: "Not only those areas with little biodiversity are the ones who should be protected." Many gaps have been made through history and in terms of protecting, at the beginning only terrestrial areas were to be protected, leaving the coastal and marine areas exposed to threat. The majority of the first areas to be protected, along the coasts of Central and South America and Mexico, and some of the Lesser Antilles were designated mainly because of the terrestrial resources, not the marine ones, but that happened to be located within the islands (Budowski & MacFarland 1982). The few studies there are to justify MPAs from an economic point of view could be one of the reasons why it is hard to designate many of the areas that need protection (Badalamenti *et al.* 2000). But recently, other Marine Protected Areas are being implemented, and almost at the same rate and number than Land Protected Areas.

There are many options or techniques to apply to a marine area that needs protection (Foster & Lemay 1989):

- a) Zoning
- b) Activity Permits
- c) Periodic Closure
- d) Catch Limits
- e) Equipment Prohibitions
- f) Impact Limitations

After an area gets protected its best characteristics can be highlighted. A protected area will be able to stand high values for recreation, tourism, heritage, scientific and education purposes (Lucas 1982). Any country would be flourishing with pride by saying an area within their land or sea is a World Heritage Site: a unique area of preservation with endemic species and pristine ecosystem for the enjoyment of future generations. An area that maintains its beauty because it has been preserved would be a preferred destination for tourism even if it were only for picture taking. On the other hand, exposing an MPA to tourism could be risky as has been shown in many areas where those same areas that were guarded from over fishing are deteriorated by anchoring of boats and irresponsible diving techniques. In this case, a safe ecotourism can be accomplished if it is planned from the beginning of the designation of the area linked to environmental education. This at the same time will produce positive attitudes from local residents to support the protected area's guidelines because they will see benefits other than from using their natural resources, as was addressed by Walpole and Goodwin (2001), where communities were strongly supportive of the protected area after being involved in tourism activities or services. In this sense, they are not merely spectators but managers of their areas, which will make them aware of conserving and preserving the values of their natural surroundings.

Finally, the decision to designate an area for protection arises from the realization that a resource that we always had in unlimited quantity and for free is now scarce because we have used it without control. An increase in population must also increase our awareness and our conviction that the same

planet that once held a small fraction of what our world's population is today, can not sustain us now unless we start managing our resources appropriately.

Panama counts with 35 protected areas, of which 8 are marine areas (see www.anam.gob.pa). One of the marine parks that serve as example in Panama is Coiba Island Marine Park, which was recently declared World Heritage (La Prensa News, July 2005). Coiba is one of the marine parks protected with the greatest marine surface in the world. This island used to be a Prison in the past, and due to the fact that had little intervention by men it conserved many of its pristine ecosystems. Furthermore, in the past four years, several studies showed many endemic species of marine and terrestrial animals. Guzman *et al* (2004) discovered many unreported species of corals and other species.

To nominate Coiba for protection to UNESCO was not an easy task, and it went through many legal processes. There was a lot of politics and tourism involved, but the scientific evidence to support its protection was beyond a national use of its resources. It is also part of the Marine Corridor of Panama and of the Marine Corridor of the Pacific (Gorgona, Malpelo, Galapagos, Cocos, and Coiba). The designation involves 270, 125 ha of which 216, 543 are marine areas protecting its corals, marine turtles, fish, and most importantly whales and dolphins.

2.2 PARTICIPATORY RURAL APPRAISAL (PRA)

Many times it happens that scientists, specialists or politicians discover a situation in a community and want to solve it in their own way, without taking into account the participation of those who actually live with that particular situation. This has caused in many instances that the decisions taken do not necessarily work according to the needs of the people living there, causing conflict between the parties. In reaction to this participative approaches had to be prepared to actively involve the community, one of these is the Participative Rural Appraisal, developed by Robert Chambers (1994), an expert in community development, which basically means to participative understand a village raising and analyzing their knowledge of their life conditions in order to

create the correct action plan. An outside party, such as a researcher, facilitates this process or organization by analyzing the problem presented and trying to solve it with the available and potential tools and budget.

Participative Rural Appraisals not only provide true knowledge, but also facilitate better communications (Drijver 1994). The rural people will be performing as much investigation, presentation, analysis, planning and decision-making as the researchers; in other words, they are not to be considered the object of development but instead development actors. Project personnel, scientists and government officers must change their attitudes and fix their mentality that everything is known, and let a window open to learn with and from the community.

For the success of the establishment of a Marine Protected Area, previous participation of the local residents must be taken into account. In the way the fishermen and stakeholders are informed of the scientific data that shows how resources are decreasing, it will help them realize that an appropriate management of the area is needed, and that the request will come from them, instead of a decree imposed by the authorities. This conclusion has been set by many studies in which negative attitudes of communities aroused, and as a result, created conflict, because their opinions were not included in the first stages of the process towards conservation of the areas where they lived (Fiallo & Jacobson 1995; Barahona & Guzman 1998; Hough 1988; Mackinnon *et al.* 1990; Parry & Campbell 1992; Drijver 1994; Straede & Helles 2000). Fishermen specially are harder to convince that an MPA will bring benefits (Badalamenti *et al.* 2000). Some of the negative attitudes were attributable to “feelings of invasion” for not being consulted regarding the areas; other negative attitudes were because they found themselves being limited with the consumption of the natural resources without a reason of why that was needed. Another reason was that they perceived the protected area as a burden on their land use and self-reliance, and most important, they saw no benefits for them. While socioeconomic impacts can play a negative or positive role, they are central to policy processes (Sholz *et al.* 2004). Prior involvement will avoid problems between the residents and the persons in charge of fulfilling the

restrictions made for the designated area, and this is particularly important for the success of the long-term re-establishment of the biological systems that are being protected.

It is not only important to involve the resident community in the process, but also to educate them (not by selling an idea) about the benefits of protecting their present and future resources. Jacobson & Robles (1992) proved that the attitudes of the residents of Kinabalu Park village in Malaysia shifted to be more favourable after a conservation education programme than before the park was established without their involvement. As Drijver (1994) describes, it is also a process that has to be done from the beginning with sensitivity, bearing in mind that conflicts will arise and compromises will be needed from both parts. Another aspect to keep in mind is a careful study of the facts that apply to that community in particular in order to establish the best designation possible that best suits the needs of those residents.

Chambers (1994) mentions three important reasons regarding the community as development actors:

- a) "The community is the source for information on the conditions, needs and attitude of the local community, thus without them, development programmes and projects will fail because of inaccuracy.
- b) The community will trust a development project or programme if they know the twist and turns of it.
- c) It is the right of the community to be involved in the community development that targets themselves ".

As described by Chambers (1994), the basic principles of PRA are:

1. Learn from the community
2. Outsiders (researches, experts) are facilitators, insiders (the community) are actors
3. Learn from and share experiences with each other
4. Relaxing and Informal
5. Involvement of all the community groups
6. Respect differences

7. Triangulation (check and recheck of information)
8. Optimizing the results
9. Learn from mistakes
10. Practical orientation
11. Continuous follow-up

In this process it is important to design the surveys in both an investigative but also a participative manner. To avoid being biased into convincing the fisherman about the benefits of a protected area, simple questions about sustainability are asked for them to decide whether this particular area needs it or not. Questions are based on socio-economics and socio-ecological areas, political stratification, education levels, and general knowledge of the status of their resources.

Participation reinforces knowledge by making the community feel their needs are heard. This is not a romantic idea, is a strategic move for management of an area, in which local communities see themselves involved by participation from outsiders into problems they always thought were no one else's concern. At the same time, they understand better about conditions and realities they were dealing with within themselves. As expressed by Chambers (1994): "They say that they see things differently. They themselves learn more of what they know, and together present and build up more than any one knew alone." If fishermen were to be involved from the beginning of the process, they would even suggest which areas are the most needed for protection from overexploiting the fisheries. Furthermore, by analyzing the socioeconomic reality of the community, we fill important data gaps (Scholz *et al.* 2004). According to Scholz *et al.* (2004) fishermen and fishing communities usually possess a high level of knowledge regarding fish populations and habitat state and are willing to share these anecdotes.

After all the preliminary stages have been done, data are collected and decisions are taken, it is always important to give feedback on the process. For the community to feel they are part of the whole process, it is not only important to listen to their opinions in the first steps but to inform them of the outcome.

Once the area has been designated, they will have a sense of accomplishment and they will surely again be participative in guarding and protecting their area. Follow-up is essential and sometimes it is important to make stakeholders and managers realize that the monitoring of a designated area is not a short-term activity but that sometimes it will require more time and funding to solve the problems of an area (Carr 2000).

2.3 THE ROLE OF MARINE ENVIRONMENTAL EDUCATION AND ECOTOURISM

It is of little use to protect a marine area without further education of the generations to come. Approaches and techniques need to be designed for interpretation in marine protected areas in order to pass on the knowledge learned during the process of “rescue” of an area that was affected by overexploitation of the resources. Most commonly these problems of uncontrolled fishing and hunting in history are because of a lack of knowledge of how the biology of life cycles of animals work.

The Education Curriculum in Panama covers quite a big content on environmental education. Nevertheless, the majority of topics in the marine sciences are given to private schools, leaving only general topics to public schools, and these are taught usually in the higher levels of secondary school. The courses are mostly emphasized on ecological processes and animal and plant groups, but not too much is given on the biology and life cycles of specific species around those islands.

In our specific case, we were able to detect that in the four communities in which we actually tested students for their knowledge on marine education, it was very basic. It would be ironic to say this given that we are talking about communities that live in islands. However, marine education is included in the curriculum designated for these schools, but the teachers said that the government does not provide the adequate resources for them to fulfil the content.

As part of designating a Marine Protected Area in the Archipelago, one of the responsibilities of the government must be to continue reinforcing the marine education in these particular schools. The students must understand the biology of the life cycles of all the species they are using for profit. As suggested by Foster & Lemay (1989), the interpretation and education in marine protected areas must include the following activities:

- a) Inventorying and cataloguing of existing marine curriculum material;
- b) Preparing a manual or guidebook for the design of marine interpretation programs;
- c) Preparing a directory of marine education experts;
- d) Encouraging national governmental and non-governmental agencies to organize training seminars and workshops on interpretation and education for marine protected area managers and teachers;
- e) Undertaking a pilot program for marine interpretation and education;
- f) Encouraging studies of the specialized curriculum needs of traditional marine cultures.

On the other hand, marine education must not only be directed at students and schools, but for the public in general. Tourists more and more look for “Eco-tourism”, which involves interpretation. Interpretation is used to increase awareness about the politics and purposes of certain areas and tries to awaken concern for conservation of natural resources (Mackinnon *et al.* 1990). It must be remembered that education is not the end of the road, but a means to get there safely. As Harmelin (2000) has expressed, MPAs are one of the few places where education can be delivered in the form of interpretation through live exhibits, trails and guidance. Many countries where MPAs are designated are the primary dive destinations for a lot of divers. Nevertheless, it must always be kept in mind that the same reasons of conservation and economic richness could pose pressure on the area that authorities are trying to protect, therefore, it is important to establish a capacity rate in order to maintain the site and bring education to the visitors in a safe way to everyone.

Environmental Education is sometimes linked to Ecotourism. Education is used as a tool to avoid conflicts that may arise by restriction of recreation, fishing and

tourism to increase environmental awareness. As is the case of many islands around the world where MPAs are set, their economies are based on agriculture, fishing and tourism (Badalamenti *et al* 2000) and the same applies to the archipelago. Panama can make use of this with a safe planning programme of Whale Watching activities. Every year, during the months of July to September, Humpback whales migrating from the Southern waters of the Pacific Ocean settle in between the islands of the Archipelago of Las Perlas for mating, breeding, nursing, and mothers playing with their calves. The waters of the Archipelago provide the whales with excellent conditions of temperature, depth and almost zero disturbances for them to engage in their normal behaviour. This brings an excellent opportunity to educate and to safely use this event for an economic profit for the residents of the islands. Whale watching if planned, organized, and carried out with strict guidelines can be a valuable resource of income for local communities, and at the same time an excellent tool to educate about the biology of these mammals, and why they choose to come to our waters for shelter. Indeed, proving the importance of preserving our marine ecosystem is not only for exploiting the fisheries, but also for ecotourism and education.

Ecotourism must also be planned to avoid mass tourism. It is a certainty that even if tourism has been a solution for many coastal communities it has also been a disaster in other cases because the local culture has been ruined (Oracion *et al.* 2005). On the external influence reasoning, an interesting paper by Badalamenti *et al* (2000), describes the two types of tourist: the winners and the losers. The first ones are those who are firstly attracted by the fact that the protected area has an environmental facility that will give them an optimal experience with nature. And the latter, those who are discouraged at the fact that they will not be able to carry out recreational fishing, spearfishing, or diving in any part they choose of the islands. Ecotourism must be structured carefully with all the interest on the table to avoid a greater negative impact.

In this aspect of marine education enforcement in schools, the general topics of marine education should not only be included, but scientists also have a responsibility to communicate the results of their work in simple language to

policymakers, managers, resource users and the whole community (Carr 2000). To assure the success of communication of the outcome of the MPA, not only researchers must be involved, but also economists, sociologists, ecologists and the government.

2.4 THE DESIGNATION OF LAS PERLAS ARCHIPELAGO AS A SPECIAL MANAGEMENT ZONE

The Archipelago of Las Perlas, by its beauty and aesthetic value itself would be enough reasons to promote it as a marine protected area.

In this study, I am working cooperatively with the Darwin Initiative and the Smithsonian Tropical Research Institute in a three-year project gathering important data to support the designation of the Archipelago of Las Perlas in what is going to be Special Management Zone. Other important studies and dissertations that have been performed within the project to support the scientific reasons of why these ecosystems need to be protected now include: Medina's dissertation on the scallop fishery of the Archipelago, a study on the history of land cover (forests) change since the 1980's to present using GIS, a study on the presence of heavy metals in sediments, a study of the economically important fish stocks of red snapper, and a series of reports on benthic invertebrate sample identifications in order to prepare a map of the Las Perlas deeper water benthic communities, among others.

There is a difference between designating Coiba and the Pearl islands as protected areas. Coiba did not have human intervention (< 10%) through the years because it was an isolated prison, whereas the Archipelago has provided food and shelter for communities for hundreds of years. The first is going to be preserved pristine, and for Las Perlas we must work harder to conserve the resources we still have, both marine and terrestrial, but also can be used by the residents with a good management for their economy and livelihood.

3.2 RESEARCH TECHNIQUE: SURVEYS

3.2.1 Participatory Rural Appraisal (PRA)

As seen in Chapter 2, Participatory Rural Appraisal refers to a set of approaches aimed to involve the local people in matters brought in by outsiders. Nevertheless, the word “Rural” does not necessarily means a rural setting, because it can be used in a wide variety of research studies (Chambers 1994). The most important key principles that must be kept in mind in order to perform this method are:

- a. Participation:** This is the most important characteristic because by involving the local community, they realize the need and their role in helping preserve the resources of the ecosystem.
- b. Flexibility:** In regard to the context of the surveys and the variables taken into account.
- c. Teamwork:** Depending on how many people will engage in the surveys.
- d. Optimal Ignorance:** To approach with humbleness in order to learn as much as possible from the locals.
- e. Systematic:** Because PRA generated dataset is more a type of qualitative data than one that can be subjected to strict statistical analysis, alternative ways should be taken into account to validate the answers given by the community, and cross-check that the general conception is consistent in the whole of the population.

