Agro-pastoralists turned fishermen: Socio-economic and environmental changes in the buffer zone of Coiba National Park, Panama.

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Abstract

In upcoming decades, the conservation and sustainable use of coastal and marine resources will become a major political and environmental challenge, as two-thirds of the world's population lives in coastal zones. The issue will likely become more problematic in developing countries, where an important number of coastal inhabitants still rely on marginal extractive activities such as fishing, farming and cattle ranching for subsistence, and where the rural poor's demand for development often lead to unsustainable extractive practices. Thus, innovative solutions need to be developed to ensure the long-term conservation and sound management of marine and coastal resources. This Masters thesis addresses the case of Coiba National Park, a marine protected area located in the Gulf of Chiriqui, Panama, and its relationship with coastal fishing and farming communities located at its outskirt. Particularly, this thesis aims to discover the drivers that pushed an important number of coastal agro-pastoralists of Coiba National Park's buffer zone to switch to artisanal fishing over the past three decades, and to determine the social, economic, and environmental impacts that resulted from that switch. In addition, this thesis analyses the relationship between Coiba National Park's authorities and buffer zone communities, and how this relationship has evolved over the years as more and more resource-users exploit the marine resources of the park. Finally, this work analyses Coiba National Park's current management strategy, how park authorities have been able to adapt their planning and management activities over the years, and explores alternatives to improve Coiba National Park's management strategy so that it can better adapt to the ever changing social, economic, and environmental conditions in which Coiba National Park's buffer zone operates.

Résumé

Durant les prochaines décennies, la conservation des ressources côtières et marines s'avérera un enjeu politique et environnemental de taille, d'autant plus si l'on tient compte que le deux-tiers de la population mondiale habite les régions côtières. L'enjeu risque d'être fortement problématique dans les pays en voie de développement où une grande majorité des populations rurales vivent toujours d'activités extractives marginales comme la pêche, l'agriculture et l'élevage, et où les besoins pressants des populations moins nanties mènent souvent à la dégradation des ressources naturelles. Par conséquent, il apparaît impératif de développer des solutions innovatrices qui permettront d'assurer la conservation et d'améliorer la gestion des ressources côtières et marines. Ce mémoire analyse la relation entre le Parc National Coiba, un espace marin protégé situé dans le Golfe de Chiriqui, Panama, et les communautés côtières de pêcheurs-agriculteurs de la région insulaire située en bordure du parc. Plus particulièrement, ce mémoire tente de découvrir les raisons qui ont mené une grande proportion des habitants de la côte du Parc National Coiba à passer de l'agriculture et de l'élevage à la pêche artisanale durant les trente dernières années et de déterminer les impacts sociaux, économiques, et environnementaux que ce changement d'activité économique a engendré dans le contexte de gestion du parc. De plus, ce mémoire analyse la relation entre les autorités du Parc National Coiba et les communautés insulaires situées en bordure du parc, tout en expliquant comment cette relation a évolué au fil des années à mesure que le nombre d'utilisateurs des ressources marines ne cessait de s'accroître. Finalement, ce mémoire analyse le plan de gestion actuel du Parc National Coiba, comment les autorités du parc ont su l'adapter au cours des années, et explore les différentes avenues de solutions possibles afin d'améliorer ce dernier de façon à ce qu'il soit plus facilement adaptable au contexte évolutif social, économique et environnementale de la région insulaire du parc.

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This research goes to the people of the Bahía Honda area, without whom this research would have never seen the light.

...Porque uno siempre tiene que mirar hacia adelante...

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AECI: Agencia Española de Cooperación Internacional

AMP: Autoridad Marítima de Panamá

ANAM: Autoridad Nacional del Ambiente

ANCON: Asociación Nacional para la Conservación de la Naturaleza

APRONAD: Asociación para la Promoción de Nuevas Alternativas de Desarrollo

CNP: Coiba National Park

ICM: Integrated Coastal Management

ICONA: Dirección General para la Conservación de la Naturaleza

IDAAN: Instituto de Acueductos y Alcantarillados Nacionales

IDIAP: Instituto de Investigación Agropecuaria de Panamá

INRENARE: Instituto Nacional de Recursos Naturales Renovables

IPAT: Instituto Panameño de Turismo

MÉDUC: Ministerio de Educación

MICI: Ministerio de Comercio e Industria

MIDA: Ministerio de Desarrollo Agropecuario

MINSA: Ministerio de Salud

MPA: Marine Protected Area

PRONAT: Programa Nacional de Titulación de Tierra

SINAP: Sistema Nacional de Áreas Protegidas

Chapter 1: Introduction and objectives

1.1. Introduction

At the turn of the 21st century, ecosystems located in areas where the ocean and land intersect will be subjected to increasing anthropogenic pressure, as they support two-thirds of the world's population (NetCoast, 2005). The issue will likely become more problematic in developing countries, where traditional activities such as fishing, farming and logging still support a vast majority of coastal inhabitants, whose desire for higher standards of living often result in unsustainable extractive practices and in natural resource degradation. Thus, innovative approaches for the sustainable use of marine and coastal natural resources are needed. Among the proposed approaches, Marine Protected Areas (MPAs) have emerged as a promising managerial strategy for the sustainable use of marine and coastal ecosystems (Pomeroy *et al.*, 2004). The use of MPAs might offer a means for reconciliation of what many consider irreconcilable fields: resource conservation and resource extraction (Crosby *et al.*, 2000; Agardy *et al.*, 2003).