3.2.2 The Survey for Pearl Islands Archipelago

The survey was designed for nine communities of the Archipelago, where the greatest population over 18 was found:

- a. San Miguel: 489 (Census 2000); surveyed: 62
- b. Casaya: Not censused; surveyed: 20
- c. Pedro Gonzalez: 158 (Census 2000); surveyed: 47
- d. Contadora: Not censused; surveyed: 46
- e. Saboga: 511 (Census 2000); surveyed: 63

- f. La Esmeralda: 201 (Census 2000); surveyed: 50
- g. La Ensenada: 52 (Census 2000); surveyed: 18
- h. La Guinea: 59 (Census 2000); surveyed: 26
- i. Martin Perez: Not censused; surveyed: 15

The survey designed covered the following items (Table 1, see Appendix):

- a. Age
- b. Occupation: land or sea, for consumption or business, daily or occasional, and also the techniques used.
- c. Education
- d. Knowledge on the Marine Protected Area subject
- e. Use of the different fishing techniques.
- f. Opinions about the use of the Archipelago for tourism purposes.

On each island, the leader was given a different set of questions to find out more about the living status of the island. The survey was mostly directed to the fishermen, because they are the most affected when a MPA is designated for protection and areas are banned for fishing causing resentment among them and the managers (Badalamenti *et al*/2000).

The questions in the surveyed were straightforward to receive a “yes”, a “no”, or “I don’t know” in certain cases. In the particular question of knowledge of a MPA, to those responding “yes”, a broader explanation was asked to test they really knew. For those responding “no”, a definition of MPA was given.

On the other hand, instead of including many questions on the same subject in the survey, the objective was to collect the perception of most of the residents about the central topic of marine protected area, to test in this manner the hypothesis that if the majority thinks there is a problem with the marine resources, then most would want to protect the area and benefit from this type of management.

The communities were evaluated on three occasions: A field trip aboard the Research Vessel Urraca of the Smithsonian Tropical Research Institute, from

April 19th -27th, 2004, a second field trip based in Contadora island from May 15th-22nd, 2004; and a final field trip based again in Contadora from May 11th-21st, 2005. On the two first field trips, different communities were assessed but with the same questions. On the last trip, an informal assessment was made only on two communities to discover their reactions after a year of negotiations towards the designation of the area.

3.2.3 Data Analysis

Survey data were analyzed using correspondence analysis with the Statistical packet XL Stat. The data were rearranged to group those items of particular sets of questions that would suggest relationships among the answers and residents. The correspondence of the answers within the communities is shown by visually analyzing how answers meet in particular quadrants, and the tendency of communities to be clustered next the selected answer.

Chi-square tests were performed with significance set at $P < 0.05$. P-values above 0.05 were considered to be not significant, and those below to be significant. This was used to determine the level of dependence between variables involved in the different questions and different attitudes of the different communities.

Correspondence analysis was applied to the following questions:

- a) Marine Protected Area Knowledge
- b) Benefits of implementing an MPA
- c) Decrease of marine resources in the last ten years
- d) Access to the island restrictions
- e) Values of the islands
- f) Fisheries should be allowed without restrictions
- g) Fishing techniques allowed

Comparing the percentages from community to community, and relating some questions to others according to its dependence, we interpreted the perception of the total community about the survey and the issues discussed on the MPA.

As it may appear that mere percentages numbers could be biased answers, statistical analysis will prove the dependence and significance of such answers. The surveys were designed to receive straightforward answers except in those cases where they were asked to give their own examples. In conducting social surveys there is always a risk of ambiguity because of the limitations in the methodology and design of the questions, but attention should be given to the meaning and interpretation that comes as a result of the analysis of answers given by community and in the general case.

CHAPTER 4 RESULTS

4.1 PROFILES OF THE COMMUNITIES STUDIED

4.1.1. General Demographics

The Archipelago of Las Perlas belongs to the District of Balboa. According to the 2000 Census (Contraloria Gral. De la Republica), the total population in the district is of 2336, with an average of 10 per km². Of this total population, 1805 are over 10 years old, 7% has completed at least third grade, and only 4% is considered analphabet population. Of this population, 1470 are over 18 years old. 50% of those above 10 years old are working in farming or in fishing and the men start fishing very early in their lives.

The current situation on living conditions is not the best expected, due to lack of electricity, potable water, specialized medical centers, and proper sanitary facilities: Of the 640 houses established in the whole archipelago, 25% lack potable water, 30% lack sanitary facilities, and 18% lack electricity. Electricity is supplied certain hours during the day for those houses that have power lines. In the villages, there is a public phone for the use of the residents. In terms of communication, some houses have television and radio, but no newspapers arrive to the islands on a daily basis. Trips to Panama are arranged by large boats organized by the resident islanders when a big group requires it; otherwise, in case of individual trips due to an emergency it would be very expensive by hiring a small boat directly to Panama or by first arriving to Contadora or San Miguel (depending where they live), to depart by plane to the City of Panama.

4.1.2. *Saboga* (Appendix 1)

Located at the north of the Archipelago and next to Contadora, Saboga residents do not engage in commercial fisheries, but only for subsistence. The same applies for agriculture; there is land to work but mainly for their subsistence. Residents mainly work in Contadora in construction of new tourism projects from 6:30am until 4pm, and usually the women work in the

hotels and shops for tourism purposes. The island holds an office for the Maritime Service, a Church with someone authorized to give Catholic communion, and a primary school. There is a small clinic to attend minor illnesses and which holds a very small supply of medicines.

The leader for Saboga and Contadora is the same. He reported an approximate population of 380 people and 87 occupied houses. Children and adolescents form the majority of the population in Saboga.

4.1.3. Contadora (Appendix 2)



Figure 4. Aerial view of Contadora Island.

It is the best-known island of the Archipelago because of its tourism destination (Fig. 4). The residents that live here are mostly originally from the capital or other cities in Panama and stay for short periods of time to finish construction projects, or are persons hired to take care of vacation houses that belong to people that live permanently in the city. Only a few have lived there for a long time, and a lot of Colombian influence is also found in this island. There are no trueborn in Contadora. However, it offers the best facilities of the Archipelago, including a hospital with good installations, e.g. telephones in most of the

houses, airport with daily flights provided by two airlines at two schedules, recreational diving resorts, a Church, three hotels, primary school, electricity 24 hours a day, but potable water is still a problem in some houses. The primary school is divided in three levels (1st, 3rd, and 6th grade), taught by one teacher to seven students in a multilevel system. Secondary schooling takes place in San Miguel or in Panama City, depending on the parents.

There is no fishing at all by the residents of this island, especially not for business purposes.

4.1.4. *Pedro Gonzalez* (Appendix 3)



Figure 5. Aerial view of Pedro Gonzalez.

The population of this village is composed in majority by fishermen and agriculture growers (Fig. 5). The fish that are caught gets sold in Panama City. There is a person in charge of buying the fish from all boats every afternoon, after being weighted. The fish are kept in a freezer until a good amount can be sent by boat to Panama, usually every three days. Usually the fish for business are: red snapper, yellow snapper, spotted snapper, jacks, dolphinfish, groupers; and for shellfish: lobster, crab, octopus, queen conch, and other mollusks. Alltogether every day it comes to an average of 3,000 pounds of marine products to be sold.

On the other hand, they are not involved at all in anything that has to do with tourism at the moment of this work. There are future projects to be developed in the islands around Pedro Gonzalez, but at this moment the aim of every adolescent is to become a fisherman. It has a primary school with two teachers, and all grades.

There is only electricity during the night, but a few houses have power plants. There is no potable water supply, but there is a public telephone and a medical center with a nurse for minor medical problems. This nurse reported many illnesses that, due to lack of equipment and medicines, patients need to be taken to Contadora or the city. There is a maritime service, but with the restriction that in the case of an emergency, they need to ask for any of the local fisherman's boat to fulfill the mission.

4.1.5. Casaya (Appendix 4)



Figure 6. Casaya Island.

This is a very small island linked to another one called Casayeta where the land is worked for agriculture (Fig. 6). Casaya residents probably account for less than 200 people that are dedicated to the fishing of octopus, lobster, mollusks and as a tradition to the pearl oyster. According to an elderly man, he said that more than 60 years ago, this is the island where the greatest amount of oysters were extracted from: close to 300 oysters per day per boat. The pearls found in

those times could be sold sometimes at \$1,000.00 a piece, sometimes as a special request, and sometimes through a general buyer from the city, who would take them first to Contadora to “count” them. (Contadora comes from the spanish word “contar” or “to count”). With the increasing demand, the resource was overexploited and less oysters would carry heavy pearls, to the point that the pearls disappeared for a while but when they reappeared never came back with the same abundance as years before (Fig. 2) (See Chapter 2).

Another resource that is becoming scarce is the octopus and lobster. Local people complain that the indian fishermen from San Blas (Northeast coast islands) are competing with them in diving for these species because they are more skilled and have no respect for the natural ban of the season, depth, or temperature of the waters.

There is no school in this island, and children must go to Pedro Gonzalez or San Miguel for education. There is a Church, but no priest. Electricity is on for only a few hours during the night, except for a few with power plant. There is one public phone, but no medical center.

4.1.6. La Esmeralda (Appendix 5)



Figure 7. La Esmeralda Village

Located in the southeast tip of Isla del Rey, Esmeralda is the biggest of the fishermen communities for the red snapper (Fig. 7). 80% of the interviewed were dedicated to fishing and 74% for sale. Although there are only two buying companies, during the snapper season they can collect almost 3,000 pounds in weight a day. This fishery is the subject of another dissertation by a MSc. student at the moment.

Electricity for most houses is only during the night. The water comes from a common well.

4.1.7. La Guinea (Appendix 6)



Figure 8. La Guinea village

This village is not on the coast, but inland in the middle in Isla del Rey to the west side of the island (Fig. 8). The population here is dedicated mostly to agriculture and cattle (30.8%), but many fish (65.4%). The fishing activity is limited by the high tide: To access the village one must wait for the high tide in order to enter through the river (or exit depending on the case). For this reason, fisherman have to plan every day for time to fish and time to work the

land. Most of the fisherman were at the village at the moment I went for the interview because they could not go out to fish.

There is a primary school with a teacher in charge of a multilevel classroom.

4.1.8. Ensenada (Appendix 7)

This is a very small village composed of fishermen and agriculture growers. It is located in an isolated part of Isla del Rey (Fig. 3). 83.3% are dedicated to fisheries and only a 16.7% to agriculture. Nevertheless, only 11.1% is for sale.

It probably has a couple of hundred residents. It has a small school, with one teacher of a multilevel classroom with approximately 25 children.

4.1.9. San Miguel (Appendix 8)



Figure 9. San Miguel village.

This is the Head of the Archipelago, and it is located in the northern tip of Isla del Rey, the biggest island of Las Perlas (Fig. 9). It has two fishing businesses with buyers that live in the island to sell in the city. San Miguel has an airport with flights to the city through Contadora some days during the week. There is a medical center with a constant supply of medicines, but for more serious conditions patients need to go to Contadora or to the city. This is the only island with both Primary and Secondary school, and approximately three classrooms

per level. Other infrastructure includes a Church and Fire Station. Because it is located in the biggest island of the Archipelago, water comes from a well and is distributed to the majority of the houses.

4.1.10. *Martin Perez* (Appendix 9)

Another small village to the west of Isla del Rey. This town is in the poorest condition compared to the other ones due to total lack of electricity. For this reason, there is no possible way for the community to make a business out of fishing, since there would not be any freezers to maintain the fish until the time of selling. Even if 66.7% of those interviewed are dedicated to fishing, only 20% make business out of it by taking their catch of the day to another island.

4.1.11. *General survey notes*

On many of the islands, some of the interviewed were residents of a particular island, but they were born in another one. The first reason they moved was in a search of a better fishery business or tourism option, the second reason was because of the lack of good facilities and living conditions.

In general, for the nine communities surveyed, 64.6% of the interviewed population is dedicated to fisheries, 18.2 % to agriculture, and 17% to other activities including tourism, teaching, and medical assistance (Table 2).

In terms of education, 48.7% have gone at least to primary school, 37.2% to secondary school, 6.6% to university in Panama City, and 6.1% not even to primary school. The age categories was selected at random, but mostly over 18 years old, and the number of persons surveyed per age category was almost the same (Table 2).

In terms of representative population, 347 out of a selected population of 1,470 residents over 18 years old was interviewed, meeting the representative percentage of 23% (more than 5% to meet a representative sample).

Table 2 . TOTAL RESPONSES AT ARCHIPELAGO OF LAS PERLAS

2000 Census of Population = 2,336pp Of 18yrs and older in Balboa district: 1,470pp

Surveyed Population: 347 men and women older than 18.

	Parameters	YES	NO	DK	Percentages		
					YES	NO	DK
AGE	18-25	78	0	0	22.5%	0.0%	0.0%
	26-35	84	0	0	24.2%	0.0%	0.0%
	36-46	85	0	0	24.5%	0.0%	0.0%
	47-70	82	0	0	23.6%	0.0%	0.0%
	71-85 or older	18	0	0	5.2%	0.0%	0.0%
ACTIVITY	Only Agriculture*	63	0	0	18.2%	0.0%	0.0%
	Consumption	41	0	0	11.8%	0.0%	0.0%
	Sale	20	0	0	5.8%	0.0%	0.0%
	Mainly Fishing*	224	0	0	64.6%	0.0%	0.0%
	Consumption	64	0	0	18.4%	0.0%	0.0%
	Sale	115	0	0	33.1%	0.0%	0.0%
	Consumption and Sale	44	0	0	12.7%	0.0%	0.0%
	Daily	113	0	0	32.6%	0.0%	0.0%
	Weekly / Sometimes	111	0	0	32.0%	0.0%	0.0%
	Line / String	106	0	0	30.5%	0.0%	0.0%
	Line / Net	22	0	0	6.3%	0.0%	0.0%
	Diving	30	0	0	8.6%	0.0%	0.0%
	Diving / line	38	0	0	11.0%	0.0%	0.0%
Nets	18	0	0	5.2%	0.0%	0.0%	
Nets/diving/line	10	0	0	2.9%	0.0%	0.0%	
Other agriculture, nor fishing (other)	59	0	0	17.0%	0.0%	0.0%	
ED.	Elementary School	169	21	0	48.7%	6.1%	0.0%
	Secondary school	129	0	1	37.2%	0.0%	0.3%
	University	23	0	0	6.6%	0.0%	0.0%

The survey was divided in central topics: Age group, Activity, Education, MPA Section, Access to the islands, Fishing issues, and value of the resources (Table 2). For this particular latter section, the items that appear on the results were given by them and were selected as the three most mentioned by the interviewed population. Therefore, for the analysis of the data, the most important central topics will be taken to be the last four mentioned and the first three will be related as additional information used to describe the profile of the population (Table 3).

4.2 MARINE PROTECTED AREA

4.2.1 Knowledge of Marine Protected Areas

One of the aims of this study is to involve the communities into active participation in the process to protect the marine resources of the Archipelago of Las Perlas, and one of the means to do this is by gathering their knowledge on the subject of marine protected areas (Fig. 10).

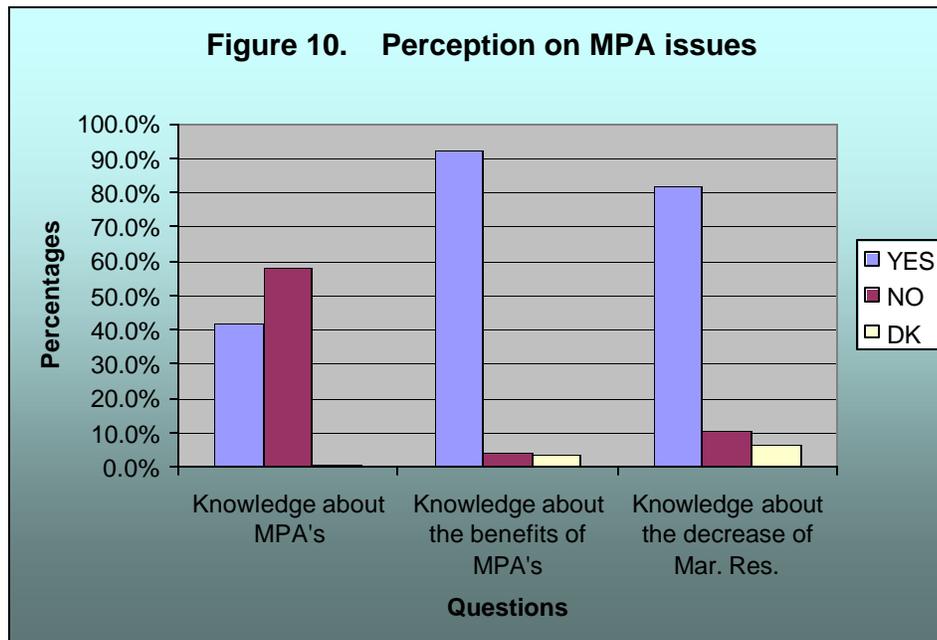


Table 3. TOTAL OF MPA, ACCESS, FISHING AND VALUES QUESTIONS

2000 Census of Population = 2,336 pp. Of 18yrs and older for Balboa district: 1,470 pp

Surveyed Population: 347 men and women older than 18.

	Parameters	YES	NO	DK	Percentages		
					YES	NO	DK
%	Knowledge about MPAs	144	201	2	41.5%	57.9%	0.6%
	Knowledge about the benefits of MPAs	321	15	11	92.5%	4.3%	3.2%
	Knowledge about the decrease of Mar. Res.	285	37	23	82.1%	10.7%	6.6%
Access	Tourism	93	2	20	26.8%	0.6%	5.8%
	Other islanders of the archipelago	83	0	0	23.9%	0.0%	0.0%
	Only residents of that island	114	0	0	32.9%	0.0%	0.0%
FISH	Unrestricted fishing	61	282	3	17.6%	81.3%	0.9%
	Any type of fishing should be allowed (netting)	110	221	15	31.7%	63.7%	4.3%
	Suitable for Tourism?	310	25	9	89.3%	7.2%	2.6%
Value	Fishing and Marine Resource	203	1	2	58.5%	0.3%	0.6%
	Land	50	0	0	14.4%	0.0%	0.0%
	Tourism	28	0	1	8.1%	0.0%	0.3%
	Other	61	0	0	17.6%	0.0%	0.0%

There was significant difference in the answers among the communities ($\chi^2=47.584$, $p=0.0001$)(Table 4). In the correspondence analysis diagram (Appendix 10) the tendency of the communities is to be distributed tightly in the quadrants of yes and no. For the nine communities, 57.9% accepted they lack knowledge on the subject of marine protected areas, and 41.5% said they knew (Table 3). At the time of the interview, they were asked to give an example of what a protected area means to them to really test if they knew or if they were only saying they knew. Of 37.2% that attended Secondary studies at school, 41.5% did not know what a MPA was, but 92.5% understood the need.

Particularly, in *Ensenada* (Appendix 7) was the greatest percentage for lack of knowledge about what MPAs are, with an 83.3 %; while in *San Miguel* the greatest percentage of those who knew the meaning of it, was found to be 66.1%.

Table 4. Statistical Analysis of Chi-Square			
Question	χ^2 observed	p-value	Significant
Knowledge of marine protected areas	47.584	<0.0001	Yes
Perception of the benefits of a MPA	16.755	0.402	Not
Perception of the decrease of marine resources	44.452	0	Yes
Perception of the most valuable resources	175.671	<0.0001	Yes
Opinions on restricting fishing in the area	23.164	0.109	Not
Opinions on the fishing technique used	52.029	<0.0001	Yes
Opinions on the access to the area	51.321	<0.0001	Yes

4.2.2 Benefits a MPA would bring to the Archipelago

As shown in Figure 10, an important 92.5% agreed a MPA would bring benefits to the Archipelago once established.

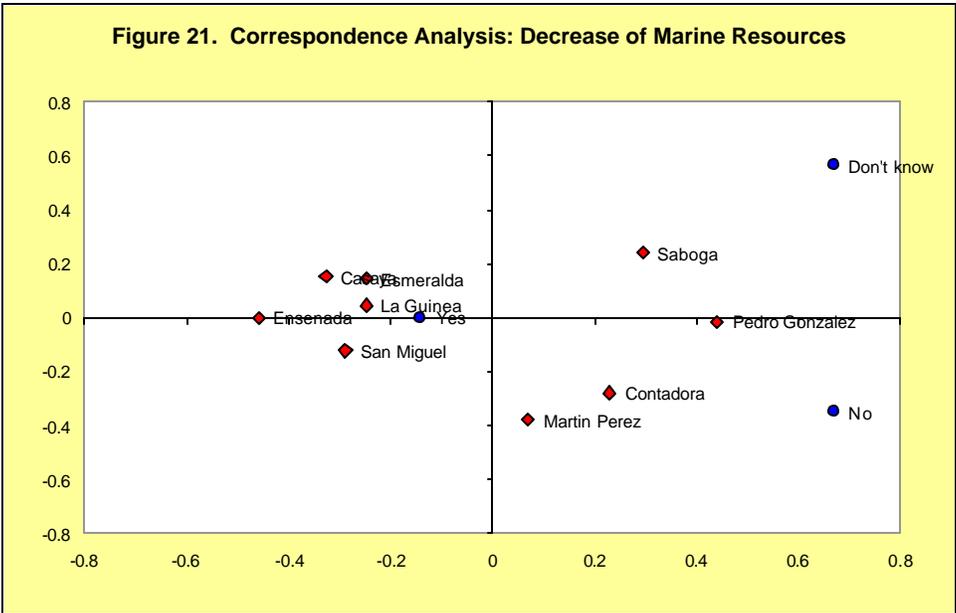
There was not significant difference in the answers given by the different communities (Table 4), even though they tend towards the yes (Appendix 11) ($\chi^2=16.755$, $p=0.402$). In all of the different islands, more than 87% would agree on the need to establish a MPA (Figure 11). For example, 100% acceptance

was found in Casaya and in La Guinea, followed by 98% in Esmeralda, 94.4% in Ensenada, 93.5% in San Miguel, 93.3% in Martin Perez, 89.1% in Contadora, 87.3% in Saboga, and 87.2% in Pedro Gonzalez.

4.2.3 Perception on the decrease of marine resources in the area.

To study their awareness on the status of the marine environment nowadays, a question was asked to find out whether they have noticed the marine resource limitation they might be experiencing in the area in the last years or if they consider it is just the same. In general, 82.1% considered in the last ten years they are finding less fish and shellfish; and 10.7% said it is just the same as always (Figure 12).

In this case, opinions varied and the dependence among the answers of the communities was significant (χ^2 observed= 44.452, $p < 0.05$)(Table 4). As seen in Figure 21, the majority of the communities have a tendency towards the “yes”, but because some communities had a slight diversified opinion, Contadora, Martin Perez and Pedro Gonzalez are off the first two quadrants.



- Answers: Yes, No, Don't know
- Name of communities

Figure 11. MAP OF THE PERCEPTION THAT THE MPA WOULD BRING BENEFITS TO THE AREA.

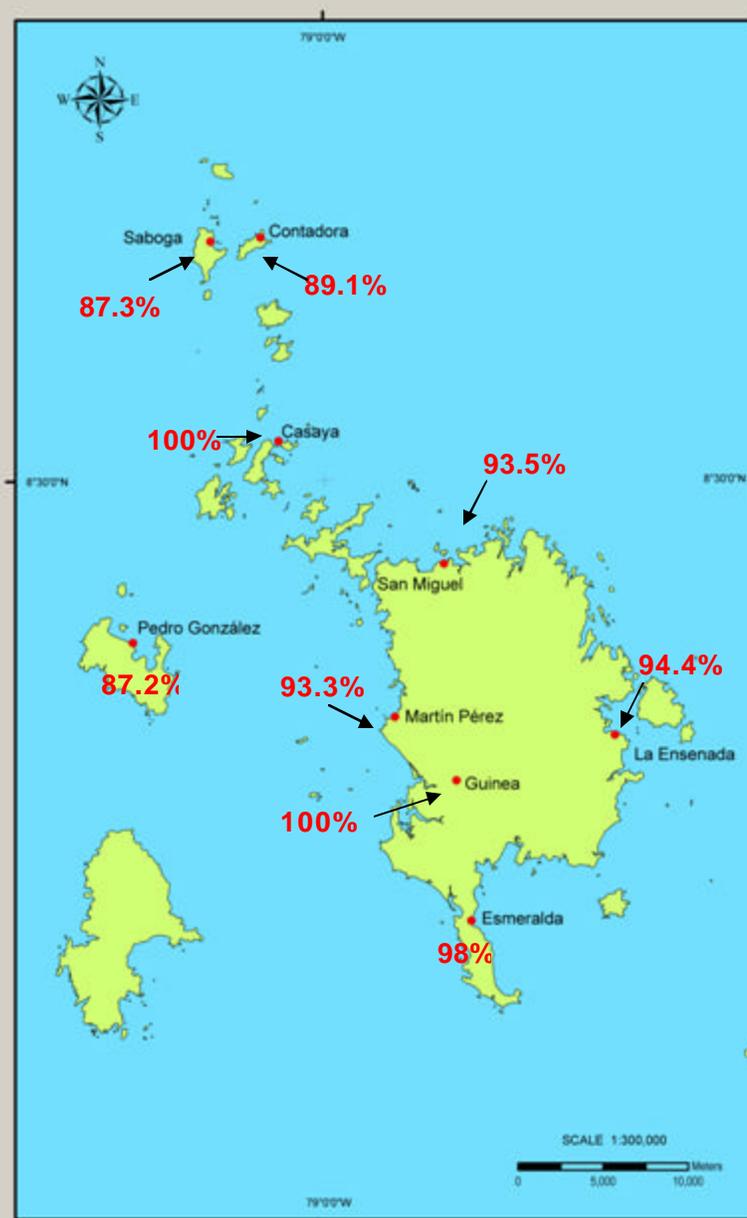
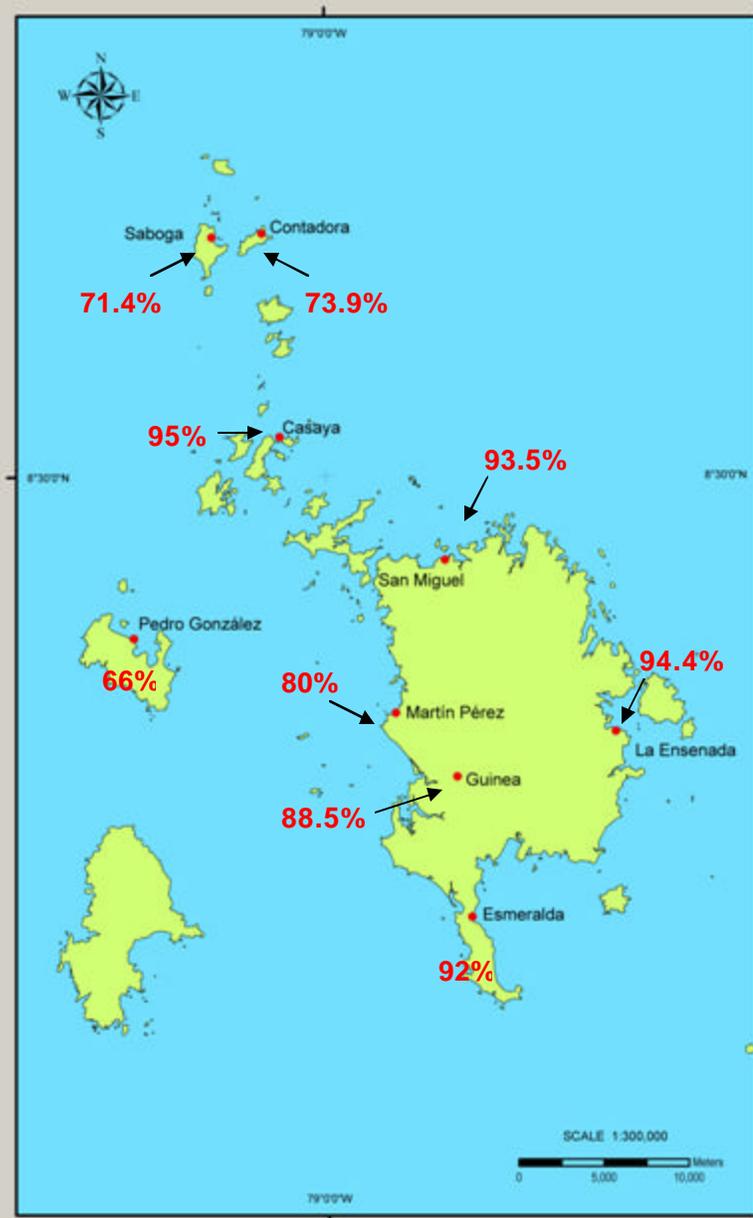


Figure 12. MAP OF THE PERCEPTION THAT RESOURCES ARE DECREASING



Especially in Casaya, there was the strongest percentage of 95% agreeing that resources are becoming scarcer by the year. Followed by Ensenada, San Miguel and Esmeralda with 94.4%, 93.5% and 92%, respectively (Appendices 7,8 and 5).

On the opinion that is not really decreasing, 21.7% of those asked in Contadora said it is not (not fishermen), and also in Pedro Gonzalez some 21.3% also agreed it is not decreasing.

4.3 QUESTIONS REGARDING ACCESS TO THE ISLANDS

For this question it is important to look at the different realities of each of the islands (Appendices 1 to 9). When asked whether they thought it would be a good idea for others to make use of their natural resources, each one would answer accordingly to the resources available in their islands. The difference in answers shown among the communities was significant (χ^2 observed= 51.321, $p < 0.001$) (Table 4). And the answers tend to vary among the choices in the different quadrants (Appendix 13).

Contadora had a strong 52.2% that agreed that access should be permitted to other residents as well, but only 17.4% for tourist to make use of the resources, because it is a community that is not dedicated to fishing or agriculture. On the other hand 52% of those interviewed at Esmeralda, which is dedicated to fishing, consider mostly local residents should use the resources. Saboga has an even opinion on the three categories, but moving higher to the "local residents" option as Casaya, with more than 40%. Because Martin Perez is not dedicated to selling what they catch by fishing, 40% agrees to welcome other islands to use their resources.

Not included as an official question, the interviewed were concerned about an issue that had arisen between locals and residents from another part of the country. Apparently, many years now, fishermen from San Blas Islands (located at the Northeast of Panama, in the Caribbean Sea), had moved to the Archipelago to compete for the marine resources. Given that they are more skilled for diving shellfish such as lobster and octopus, this represents a

competition among them to sale to companies. This creates a social conflict because both groups are Panamanians and there are no laws to prevent them from moving to these islands for subsistence.

4.4 QUESTIONS REGARDING THE FISHERIES

4.4.1 Description of the Fishing Activity

As it has already been established that the principal activity of these islanders is fishing (64.6%) (Fig. 13), some 33.1% fish to sale, 18.4% fish for own consumption, and 12.7% for both sale and consumption (Table 2). Of the surveyed population 32.6% fish every day, and 30.5% several times a week.

The fish and shellfish they all reported catching were mainly: Red snapper, yellow snapper, white snapper, almaco jack, blue crevalle, black jack, dolphinfish, groupers, lobster, queen conch, octopus, squid, oysters, and other variety of conchs. Sometimes, they don't only sell particular species but what they call "revoltura", which is a mix of a lot of things, and also has a price per pound. They classify their catching of the day in two groups: Snapper (which includes all types of snapper and groupers) and "revoltura" (mix of jacks, shark, and others). Usually, the selling price for the Snapper group is around 0.60 cents per pound, and for the "revoltura" group is 0.20 cents per pound.

The fishing activity is seasonal, meaning that during the "dry season months" (December-March), the activity concentrates on catching fish (Fig. 14). During these months, upwelling events occur and the richer nutrient colder waters bring abundance in fish. During the "wet season months" (April-November), fishermen are mostly dedicated to shellfish collection, such as octopus, lobsters and conchs.

Figure 13. MAP OF FISHERMEN DISTRIBUTION
(From the interviewed population.)

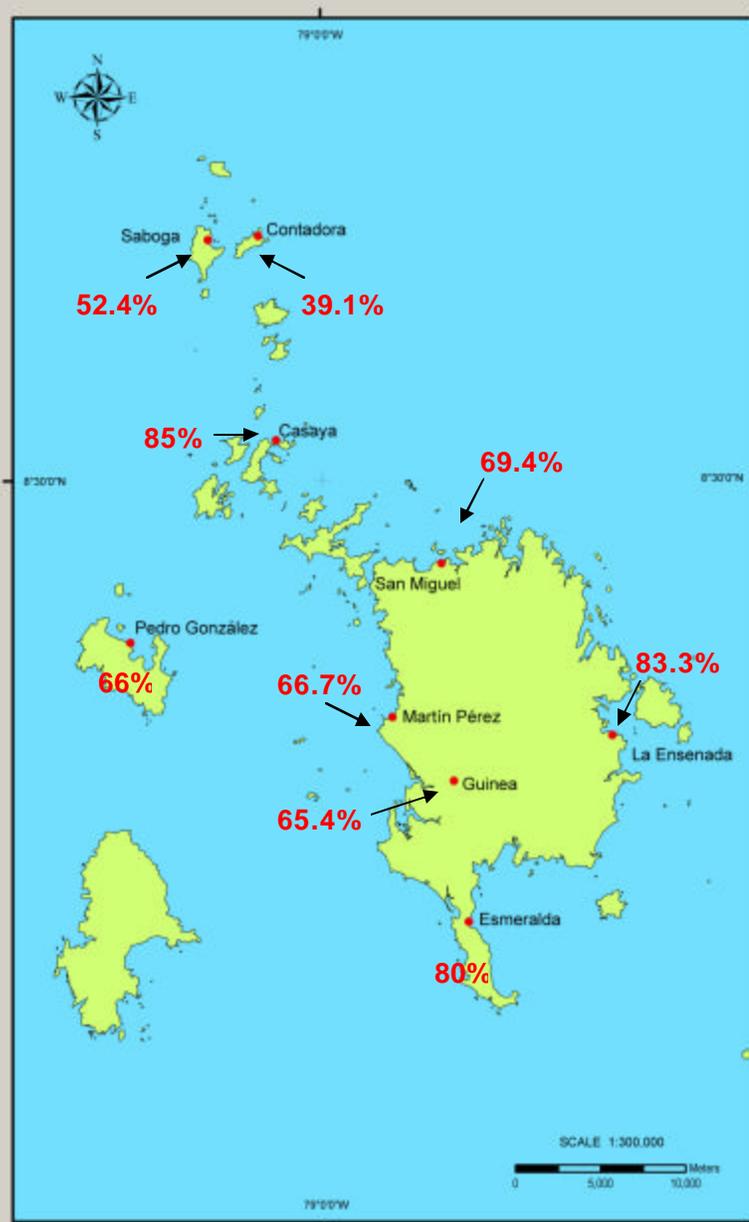




Figure 14. Fishermen unloading red snapper at Pedro Gonzalez

For example, during the last field trip in the month of May 2005, they said that the snappers have started swimming to the south of the archipelago, and now the fishermen would start diving for octopus and lobster. Red Snapper fishery during this month was concentrated in the southern village of Esmeralda, because it is found in deeper and colder waters, and in Pedro Gonzalez they would fish for snapper at nighttime.

The amount of fish caught varies from island to island. For example, in the four islands where snapper is fished the most we found that, in Ensenada the fishermen would say they catch between 100-200lbs/per day/per boat. In Esmeralda they said between 200-800 lbs of snapper per day/per boat. In San Miguel and Pedro Gonzalez the fishermen reported around 200 lbs-500 lbs. In good season the weight of a snapper can go from 5 lbs to 20 lbs, and groupers can weight up to 150 lbs. (Fig. 15). Some fishermen clean the fish on the boats before delivering to the buyer, and some give it to the women to perform the cleaning (Fig. 16).

During a good season of shellfish, some of the interviewed fishermen attested that they catch 200-300lbs/per boat/per day of octopus. During the off-season for octopus, the catch comes up to about 50-100 lbs/per boat/ per day.



Figure 15. Usual snapper size.



Figure 16. Women cleaning the fish.

They sell it at 1.25/lb, or at 0.75 / lb when it is abundant. The lobster is taken out with the “chuzo” (Fig.17), and the Octopus with a hook (Fig. 18), both by breath-hold diving, with a percentage of 11.2%.



Figure 17. “Chuzo” for shellfish fishing



Figure 18. Hook for snapper fishing.

The technique most commonly used for snapper is the line with hooks and the amount of hooks depends on the species aimed, and it is used by 30.5% of the fishermen. The minority said they use netting (5.2%).

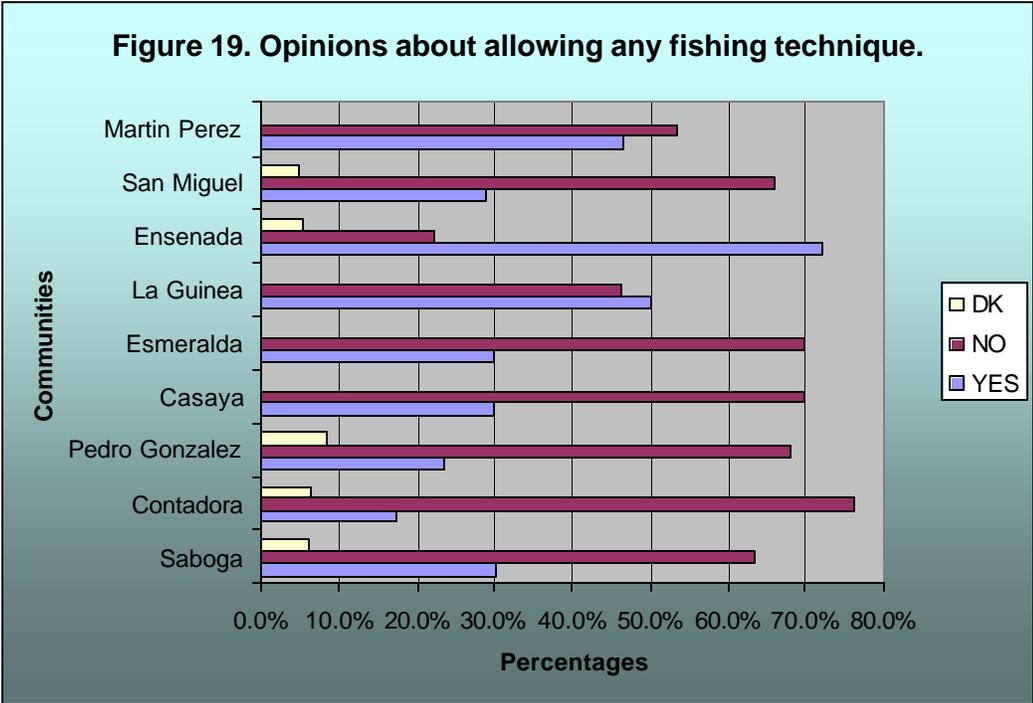
4.4.2 Fishing without restrictions

Many different groups come into the area to obtain benefit from the marine resources of the Archipelago. Big commercial boats, boats from the city come with better technology and machinery, and better skilled Indians come from other parts of the country. There is some opposition by some of the local fishermen in terms of these groups being introduced in the area, as well as some techniques been used that might affect their local fisheries.

To the question of whether they think fishing should be allowed without restriction to the area, 81.3% said there must be some kind of restriction (Table 3). The analysis shows there is no great significance ($\chi^2 = 23.164$, $p=0.109$) (Table 4). The strongest opinion in this manner came from those interviewed at Contadora, where 93.5% said fishing should not be carried out without restrictions.

4.4.3 Fishing with any technique

Of the fishermen, 63.7% agreed that certain techniques, including the use of illegal netting should be completely banned. Here there was some significant dependence among these answers ($\chi^2 = 52.029$, $p<0.05$) (Table 4). As we can see in Figure 19, the majority of the communities answered “NO” to whether any fishing technique should be allowed. In Contadora 76% opposed to the use of any fishing technique, followed by Casaya and Esmeralda with 70%.

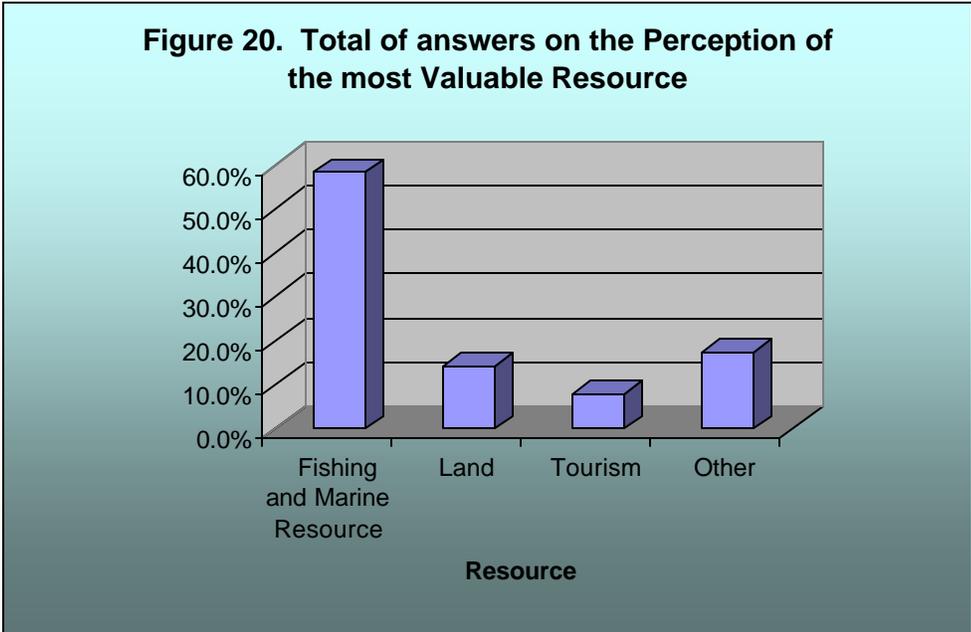


4.5 VALUE OF THE RESOURCES

I included a question to find out what they consider to be the most valuable resource the Archipelago has to offer, without giving them answers to choose from, and as Fig. 19 shows, 58.5% answered the marine resource, 14.4% said the land, 8.1% said tourism, and 17.6% said others, including better living conditions (Table 3).

In the statistical analysis the dependence in the answers among the communities is quite significant (Observed= 175.671, $p < 0.05$ – Table 4), and as we can see in Appendix 16, the choices decided by the interviewed are evenly distributed along the quadrants, but mostly towards the marine resource.

Of the fishermen, 89.3% is strongly hoping for tourism to be developed in the area. Currently, several projects are planned for the archipelago and at least the women hope for this type of jobs.



4.6 A NOTE ON TOURISM ANSWERS

The topic of tourism was mentioned in three of the sections, but just to clarify the difference, here is an important note. In the section regarding the Access questions, the question asked was whether they thought that if that island in particular should be accessed by other tourists to exploit their natural resources, and the options were tourists, other islanders, or only the residents (Table 3). In the section of Fisheries, it was intended to know if they thought the fisheries should be extended as a tourism activity for private yachts and boats. And for the section of Value of Resources, the interviewed would come up with the three mentioned options.

4.7 PARTICIPATION OF RESIDENTS

There was a question included in the survey to have a general idea of those who would be interested in take part actively in the protection of the area. The questions were directed to what type of activity they would like to be involved in: organizing the community to work inside the MPA, helping to enforce the laws, helping in education, or helping to conserve. The answers were equally selected by the interviewed, and some even wanted to be helpful in all of the areas.

CHAPTER 5 DISCUSSION

Human growth is causing resources to decline, and the concern should not only be directed to the possible destruction of habitats but also in the threat it poses to the sustainability of economic development (Tisdell 1995). As mentioned before, MPAs offer the best alternatives to prevent further overexploitation, irreparable harm, and even extinction of certain species and whole ecosystems.

No longer can scientists assume that only biological data are enough to support the designation of an area to be protected, in the development and management of protected areas social sciences must play a critical role (Mascia 2003). As this study has shown, also through anecdotal information from young and old fishermen, it is essential to understand the reality of what might work in Pearl Island Archipelago regarding Marine Protected Area restrictions. The results have also shown that previous participation, sharing of information, and education is imperative for the success of the whole process.

Many studies have shown resentment and negative attitudes on the part of fishermen towards managers of MPAs (Barahona & Guzman 1998; Fiallo & Jacobson 1995; Hough 1988; Parry & Campbell 1992), because the local communities were not informed and decisions were taken without them. Attitudes and perception from fishermen in our study showed a general acceptance of the establishment of a marine protected area in the Pearl Island Archipelago. It is interesting to see that the nine communities interviewed agreed in near a hundred percent that the islands will benefit by the implementation of a MPA due to the current decrease in marine resources, also agreed by the majority of the population interviewed (Figures 11 & 12).

As Pimbert & Pretty (1997) have described: no scientific method will ever be able to ask all the right questions, and the results are always open to interpretation, but what we want to point out here is the fact that through the set of questions and through mutual communication the communities expressed their concern about the fate of their marine resources. The questions on this

study were careful asked to avoid bias, and to avoid wrongful interpretation. In many cases it is analysed by individual community rather than as a whole, depending on the case.

The following can be taken as factors that have positively influenced the communities in the welcoming of the designation of Las Perlas Archipelago as a Marine Protected Area.

5.1 KNOWLEDGE OF MARINE PROTECTED AREAS

Our results show that more than half of the interviewed population did not know what MPAs are (Appendix 17). In terms of education, the majority has been to primary school and secondary school. Hence, the lack of knowledge on this subject could not be attributable to lack of education. Those who knew the meaning said they have gathered the information through television or radio, but not from school. Nevertheless, the higher the education preparation, the higher was the acceptance of the MPA, also found by Fiallo & Jacobson (1995) and Heinen (1993).

The highest percentage for lack of knowledge of MPAs was in La Ensenada, which ironically had the highest percentage on primary school preparation. The fact that it is one of the hardest communities to reach might have to do with the lack of information getting to them, such as via radio or television. This was the most isolated community in the archipelago.

In the first stages of this process, the communities have been involved by being introduced to the concept of MPAs. This step is usually missed in many establishments of MPAs, as it happened in Ecuador where negative attitudes were influenced by the lack of knowledge of the communities (Fiallo & Jacobson 1995).

5.2 PERCEPTION THAT A MPA WOULD BRING BENEFITS

As expressed before, a high percentage did not know what an MPA is, and those who said “yes”, were tested with an example to prove they had a true knowledge. Therefore, those who did not know received an explanation with local examples of other protected areas in the country. After that explanation they were asked if they thought the Archipelago would be benefited by the designation of a marine protected area. On an average, 92.5% answered it would be beneficial, and none of the communities individually was under the 85% of acceptance.

Those who realized there could be direct benefits with an MPA, such as better work through tourism and more resources for their fisheries business were more positive than those who are unrelated to any type of marine activity. Fiallo & Jacobson (1995) described a similar situation where those with personal benefits reflected more positive attitudes than those who affected it negatively. Also Pollnac & Pomeroy (2005) described as an important factor that if by early involvement the communities perceive there are benefits to their favor, they would direct these benefits to the best of their interests and accept the MPA. However, Walpole & Goodwin (2001), pointed out that the benefits received through tourism had no effect on conservation awareness for those directly involved, as it did for Fiallo & Jacobson (1995) who received positive experiences. The expected behaviour is that communities appreciate the environment through the promotion of tourism purposes. Apparently, this is only the case at the beginning when the business starts to develop and expectations are high. In our study a high 89.3% considered that fishing could be developed as a tourist activity. In another question regarding future tourism development for the area, some resented that possibility referring to the fact that it might not be for the benefit of the Archipelago but for foreign investors hiring foreign people. This reality was also commented by Tisdell (1995), who found that communities often feel there is little incentive because they receive little, if any, of the economic benefits of such conservation. The important note on this is that it must be carefully planned to avoid an even greater load on the

environment that is trying to be preserved, such as pollution, habitat modification, and cultural deterioration (Jacobson & Robles 1992). We believe that education could empower Las Perlas's communities; indeed basic training would increase the skills in the long-term, but first there is an overall handicap to fulfil the needs for speaking English or another foreign language

Casaya showed a 100% of acceptance, due to the fact that they have been close-front witnesses of what can happen to a resource when it is not managed accordingly, as it has happened to the pearl oyster and the scallop fisheries (Galtsoff 1950, Medina *et al.* in press).

5.3 CONSCIOUSNESS FOR AN OVERALL DECREASE IN LOCAL MARINE RESOURCES

A high percentage was found among those that think that the marine resources are decreasing (82.1%), and therefore are concerned with the protection of these resources. Again, Casaya showed the highest percentage for the same reasons expressed above, but all of those highly dedicated to fishing agree on the same, except Pedro Gonzalez who had a 66% due probably to a resistance in admitting high benefits with an MPA (87.2%). Thus, the statistical analysis shows a significant dependence among the variables. In Appendix 12, we see Saboga, Contadora, Martin Perez (MP) and Pedro Gonzalez, moving away from the "Yes" quadrant. The first two are not fully dedicated to fisheries and would not know for sure if the resources are in an unstable state. MP is not fully dedicated to fisheries because of lack of business facilities. And Pedro Gonzalez residents consider they are still able to find a fair amount of fish.

There seems to be a relationship between those that agreed that the marine resources are not going down and that at the same time accepts any fishing technique, in a way to justify their use of netting or chuzo without a concern of the harm that it is being done to the habitat. Another reason to continue the use of these practices is competition, as will be explained in the next section. There is also a relationship between the opinions on the decrease of resources and their opinions on access to the area: Appendix 16 shows a tendency

towards “Only Locals”, and in their words the reason for this was: “Because then we will run out of it”. In their own words, they say they “can’t compete with large vessels” that come to fish in the same waters, because they come with a better technology to get more fish faster than using hooks, as they do.

The need to protect an area because there is sign of decrease in fish catches should not only be emphasized to protect the fish. Odum (1982) over-exemplifies three approaches in the attempt to manage coastal habitat for fishery resources: a) Protect the fishery resources; b) Protect specific types of habitat; and, c) Protect all types of habitat. Of course, the latter is almost impossible to accomplish due to social and political reasons in any developing country.

5.4 FISHERIES

More and more studies have shown that fish stocks studies (Hall 1998), or of studies documenting the critical habitat loss (Odum 1982) are unlikely to be reliable sources of information alone. On the other hand, it has been proven that not only fish populations must be protected, but also that once the fish population begins to attain overexploitation levels, is the ecosystems that get mostly affected (Badalamenti *et al.* 2000, Agardy 2002). Thus, the most logical thing would be to study the relationship and rate between ecosystem evolution (and its knowledge) and the socio-economic need of it, in order to establish a sustainable use of its resources according to the current changes.

In the particular case for Las Perlas, the communities have been fishing for more years that generations can remember. The problem is that total population in Panama is increasing at a rate of approximately 60,000 per year (Contraloria Gral. de La Republica). Fishing is their daily activity, and for some target species they do it even at night. The Archipelago provides highly productive waters for many species of fish and shellfish, what has brought the problem of foreign vessels getting profit with a higher technology. This in turn reduces the catch fishermen can get per day, as well as the total stock because there is no time allowed for recovery. These symptoms are starting to show by

the attested reduction in catch reported by the fishermen described in the previous section. This is reflected in the high percentage (81%) that said that there should not be *unrestricted fishing* allowed, and Appendix 14 shows a no significant dependence among the variables.

Fishermen are probably the most affected in the implementation of an MPA, especially when this activity is prohibited for a period of time, or it is limited to a strict point of “no take zones” (Badalamenti *et al.* 2000, Hall 1998). The role of education is important in this situation in order to convince them that there are other activities they can do to supplement income. Tourism comes up again as an option to solve this problem and Badalamenti *et al.* (2000) gives a few examples of what could be suggested: leading boat tours and fishing trips, producing handicrafts, providing holiday accommodation and meals for tourists. It is highly desirable that local communities involve themselves in these activities to avoid feelings of invasion and to well justify MPAs from an economic point of view, but as expressed many times, with capacity limitations.

Regarding the techniques used, most of the fishermen understood that certain techniques such as netting for fishing, and “chuzo” for lobster, is unfair to the species, and at the same time causes an impact to the ecosystem. The use of chuzo was prohibited in 1981 (Executive Decree No. 15 from March 30th 1981) allowing only the use of “laze”, while gillnets or “trasmallos” were prohibited under the Executive Decree No. 40 from March 20th, 1992. Many fishermen were very concerned by the use of netting of large vessels that leave this type of technique in the water harming the ecosystem. Nevertheless, Appendix 15 shows there is a significant dependence among the variables, showing that the answers are divided. Even the majority agreed that certain techniques should be abolished; many still think that if it works they are going to use it, especially those fishermen that work for the big buyers of the city and feel pressured to catch large quantities of fish. There is a social conflict among the archipelago residents and indigenous people from other parts of the country coming to fish. Because these are more skilled to catch lobster and octopus by free diving, and they do not stop their activity even because of depth or cold waters (or bans),

the residents feel challenged to catch an equal amount of fish to be able to sell it to the local buyers as well.

We asked the community what they thought to be the most valuable resource, without giving them options, and the three most selected answers were plotted in Appendix 13, showing also a significant dependence among the variables. The majority (58.5%) defined Fishing and Marine Resources to be the most important to them to conserve for the future (Appendix 3). This shows that even if they want to continue using their resources and that they are aware of the eminent collapse of some fishing stocks, they have a high awareness of its value and would like it to last.

5.5 PARTICIPATION OF THE COMMUNITIES

The factors that might have influenced the high percentage of support for the implementation of the MPA in the Pearl Islands might have to do with the initial participation of residents into the first months of this process. Six months after the two initial months of interviews there was a second intervention, designed to valid our results in all individual communities, where we showed their answers publicly and regardless of gender or political position, so that they could see the use we have given to their initial comments on the state of the marine resources of the area, and their own perception and the overall for the archipelago (all villages combined). According to Pimbert and Pretty (1997) there are several levels of participation:

1. Passive Participation
2. Participation in information giving
3. Participation by consultation
4. Participation for material incentives
5. Functional participation
6. Interactive participation

During the survey, a question was asked about how they would like to be involved in the formation of a protected area. None of the interviewed said they would not like to participate somehow. The proposed activities were: 1)

Organize the community to work within the MPA, 2) Law enforcement (such as setting limits, setting buoys, technique selection), 3) Educate about the importance of the MPA; and, 4) Help to conserve the resources.

In another study it should be interesting to interview the other party of stakeholders and evaluate their knowledge of the situation. As White *et al.* (2005) described, stakeholders play an important role in the decision-making process, and if the participation wants to be taken to the interactive level, communication should not only be through scientists, but by them directly to the residents as well. Entities such as the tourism, marine, patrimonial, governmental, and political authorities should be directly participating in the process.

5.6 EDUCATION AND ECOTOURISM

Education plays an important and essential step towards the support of communities to promote a protected area (Fiallo & Jacobson 1995, Parry & Campbell 1992). Depending on how the business is carried on, fishermen will accept the restrictions after understanding that the sacrifice of opportunities to fish, will result in an increase of fish stocks (Oracion *et al.* 2005). By conversation it was stated by fishermen that fishing could be reduced but not completely abolished because that is what they have done all of their lives.

The key to the success of an MPA in a remote area is reassurance and education. It is important to reaffirm that those limitations imposed by the establishment of an MPA will be compensated by the benefits it will bring (Wilson 1995). This will not be a hard task to accomplish since half of the interviewed population agreed that the marine resource is the most important value that these islands have to offer (58.5%) and that must be kept for the following generations. A small 8.1% considered tourism to be valuable today due to the fact that it is not developed but only in one of the islands: Contadora.

The fear towards a successful tourism development is understandable given that in many cases it has worsened the situation. This was the feeling shown

by the communities in general when asked what the most important value was for the islands: the majority tilted to other values (e.g. fishing, agriculture) and only the towns of Contadora and Saboga, currently involved in Tourism, valued this activity as the most important (Figure 20). The challenge is to learn from those mistakes and engage into a well-planned tourism to provide a good economic and socio-ecologic incentive for management and for conservation (Agardy 1993). In many cases, tourism may not be the only option. For example, Guzman *et al.* (2004) warned that an inadequate plan for tourism in the Coiba National Park in Panama would be detrimental and threatening to the environmental values of the region. In other studies tourism has shown to have a negative impact on the environment (Jacobson & Robles 1992, Badalamenti *et al.* 2000, Oracion *et al.* 2005), as well as on the social structure of the place, if it is not regulated and used as a conservation and development tool (Walpole & Goodwin 2001). It is a matter of negotiating, of promoting socially differentiated goals of community members, scientists, and government oriented towards guaranteeing a sustainable resource.

5.7 ECONOMIC ALTERNATIVE TO FISHERIES: WHAL E WATCHING

Every year the Pearl Islands is the selected destination for Humpback Whales (*Megaptera novaengliae*) on their winter migration from the South. Between the months of June and October mothers with calves escorted by males arrive to islands looking for protection, shallow depths and warm and calm waters. They incur in their regular behaviour of mating, giving birth, and nursing, playing and teaching the young all they need to learn before they return to the Southern waters of the Pacific. As has happened in many countries around the world where Humpback Whales spend their time, whale watching is an ecological but economical productive activity for the tourism sector leaving millions of dollars annually. If organized in a controlled manner, it can offer an alternative to local communities to make a profit in their areas. But the most important first step is to protect the waters that the whales choose to spend their time, and to design the appropriate whale watching regulations.

Again, it is a matter of educating the local residents about the precautions needed not to scare the whales away, not to harass them, and to prevent the deterioration of the environment that they choose to reproduce and raise their young. Also, an unmeasured massive tourism can leave pollution and more harm to the ecosystem than before. By involving the fishermen in this type of activity, we would be reaching another step in active participation of the communities, because after the proper training, they would be directly involved by driving the boats and becoming guides. At the same time, this would be considered as a follow-up of establishing an MPA because it would mean the resources are being respected by engaging in other activities besides fishing.

5.8 THE LEGAL PROCESS

Legal process plays a definite essential role in attaining the goal of protecting. The choices to preserve a certain area after scientific and social data have proven it needs to be protected are not between pristine wilderness and humans but between different forms of political control (Pimbert & Pretty 1997). Some countries have developed the bases of the laws to protect the environment many years ago, such as Mexico that has a history of coastal and marine protected areas over 75 years old (Bezaury-Creel 2005). But the developing countries have to start from scratch developing first environmental laws that later will assign specific cases to enforce those laws. In Panama, one of the greatest accomplishments has been for Coiba Island to be designated as a World Heritage by UNESCO, after a series of deliberations, including scientific data submitted by Guzman *et al* (2004). And an even greater success is the creation of the law this year that creates a marine corridor for the conservation of aquatic mammals, including whales, dolphins and manatees in all territorial water of Panama.

At the moment of writing this paper (2005) the legal process of implementing the designation of Las Perlas is in the policy making stages, using the data expressed in this study as supportive evidence and in conjunction with other studies as part of this project. The case states that the Pearl Island Archipelago holds an extensive area of high commercial value (fisheries and

tourism) and ecological value for the whole country described in mangroves, rocky shores, beaches, sandy bottom, wide coralline communities, and coral reefs.

In the process explained by Bezaury-Creel (2005), the implementation of an Integrated Coastal Management policy uses two tools for its strategy: ecological zoning programs, and marine protected areas. By May 2005, the *Autoridad Maritima de Panama* (AMP), and the Smithsonian Tropical Research Institute, wrote the first draft to designate the area as *Special Management Zone*. It is important to study the best case that applies to the Archipelago in terms of designating Special Management Zone, no-take zones, or a greater Marine Protected Area. As Christie *et al* (2002) comments, no-take zones are not always the best option, because the fishing that takes place outside this restricted areas, ends up removing all the fish that swim out of these scattered restricted areas. Currently, this draft is being revised for a final form where the specific limitations of the management zone will be described and that best fits the particular case of the Pearl Island Archipelago. The special protected area, administrated by AMP under an integrated coastal management plan, allows the creation of National Parks or Wildlife Refugies following the international categories (see IUCN www.iucn.org) and administered under the *Autoridad Nacional del Ambiente* (ANAM). Lobbying to create 2-3 more protected areas (*sensu*IUCN) is underway.

In the study by Fiallo & Jacobson (1995), residents did not agree that there were more animals after the reserve was created, but in the study by Guzman (1998), a majority of residents admitted there were more resources after the banning imposed by the policy. In the first case, the reserve was imposed, in the latter case, the reserve was imposed but there was a process of education and participation, creating understanding among the residents. In part it is the responsibility of the government to work towards reconciling the differences that may arise among the players of the process and to encourage the success of the policy (Oracion *et al.* 2005). It is the best of our hope to be able to set a community-based MPA. According to Balgos (2005), there are main steps to follow: 1) Community entry, preparation and appraisal; 2) Planning,

determination of management and financing arrangements; 3) Formalization through approval, plan and budget; 4) Implementation and adjustment. We should adopt a modified version of this model adapted to local idiosyncrasy.

It is important to highlight the role that financing plays in these processes. Most of the time governments have not managed the budget accordingly to invest in conservation issues. This is when environmental initiatives – such as the UK's Darwin Initiative – come into play to support financially developing countries that are beginning to protect their resources. Once the law is made, there should be enough funding to enforce it in the long-term. Many areas have been nominated for protection but the lack of budget to enforce it has turned all the effort into disaster (Carr 2000), what is called “paper parks”. The budget destined should be enough to overcome major obstacles such as conflicting policies, laws, and implementation of programs; lack of patrol boats and other basic equipment to conduct monitoring and surveillance; and, lack of adequately trained for coastal law enforcement units (Eisma *et al.* 2005), and of course to support educational programs.

The ICM activities in the Philippines failed to continue mainly due to an absence of a clear policy framework (Eisma *et al.* 2005). But another example in the Southern Gulf of Mexico (Yanez-Arancibia *et al.* 1999) shows how integrating science into policymaking plays a significant role in the planning process of defining Integrated Coastal Zones. It is important that the government makes a realistic legal document that applies to the situation that the Archipelago of Las Perlas deals with, and all the participants are sure of their involvement in a long-term basis. It is not a matter of imposing a policy based on the predominant view that rural people are mismanagers of natural resources. When local people reject the policies imposed upon them, the law seeks success by manipulation of social, economic and ecological environments, which eventually leads to coercion (Pimbert & Pretty 1997).

We have covered the first most important steps: to involve the community, to listen to the communities needs, and we have started to educate the community. We have also heard the residents of these fishing communities

asking for help to protect the resources that make their daily lives and generations to come. Now we have to make it a reality through legal paperwork that a Marine Protected Area will be implemented because the community itself said it needs to be done.

As hard as it might be to accept it, it would be difficult to scientifically prove the fact that the increase in population is causing our problem of shortage of resources, but a statement by O'Riordan (2000) can certainly shake this tree of awareness of what is left for us to either just take or manage: *"It took all of human history to 1800 to create the first billion: the sixth billion was created in just a decade, 1987-1997"*.

CONCLUSION

As we have seen in this and other studies, all the factors that should be considered are linked to one another: Participation – Socio-economic facts – Community history – Scientific data – Education – Tourism and Policy processes. All play an important role into designating a Protected Area in the most successful way.

From this study we are able to conclude the following:

- That the overall perception of all the fishing communities in Archipelago of Las Perlas towards the designation of a Marine Protected Area was very positive (92%).
- That initial involvement of communities in the first stages of this long process is essential to understand their realities and for them to understand the need to better manage the marine resources with regulations.
- That Education plays an important role in achieving the goal of communication to better involve the communities in the short and long-term of the MPA.
- That Tourism is an alternative way of economic sustainability for local communities if well planned, organized, and performed by the residents.
- That more than 80% of the surveyed population wants the implementation of regulations to current fishery techniques and activities.

There could be a variety of reasons of why a country should designate a Marine Protected Area, starting from scientific data, socio-ecological studies, but also highlighting its aesthetic value and landscape beauty, to prevent excessive human intervention to ruin it in the name of tourism.

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APPENDICES

Appendix 1. BLANK SURVEY FOR ARCHIPELAGO OF LAS PERLAS

Name of the community _____ E.G.: M I B Survey # _____ Date: _____
 Individual _____ House _____ Ch A Sex: F M

Additional Notes

SURVEY ARCHIPELAGO LAS PERLAS

PERSONAL FACTS

Age

Civil Status: Married Single Living together

Place of birth?

How long have you been living at Las Perlas? / Which island?

Children? How many live with you?

ECONOMICS

What do you do?

Do you do the same throughout the year? Change according to season?

What is your approximate income? Monthly? Weekly? Per work?

Do you work the land?

What type? (Agriculture, cattle, craft, tourism)

Daily, Weekly, Monthly, occasionally?

Business (own consumption, local sale, sale to the city)

Methods (machinery, techniques, burning, cutting)

Do you work with marine resources?

Which? (fish, shellfish)

Approximate amount (weight in pounds, unit)?

Daily, weekly, monthly, sometimes?

Business (own consumption, local sale, sale to the city)

Type of vessel (sail, motor boat, cayuco) Owned?

Fishing technique used (netting, diving, line)

Any other personal, family, tourism business? (hotel, transportation services)

What work would you like to do?

GEOGRAPHY

Do you have other lands besides your house here?

Was your house made by you or given to you?

	YES	NO	DK	N/A
Do you live comfortably?				
SOCIALS				
Education				
What languages do you speak?				
Primary education / secondary / University				Where?
Health				
Do you consider the health system to be satisfactory? What is missing?				
What do you usually eat?				
Politics				
What do you know about the history of this community?				
What changes would you like to see in your community to improve the conditions?				
KNOWLEDGE OF MARINE PROTECTED AREAS				
Do you know the meaning of Protected Areas? National Park?				Define.
How did you learn about this? TV, Radio, News, Training?				
Do you know other protected areas of the country?				
Do you think there would be benefits with the creation of an MPA?				
What do you think would be the benefit? Or the drawback in case of no?				
Do you think the creation of an MPA would limit your use of the natural resources?				
Do you hope for new places of job with an MPA?				
How would you like to support the creation of an mpa?				
Organize the community to work inside the MPA				
Helping to fulfill the laws (limits techniques, buoys)				
Helping to educate				
Helping to preserve (fishing, cutting, controlled hunting)				
USE OF NATURAL RESOURCES				
Do you think the resources have decreased in the last ten years?				
Do you think the area you use for your resources should be accessible to tourism, other islands of the archipelago, or only to these residents?				
Should fishing be allowed without any restrictions? (Embarkations)				
Should any technique for fishing be allowed?				
Do you think this area should be used for tourism?				
What do you consider to be the MOST VALUABLE RESOURCE of the island?				

Appendix 1. SURVEY FOR SABOGA

COMMUNITIES		SABOGA (63)					
	Parameters	TOTALS			% based on survey		
		YES	NO	DK	YES	NO	DK
A G E S	18-25	11	0	0	17.5%	0.0%	0.0%
	26-35	17	0	0	27.0%	0.0%	0.0%
	36-46	18	0	0	28.6%	0.0%	0.0%
	47-70	14	0	0	22.2%	0.0%	0.0%
	71-85 or older	3	0	0	4.8%	0.0%	0.0%
A C T I V I T Y	Only Agriculture*	19	0	0	30.2%	0.0%	0.0%
	Consumption	14	0	0	22.2%	0.0%	0.0%
	Sale	5	0	0	7.9%	0.0%	0.0%
	Mainly Fishing*	33	0	0	52.4%	0.0%	0.0%
	Consumption	18	0	0	28.6%	0.0%	0.0%
	Sale	5	0	0	7.9%	0.0%	0.0%
	Consumption and Sale	10	0	0	15.9%	0.0%	0.0%
	Daily	6	0	0	9.5%	0.0%	0.0%
	Weekly / Sometimes	27	0	0	42.9%	0.0%	0.0%
	Line / String	15	0	0	23.8%	0.0%	0.0%
	Line / Net	4	0	0	6.3%	0.0%	0.0%
	Diving	3	0	0	4.8%	0.0%	0.0%
	Diving / Line	5	0	0	7.9%	0.0%	0.0%
	Net	5	0	0	7.9%	0.0%	0.0%
	Net / Diving/ Line	1	0	0	1.6%	0.0%	0.0%
Either Agriculture, nor fishing	11	0	0	17.5%	0.0%	0.0%	
E D U C	Only elementary school	34	1	0	54.0%	1.6%	0.0%
	Secondary school	28	0	0	44.4%	0.0%	0.0%
	University	0	0	0	0.0%	0.0%	0.0%
M P A	Knowledge about MPA's	18	45	0	28.6%	71.4%	0.0%
	Knowledge about the benefits of MPA's	55	4	4	87.3%	6.3%	6.3%
	Knowledge about the decrease of Mar. Res.	45	8	10	71.4%	12.7%	15.9%
A c c	Tourism	20	0	0	31.7%	0.0%	0.0%
	Other Residents of the Arch.	14	0	0	22.2%	0.0%	0.0%
	Local Residents	27	0	0	42.9%	0.0%	0.0%
F i s h	Unrestricted fishing	16	47	0	25.4%	74.6%	0.0%
	Any type of fishing (netting)	19	40	4	30.2%	63.5%	6.3%
	Suitable for Tourism?	56	4	3	88.9%	6.3%	4.8%
V a l u e	Fishing and Marine Resource	21	0	0	33.3%	0.0%	0.0%
	Land	4	0	0	6.3%	0.0%	0.0%
	Tourism	10	0	0	15.9%	0.0%	0.0%
	Other	27	0	0	42.9%	0.0%	0.0%

Appendix 2. SURVEY FOR CONTADORA

COMMUNITIES		CONTADORA (46)					
	Parameters	TOTALS			% based on survey		
		YES	NO	DK	YES	NO	DK
A G E S	18-25	14	0	0	30.4%	0.0%	0.0%
	26-35	14	0	0	30.4%	0.0%	0.0%
	36-46	11	0	0	23.9%	0.0%	0.0%
	47-70	7	0	0	15.2%	0.0%	0.0%
	71-85 or older	0	0	0	0.0%	0.0%	0.0%
A C T I V I T Y	Only Agriculture*	9	0	0	19.6%	0.0%	0.0%
	Consumption	3	0	0	6.5%	0.0%	0.0%
	Sale	4	0	0	8.7%	0.0%	0.0%
	Mainly Fishing*	18	0	0	39.1%	0.0%	0.0%
	Consumption	15	0	0	32.6%	0.0%	0.0%
	Sale	1	0	0	2.2%	0.0%	0.0%
	Consumption and Sale	2	0	0	4.3%	0.0%	0.0%
	Daily	3	0	0	6.5%	0.0%	0.0%
	Weekly / Sometimes	15	0	0	32.6%	0.0%	0.0%
	Line / String	14	0	0	30.4%	0.0%	0.0%
	Line / Net	0	0	0	0.0%	0.0%	0.0%
	Diving	2	0	0	3.2%	0.0%	0.0%
	Diving / Line	2	0	0	4.3%	0.0%	0.0%
	Net	0	0	0	0.0%	0.0%	0.0%
	Net / Diving/ Line	0	0	0	0.0%	0.0%	0.0%
Either Agriculture, nor fishing	19	0	0	41.3%	0.0%	0.0%	
E D U C	Only elementary school	9	0	0	19.6%	0.0%	0.0%
	Secondary school	27	0	0	58.7%	0.0%	0.0%
	University	10	0	0	21.7%	0.0%	0.0%
M P A	Knowledge about MPA's	25	19	2	54.3%	41.3%	4.3%
	Knowledge about the benefits of MPA's	41	3	2	89.1%	6.5%	4.3%
	Knowledge about the decrease of Mar. Res.	34	10	2	73.9%	21.7%	4.3%
A C C	Tourism	8	0	4	17.4%	0.0%	8.7%
	Other Residents of the Arch.	24	0	0	52.2%	0.0%	0.0%
	Local Residents	5	0	0	10.9%	0.0%	0.0%
F I S H I N G	Unrestricted fishing	1	43	2	2.2%	93.5%	4.3%
	Any type of fishing (netting)	8	35	3	17.4%	76.1%	6.5%
	Suitable for Tourism?	46	0	0	100.0%	0.0%	0.0%
V A L U E	Fishing and Marine Resource	12	0	0	26.1%	0.0%	0.0%
	Land	2	0	0	4.3%	0.0%	0.0%
	Tourism	14	0	0	30.4%	0.0%	0.0%
	Other	17	0	0	37.0%	0.0%	0.0%

Appendix 3. SURVEY FOR PEDRO GONZALEZ

COMMUNITIES		PEDRO GONZALEZ (47)					
	Parameters	TOTALS			% based on survey		
		YES	NO	DK	YES	NO	DK
A G E S	18-25	14	0	0	29.8%	0.0%	0.0%
	26-35	12	0	0	25.5%	0.0%	0.0%
	36-46	7	0	0	14.9%	0.0%	0.0%
	47-70	13	0	0	27.7%	0.0%	0.0%
	71-85 or older	1	0	0	2.1%	0.0%	0.0%
A C T I V I T Y	Only Agriculture*	7	0	0	14.9%	0.0%	0.0%
	Consumption	4	0	0	8.5%	0.0%	0.0%
	Sale	3	0	0	6.4%	0.0%	0.0%
	Mainly Fishing*	31	0	0	66.0%	0.0%	0.0%
	Consumption	3	0	0	6.4%	0.0%	0.0%
	Sale	22	0	0	46.8%	0.0%	0.0%
	Consumption and Sale	5	0	0	7.9%	0.0%	0.0%
	Daily	26	0	0	55.3%	0.0%	0.0%
	Weekly / Sometimes	5	0	0	10.6%	0.0%	0.0%
	Line / String	18	0	0	38.3%	0.0%	0.0%
	Line / Net	4	0	0	6.3%	0.0%	0.0%
	Diving	4	0	0	6.3%	0.0%	0.0%
	Diving / Line	4	0	0	8.5%	0.0%	0.0%
	Net	1	0	0	1.6%	0.0%	0.0%
	Net / Diving/ Line	0	0	0	0.0%	0.0%	0.0%
Either Agriculture, nor fishing	8	0	0	12.7%	0.0%	0.0%	
E D U C	Only elementary school	30	4	0	63.8%	8.5%	0.0%
	Secondary school	12	0	0	25.5%	0.0%	0.0%
	University	1	0	0	2.1%	0.0%	0.0%
M P A	Knowledge about MPA's	16	31	0	34.0%	66.0%	0.0%
	Knowledge about the benefits of MPA's	41	3	3	87.2%	6.4%	6.4%
	Knowledge about the decrease of Mar. Res.	31	10	6	66.0%	21.3%	12.8%
A C C	Tourism	13	0	0	27.7%	0.0%	0.0%
	Other Residents of the Arch.	11	0	0	23.4%	0.0%	0.0%
	Local Residents	15	0	0	31.9%	0.0%	0.0%
F I S H I N G	Unrestricted fishing	13	34	0	27.7%	72.3%	0.0%
	Any type of fishing (netting)	11	32	4	23.4%	68.1%	8.5%
	Suitable for Tourism?	43	3	0	91.5%	6.4%	0.0%
V A L U E	Fishing and Marine Resource	34	0	1	72.3%	0.0%	2.1%
	Land	6	0	0	12.8%	0.0%	0.0%
	Tourism	0	0	0	0.0%	0.0%	0.0%
	Other	6	0	0	12.8%	0.0%	0.0%

Appendix 4. SURVEY FOR CASAYA

COMMUNITIES		CASAYA (20)					
	Parameters	TOTALS			% based on survey		
		YES	NO	DK	YES	NO	DK
A G E S	18-25	4	0	0	20.0%	0.0%	0.0%
	26-35	2	0	0	10.0%	0.0%	0.0%
	36-46	7	0	0	35.0%	0.0%	0.0%
	47-70	5	0	0	25.0%	0.0%	0.0%
	71-85 or older	2	0	0	10.0%	0.0%	0.0%
A C T I V I T Y	Only Agriculture*	3	0	0	15.0%	0.0%	0.0%
	Consumption	3	0	0	15.0%	0.0%	0.0%
	Sale	0	0	0	0.0%	0.0%	0.0%
	Mainly Fishing*	17	0	0	85.0%	0.0%	0.0%
	Consumption	4	0	0	20.0%	0.0%	0.0%
	Sale	9	0	0	45.0%	0.0%	0.0%
	Consumption and Sale	4	0	0	6.3%	0.0%	0.0%
	Daily	11	0	0	55.0%	0.0%	0.0%
	Weekly / Sometimes	6	0	0	30.0%	0.0%	0.0%
	Line / String	4	0	0	20.0%	0.0%	0.0%
	Line / Net	0	0	0	0.0%	0.0%	0.0%
	Diving	9	0	0	14.3%	0.0%	0.0%
	Diving / Line	2	0	0	10.0%	0.0%	0.0%
	Net	0	0	0	0.0%	0.0%	0.0%
	Net / Diving/ Line	2	0	0	10.0%	0.0%	0.0%
Either Agriculture, nor fishing	0	0	0	0.0%	0.0%	0.0%	
E D U C	Only elementary school	9	0	0	45.0%	0.0%	0.0%
	Secondary school	8	0	0	40.0%	0.0%	0.0%
	University	1	0	0	5.0%	0.0%	0.0%
M P A	Knowledge about MPA's	11	9	0	55.0%	45.0%	0.0%
	Knowledge about the benefits of MPA's	20	0	0	100.0%	0.0%	0.0%
	Knowledge about the decrease of Mar. Res.	19	0	1	95.0%	0.0%	5.0%
A C C	Tourism	2	0	4	10.0%	0.0%	20.0%
	Other Residents of the Arch.	6	0	0	30.0%	0.0%	0.0%
	Local Residents	8	0	0	40.0%	0.0%	0.0%
F I S H I N G	Unrestricted fishing	3	17	0	15.0%	85.0%	0.0%
	Any type of fishing (netting)	6	14	0	30.0%	70.0%	0.0%
	Suitable for Tourism?	14	6	0	70.0%	30.0%	0.0%
V A L U E	Fishing and Marine Resource	15	0	1	75.0%	0.0%	5.0%
	Land	3	0	0	15.0%	0.0%	0.0%
	Tourism	1	0	0	5.0%	0.0%	0.0%
	Other	1	0	0	5.0%	0.0%	0.0%

Appendix 5. SURVEY FOR LA ESMERALDA

COMMUNITIES		ESMERALDA (50)					
	Parameters	TOTALS			% based on survey		
		YES	NO	DK	YES	NO	DK
A G E S	18-25	12	0	0	24.0%	0.0%	0.0%
	26-35	13	0	0	26.0%	0.0%	0.0%
	36-46	16	0	0	32.0%	0.0%	0.0%
	47-70	9	0	0	18.0%	0.0%	0.0%
	71-85 or older	0	0	0	0.0%	0.0%	0.0%
A C T I V I T Y	Only Agriculture*	5	0	0	10.0%	0.0%	0.0%
	Consumption	5	0	0	10.0%	0.0%	0.0%
	Sale	0	0	0	0.0%	0.0%	0.0%
	Mainly Fishing*	40	0	0	80.0%	0.0%	0.0%
	Consumption	2	0	0	4.0%	0.0%	0.0%
	Sale	37	0	0	74.0%	0.0%	0.0%
	Consumption and Sale	1	0	0	1.6%	0.0%	0.0%
	Daily	30	0	0	60.0%	0.0%	0.0%
	Weekly / Sometimes	10	0	0	20.0%	0.0%	0.0%
	Line / String	21	0	0	42.0%	0.0%	0.0%
	Line / Net	0	0	0	0.0%	0.0%	0.0%
	Diving	3	0	0	4.8%	0.0%	0.0%
	Diving / Line	14	0	0	28.0%	0.0%	0.0%
	Net	0	0	0	0.0%	0.0%	0.0%
	Net / Diving/ Line	1	0	0	2.0%	0.0%	0.0%
Either Agriculture, nor fishing	5	0	0	7.9%	0.0%	0.0%	
E D U C	Only elementary school	31	5	0	62.0%	10.0%	0.0%
	Secondary school	13	0	0	26.0%	0.0%	0.0%
	University	1	0	0	2.0%	0.0%	0.0%
M P A	Knowledge about MPA's	15	35	0	30.0%	70.0%	0.0%
	Knowledge about the benefits of MPA's	49	1	0	98.0%	2.0%	0.0%
	Knowledge about the decrease of Mar. Res.	46	1	3	92.0%	2.0%	6.0%
A C C	Tourism	16	0	0	32.0%	0.0%	0.0%
	Other Residents of the Arch.	7	0	0	14.0%	0.0%	0.0%
	Local Residents	26	0	0	52.0%	0.0%	0.0%
F I S H I N G	Unrestricted fishing	6	44	0	12.0%	88.0%	0.0%
	Any type of fishing (netting)	15	35	0	30.0%	70.0%	0.0%
	Suitable for Tourism?	45	4	1	90.0%	8.0%	2.0%
V A L U E	Fishing and Marine Resource	44	0	0	88.0%	0.0%	0.0%
	Land	2	0	0	4.0%	0.0%	0.0%
	Tourism	0	0	1	0.0%	0.0%	2.0%
	Other	1	0	0	2.0%	0.0%	0.0%

Appendix 6. SURVEY FOR LA GUINEA

COMMUNITIES		LA GUINEA (26)					
	Parameters	TOTALS			% based on survey		
		YES	NO	DK	YES	NO	DK
A G E S	18-25	7	0	0	26.9%	0.0%	0.0%
	26-35	5	0	0	19.2%	0.0%	0.0%
	36-46	5	0	0	19.2%	0.0%	0.0%
	47-70	6	0	0	23.1%	0.0%	0.0%
	71-85 or older	3	0	0	11.5%	0.0%	0.0%
A C T I V I T Y	Only Agriculture*	8	0	0	30.8%	0.0%	0.0%
	Consumption	0	0	0	0.0%	0.0%	0.0%
	Sale	8	0	0	30.8%	0.0%	0.0%
	Mainly Fishing*	17	0	0	65.4%	0.0%	0.0%
	Consumption	6	0	0	23.1%	0.0%	0.0%
	Sale	5	0	0	19.2%	0.0%	0.0%
	Consumption and Sale	6	0	0	9.5%	0.0%	0.0%
	Daily	1	0	0	3.8%	0.0%	0.0%
	Weekly / Sometimes	16	0	0	61.5%	0.0%	0.0%
	Line / String	3	0	0	11.5%	0.0%	0.0%
	Line / Net	6	0	0	9.5%	0.0%	0.0%
	Diving	1	0	0	1.6%	0.0%	0.0%
	Diving / Line	1	0	0	3.8%	0.0%	0.0%
	Net	4	0	0	6.3%	0.0%	0.0%
	Net / Diving/ Line	2	0	0	7.7%	0.0%	0.0%
Either Agriculture, nor fishing	1	0	0	1.6%	0.0%	0.0%	
E D U C	Only elementary school	17	4	0	65.4%	15.4%	0.0%
	Secondary school	5	0	0	19.2%	0.0%	0.0%
	University	0	0	0	0.0%	0.0%	0.0%
M P A	Knowledge about MPA's	10	16	0	38.5%	61.5%	0.0%
	Knowledge about the benefits of MPA's	26	0	0	100.0%	0.0%	0.0%
	Knowledge about the decrease of Mar. Res.	23	1	1	88.5%	3.8%	3.8%
A C C	Tourism	6	0	0	23.1%	0.0%	0.0%
	Other Residents of the Arch.	5	0	0	19.2%	0.0%	0.0%
	Local Residents	9	0	0	34.6%	0.0%	0.0%
F I S H I N G	Unrestricted fishing	4	21	0	15.4%	80.8%	0.0%
	Any type of fishing (netting)	13	12	0	50.0%	46.2%	0.0%
	Suitable for Tourism?	19	6	0	73.1%	23.1%	0.0%
V A L U E	Fishing and Marine Resource	11	0	0	42.3%	0.0%	0.0%
	Land	15	0	0	57.7%	0.0%	0.0%
	Tourism	0	0	0	0.0%	0.0%	0.0%
	Other	0	0	0	0.0%	0.0%	0.0%

Appendix 7. SURVEY FOR LA ENSENADA

COMMUNITIES		ENSENADA (18)					
	Parameters	TOTALS			% based on survey		
		YES	NO	DK	YES	NO	DK
A G E S	18-25	0	0	0	0.0%	0.0%	0.0%
	26-35	6	0	0	33.3%	0.0%	0.0%
	36-46	6	0	0	33.3%	0.0%	0.0%
	47-70	3	0	0	16.7%	0.0%	0.0%
	71-85 or older	3	0	0	16.7%	0.0%	0.0%
A C T I V I T Y	Only Agriculture*	3	0	0	16.7%	0.0%	0.0%
	Consumption	3	0	0	16.7%	0.0%	0.0%
	Sale	0	0	0	0.0%	0.0%	0.0%
	Mainly Fishing*	15	0	0	83.3%	0.0%	0.0%
	Consumption	4	0	0	22.2%	0.0%	0.0%
	Sale	2	0	0	11.1%	0.0%	0.0%
	Consumption and Sale	9	0	0	14.3%	0.0%	0.0%
	Daily	8	0	0	44.4%	0.0%	0.0%
	Weekly / Sometimes	7	0	0	38.9%	0.0%	0.0%
	Line / String	3	0	0	16.7%	0.0%	0.0%
	Line / Net	2	0	0	3.2%	0.0%	0.0%
	Diving	5	0	0	7.9%	0.0%	0.0%
	Diving / Line	1	0	0	5.6%	0.0%	0.0%
	Net	4	0	0	6.3%	0.0%	0.0%
	Net / Diving/ Line	1	0	0	5.6%	0.0%	0.0%
Either Agriculture, nor fishing	0	0	0	0.0%	0.0%	0.0%	
E D U C	Only elementary school	12	4	0	66.7%	22.2%	0.0%
	Secondary school	1	0	0	5.6%	0.0%	0.0%
	University	1	0	0	5.6%	0.0%	0.0%
M P A	Knowledge about MPA's	3	15	0	16.7%	83.3%	0.0%
	Knowledge about the benefits of MPA's	17	0	1	94.4%	0.0%	5.6%
	Knowledge about the decrease of Mar. Res.	17	0	0	94.4%	0.0%	0.0%
A c c	Tourism	4	0	0	22.2%	0.0%	0.0%
	Other Residents of the Arch.	2	0	0	11.1%	0.0%	0.0%
	Local Residents	6	0	0	33.3%	0.0%	0.0%
F i s h i n g	Unrestricted fishing	3	15	0	16.7%	83.3%	0.0%
	Any type of fishing (netting)	13	4	1	72.2%	22.2%	5.6%
	Suitable for Tourism?	15	0	2	83.3%	0.0%	11.1%
V a l u e	Fishing and Marine Resource	12	0	0	66.7%	0.0%	0.0%
	Land	5	0	0	27.8%	0.0%	0.0%
	Tourism	1	0	0	5.6%	0.0%	0.0%
	Other	0	0	0	0.0%	0.0%	0.0%

Appendix 8. SURVEY FOR SAN MIGUEL

COMMUNITIES		SAN MIGUEL (62)					
	Parameters	TOTALS			% based on survey		
		YES	NO	DK	YES	NO	DK
A G E S	18-25	14	0	0	22.6%	0.0%	0.0%
	26-35	11	0	0	17.7%	0.0%	0.0%
	36-46	13	0	0	21.0%	0.0%	0.0%
	47-70	18	0	0	29.0%	0.0%	0.0%
	71-85 or older	6	0	0	9.7%	0.0%	0.0%
A C T I V I T Y	Only Agriculture*	5	0	0	8.1%	0.0%	0.0%
	Consumption	5	0	0	8.1%	0.0%	0.0%
	Sale	0	0	0	0.0%	0.0%	0.0%
	Mainly Fishing*	43	0	0	69.4%	0.0%	0.0%
	Consumption	7	0	0	11.3%	0.0%	0.0%
	Sale	31	0	0	50.0%	0.0%	0.0%
	Consumption and Sale	5	0	0	7.9%	0.0%	0.0%
	Daily	21	0	0	33.9%	0.0%	0.0%
	Weekly / Sometimes	22	0	0	35.5%	0.0%	0.0%
	Line / String	26	0	0	41.9%	0.0%	0.0%
	Line / Net	5	0	0	7.9%	0.0%	0.0%
	Diving	2	0	0	3.2%	0.0%	0.0%
	Diving / Line	8	0	0	12.9%	0.0%	0.0%
	Net	1	0	0	1.6%	0.0%	0.0%
	Net / Diving/ Line	1	0	0	1.6%	0.0%	0.0%
Either Agriculture, nor fishing	14	0	0	22.2%	0.0%	0.0%	
E D U C	Only elementary school	18	1	0	29.0%	1.6%	0.0%
	Secondary school	35	0	0	56.5%	0.0%	0.0%
	University	8	0	0	12.9%	0.0%	0.0%
M P A	Knowledge about MPA's	41	21	0	66.1%	33.9%	0.0%
	Knowledge about the benefits of MPA's	58	4	0	93.5%	6.5%	0.0%
	Knowledge about the decrease of Mar. Res.	58	4	0	93.5%	6.5%	0.0%
A C C	Tourism	22	2	12	35.5%	3.2%	19.4%
	Other Residents of the Arch.	8	0	0	12.9%	0.0%	0.0%
	Local Residents	15	0	0	24.2%	0.0%	0.0%
F I S H I N G	Unrestricted fishing	12	49	1	19.4%	79.0%	1.6%
	Any type of fishing (netting)	18	41	3	29.0%	66.1%	4.8%
	Suitable for Tourism?	57	2	3	91.9%	3.2%	4.8%
V A L U E	Fishing and Marine Resource	43	1	0	69.4%	1.6%	0.0%
	Land	8	0	0	12.9%	0.0%	0.0%
	Tourism	2	0	0	3.2%	0.0%	0.0%
	Other	8	0	0	12.9%	0.0%	0.0%

Appendix 9. SURVEY FOR MARTIN PEREZ

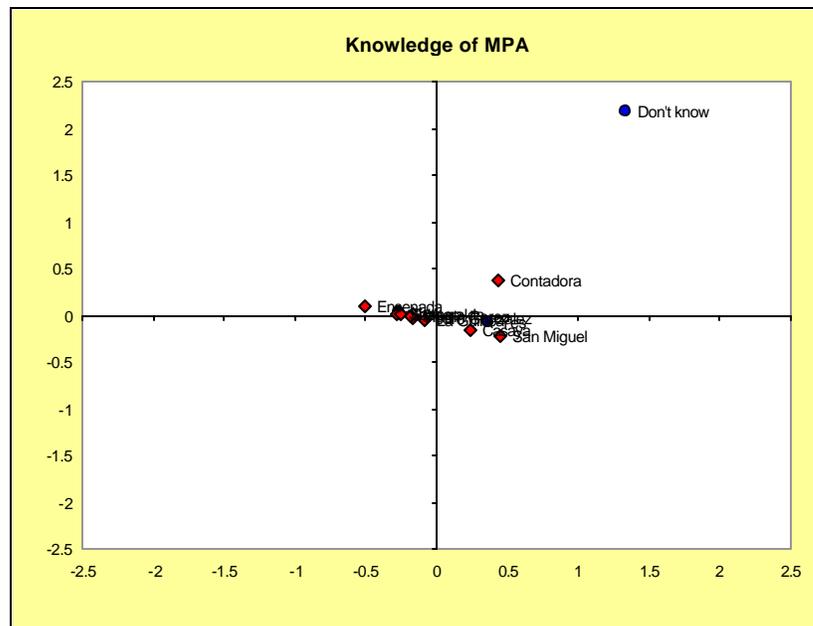
COMMUNITIES		MARTIN PEREZ (15)					
	Parameters	TOTALS			% based on survey		
		YES	NO	DK	YES	NO	DK
A G E S	18-25	2	0	0	13.3%	0.0%	0.0%
	26-35	4	0	0	26.7%	0.0%	0.0%
	36-46	2	0	0	13.3%	0.0%	0.0%
	47-70	7	0	0	46.7%	0.0%	0.0%
	71-85 or older	0	0	0	0.0%	0.0%	0.0%
A C T I V I T Y	Only Agriculture*	4	0	0	26.7%	0.0%	0.0%
	Consumption	4	0	0	26.7%	0.0%	0.0%
	Sale	0	0	0	0.0%	0.0%	0.0%
	Mainly Fishing*	10	0	0	66.7%	0.0%	0.0%
	Consumption	5	0	0	33.3%	0.0%	0.0%
	Sale	3	0	0	20.0%	0.0%	0.0%
	Consumption and Sale	2	0	0	3.2%	0.0%	0.0%
	Daily	7	0	0	46.7%	0.0%	0.0%
	Weekly / Sometimes	3	0	0	20.0%	0.0%	0.0%
	Line / String	2	0	0	13.3%	0.0%	0.0%
	Line / Net	1	0	0	1.6%	0.0%	0.0%
	Diving	1	0	0	1.6%	0.0%	0.0%
	Diving / Line	2	0	0	13.3%	0.0%	0.0%
	Net	3	0	0	4.8%	0.0%	0.0%
	Net / Diving/ Line	2	0	0	13.3%	0.0%	0.0%
Either Agriculture, nor fishing	1	0	0	1.6%	0.0%	0.0%	
E D U C	Only elementary school	9	2	0	60.0%	13.3%	0.0%
	Secondary school	0	0	0	0.0%	0.0%	0.0%
	University	1	0	0	6.7%	0.0%	0.0%
M P A	Knowledge about MPA's	5	10	0	33.3%	66.7%	0.0%
	Knowledge about the benefits of MPA's	14	0	1	93.3%	0.0%	6.7%
	Knowledge about the decrease of Mar. Res.	12	3	0	80.0%	20.0%	0.0%
A C C	Tourism	2	0	0	13.3%	0.0%	0.0%
	Other Residents of the Arch.	6	0	0	40.0%	0.0%	0.0%
	Local Residents	3	0	0	20.0%	0.0%	0.0%
F I S H I N G	Unrestricted fishing	3	12	0	20.0%	80.0%	0.0%
	Any type of fishing (netting)	7	8	0	46.7%	53.3%	0.0%
	Suitable for Tourism?	15	0	0	100.0%	0.0%	0.0%
V A L U E	Fishing and Marine Resource	11	0	0	73.3%	0.0%	0.0%
	Land	5	0	0	33.3%	0.0%	0.0%
	Tourism	0	0	0	0.0%	0.0%	0.0%
	Other	1	0	0	6.7%	0.0%	0.0%

Appendix 10. KNOWLEDGE OF MARINE PROTECTED AREAS

Chi-Square independence test

Chi-square (observed value)	47.584
Chi-square (critical value)	26.296
DF	16
One-tailed p-value	< 0,0001
Alpha	0.05

Correspondence Analysis



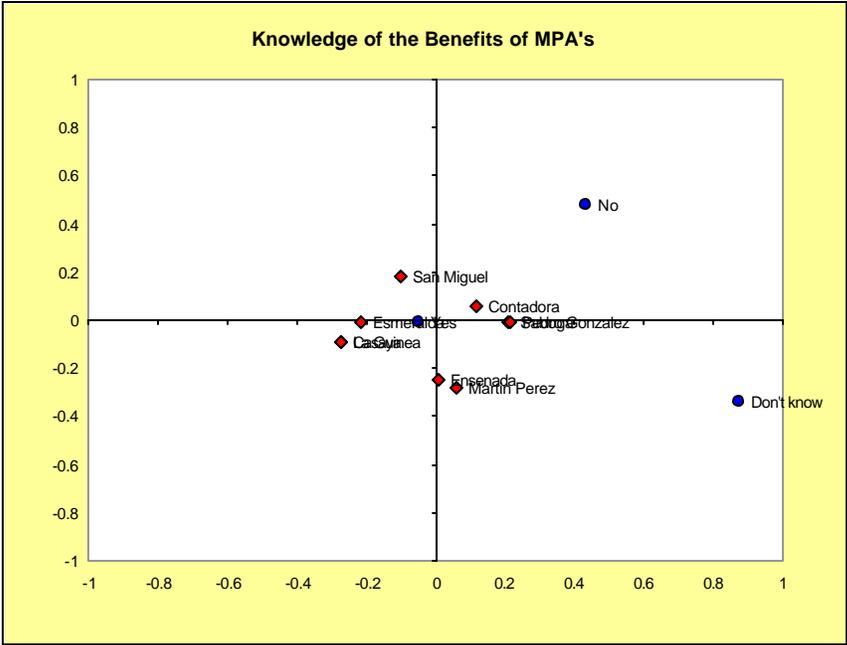
- Answers
- Islands

Appendix 11. PERCEPTIONS OF THE BENEFITS OF A MPA

Chi-square independence test

Chi-square (observed value)	16.755
Chi-square (critical value)	26.296
DF	16
One-tailed p-value	0.402
Alpha	0.05

Correspondence Analysis



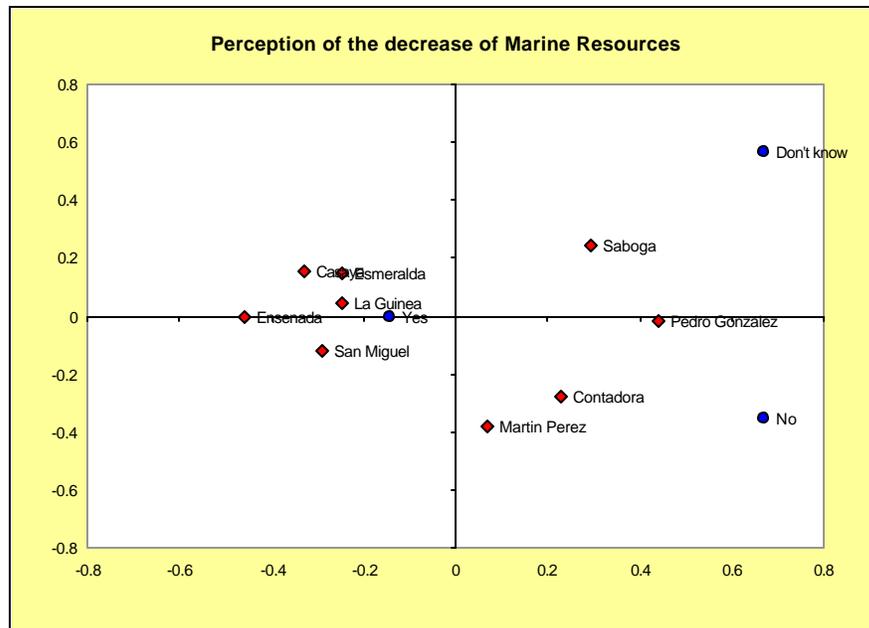
- Answers
- ◆ Islands

Appendix 12. PERCEPTION OF THE DECREASE OF MARINE RESOURCES

Chi-square independence test

Chi-square (observed value)	44.452
Chi-square (critical value)	26.296
DF	16
One-tailed p-value	0.000
Alpha	0.05

Correspondence Analysis



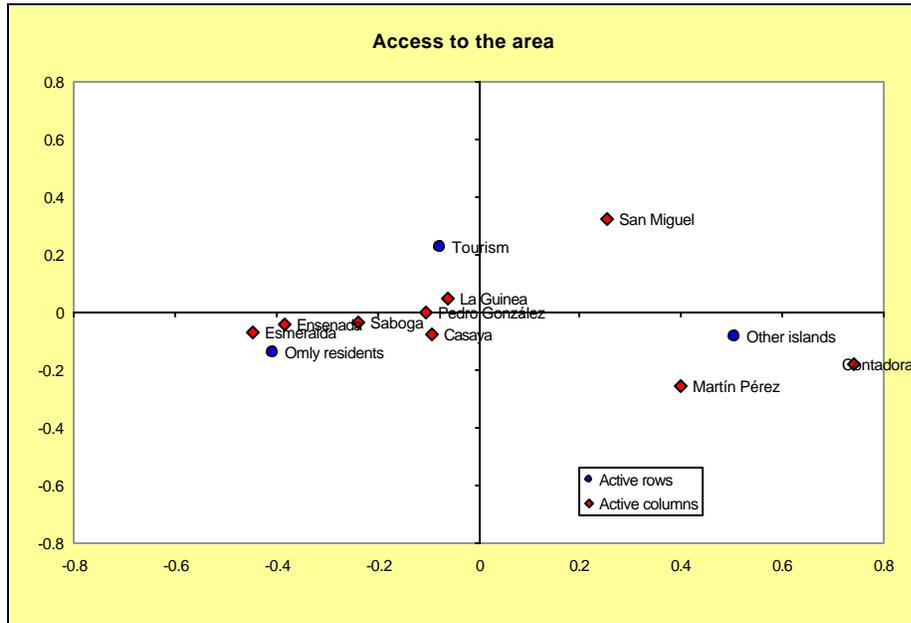
- Answers
- Islands

Appendix 13. OPINIONS ON THE ACCESS TO THE AREA

Chi-Square Independence Test

Chi-square (observed value)	51.321
Chi-square (critical value)	26.296
DF	16
One-tailed p-value	< 0,0001
Alpha	0.05

Correspondence Analysis



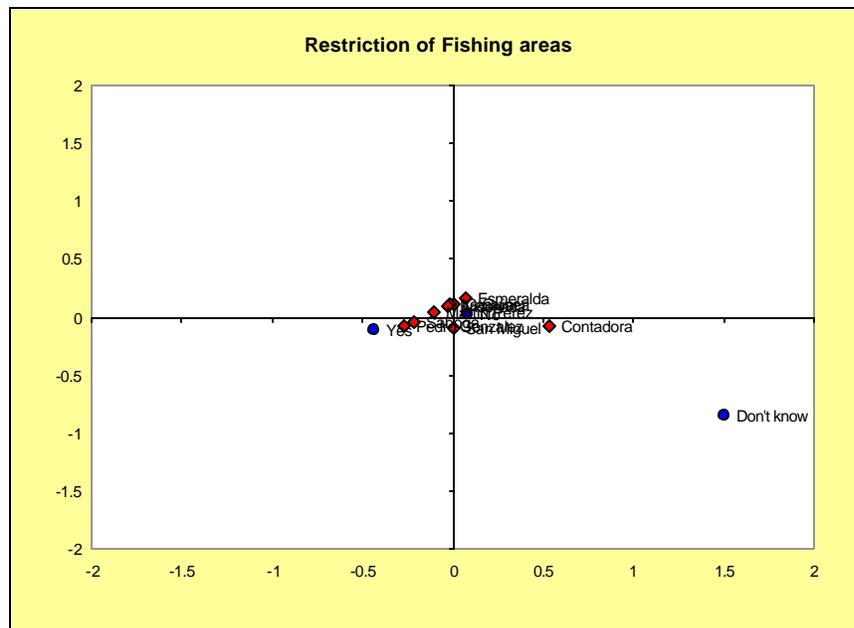
- Options
- ◆ Islands

Appendix 14. OPINIONS ON RESTRICTING FISHING IN THE AREAS

Chi-Square Independence Test

Chi-square (observed value)	23.164
Chi-square (critical value)	26.296
DF	16
One-tailed p-value	0.109
Alpha	0.05

Correspondence Analysis



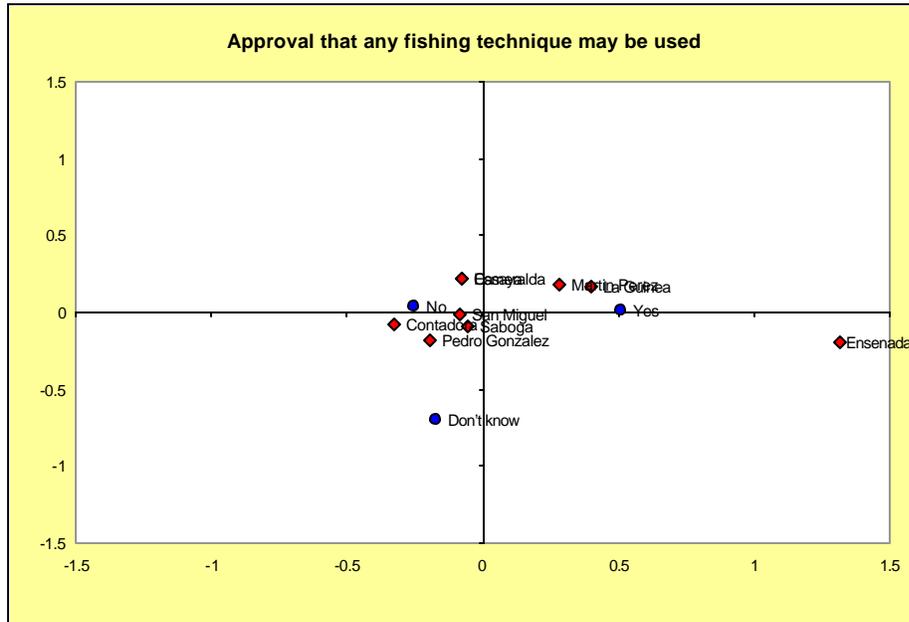
- ◆ Answers
- ◆ Islands

Appendix 15. OPINIONS ON THE FISHING TECHNIQUE USED

Chi-Square Independence Test

Chi-square (observed value)	52.029
Chi-square (critical value)	26.296
DF	16
One-tailed p-value	< 0,0001
Alpha	0.05

Correspondence Analysis



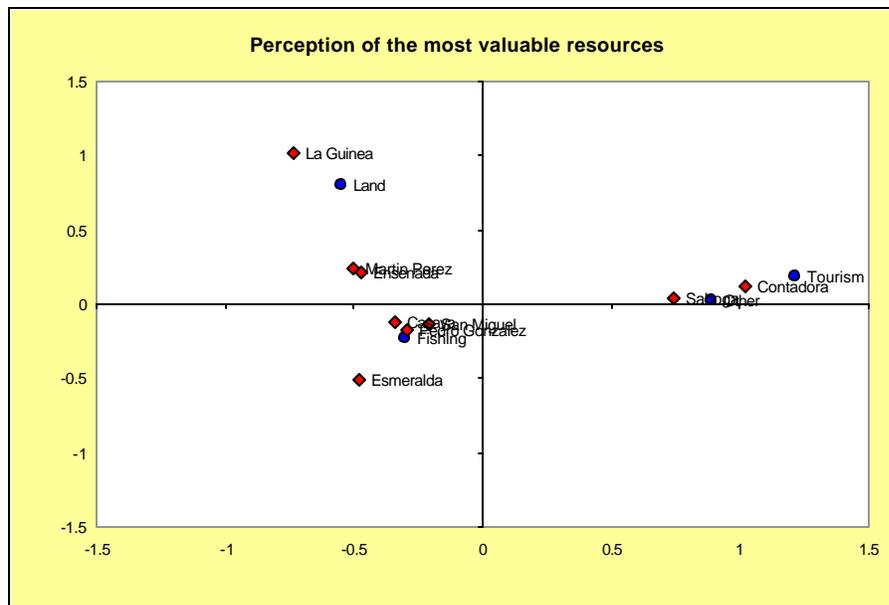
- Answers
- ◆ Islands

Appendix 16. PERCEPTION OF THE MOST VALUABLE RESOURCES

Chi-Square Independence Test

Chi-square (observed value)	175.671
Chi-square (critical value)	36.415
DF	24
One-tailed p-value	< 0,0001
Alpha	0.05

Correspondence Analysis



- ◆ Resources
- ◆ Islands

Appendix 17. MAP OF PERCENTAGE THAT LACK KNOWLEDGE ABOUT MPA