While a certain number of successful Marine Protected Areas can be found in the Western world, their implementation has been most difficult in many parts of the world, particularly in the South (see Gladstone, 2000; Elliot *et al.*, 2001; Fauzy and Buchary, 2002, Agardy *et al.*, 2003). Out of the 1306 MPAs surveyed worldwide, Kelleher *et al.* (1995) found that only 31% were meeting their management objectives. Many developing countries have faced difficulties in establishing successful MPAs, often because they lack the resources to effectively implement policing and management programs (Elliot *et al.*, 2001; Fauzy and Buchary, 2002) or because they offer limited participatory opportunities to resource-users,

two conditions often considered essential to ensure sustainable natural resources extraction and rule compliance (White *et al.*, 2002, Capiniti *et al.*, 2004).

Since its creation, Coiba National Park (CNP), a marine protected area located offshore of the south-western tip of the Veraguas province in the Republic of Panama, has been experiencing many of the problems generally faced by MPAs in developing countries. From its creation in 1986 to about 2 years ago, CNP fell within the category of "paper parks"; the park's 216 543 hectares of oceanic surface were patrolled by only one boat, and few programs or assessment measures of the original management plan (see AECI, ICONA, and INRENARE; 1996) were implemented. Park management authorities of the time, namely the Panama National Environmental Authority (ANAM), lacked the financial resources and institutional capacity to ensure the protection of the park and rule compliance (Moretti, 2002). Besides their efforts in countering illegal resource extraction and in performing environmental education activities, ANAM never managed to develop measures to integrate local communities into planning and management of the park. In addition, little effort was made to mitigate the potential adverse socio-economic impacts the creation of CNP may have had on local livelihoods. Until recently, fishing regulations were not respected, and illegal fishing was widespread and poorly countered (Moretti, 2002).

The situation started changing in 2002 with the involvement of international donor organizations such as the AVINA Foundation and Conservation International, and international and national NGOs such as MarViva and ANCON. Together, these organizations have been able to assist ANAM in improving protection measures around CNP, resulting in a decrease of illegal fishing activities within the park. Although these new partnerships could have been an ideal occasion to engage in a consultation process with resource-user communities to develop a more integrated approach to the management of CNP, the new management framework was established without consulting buffer zone

communities, and was presented as a *fait-accompli*. Based on precautionary principles, these new measures to increase the protection of CNP were not matched with community programs to mitigate the economic impacts resulting from restricted access to park resources.

The buffer zone of CNP encompasses many communities that for decades have been relying on the marine and terrestrial resources of Coiba National Park and its buffer zone for subsistence activities such as fishing, farming, cattle ranching, hunting, logging, and gathering. The *corregimiento* of Bahía Honda, the closest political-administrative unit to Coiba National Park, includes 37 communities that sustain themselves primarily from such traditional extractive activities. Although most families of the area have traditionally been farming and grazing coastal lands just outside the limits of the park for subsistence, the observed increase in the number of artisanal fishermen exploiting CNP have led some to believe that coastal agro-pastoralists of CNP's buffer zone might have been, over the years, leaving their farming lifestyle to turn to fishing. With a growing number of resource-users, the long-term conservation of Coiba National Park has become a more complex endeavour over the years.

This study thus attempts to draw a broad portrait of the main socio-economic and environmental changes that some of the coastal communities located in the buffer zone of Coiba National Park have been undergoing over the past generation, with a focus on coastal resource management strategies and how they have been affecting the operational framework in which Coiba National Park is being managed. The *corregimiento* of Bahía Honda was chosen as the sample study site. The people of Bahía Honda were to be my hosts.

1.2. Objectives and hypothesis

The objectives of this study were four-fold. First, this study aimed to identify the main socio-economic and environmental factors that might have led coastal inhabitants of the

buffer zone of Coiba National Park to switch from a farming-based lifestyle to a fishing-based lifestyle over the past decades, using the *corregimiento* of Bahía Honda as the sample study site. The second objective of this study was to assess the significance of the switch in the area. The third objective of the study aimed to identify the main social, economic, and environmental changes associated with the employment switch and the establishment of Coiba National Park, starting from the years preceding the beginning of the switch up until today. Particularly, the third objective attempts to assess how the employment switch has been affecting the socio-economic and environmental conditions in which Coiba National Park operates. Finally, the fourth objective intended to document and analyse ongoing park policies, identify how such policies have been impacting local communities, and look at opportunities and obstacles to integrate Coiba National Park in a more integrated coastal management strategy that would enhance its long-term conservation.

These objectives were determined based on the hypothesis that declining productivity of coastal lands within the buffer zone of Coiba National Park has led coastal inhabitants to leave their agro-pastoralist lifestyle to switch to a more profitable and/or stable employment (in this instance, fishing). This switch in employment would have diminished human impacts on coastal agricultural and forest ecosystems, but intensified pressure on the marine resources of Coiba National Park. The possibility that coastal agricultural and economic conditions are determinants of the number of resource-users exploiting the resources of Coiba National Park raises the imperative of developing a thorough understanding of these conditions to improve the management of the park. To test this hypothesis, a land-use, land-management, and land-productivity assessment of coastal lands was undertaken, starting from the years preceding the switch. In addition, a socio-economic assessment of local fishing and agro-pastoralist populations over time was undertaken, with a particular focus on resource management determinants, employment patterns, and park management policies.

Chapter 2: Literature Review

2.1. Introduction to the literature review

To address the four objectives of this study, a literature review was conducted, divided in three different topics. The first part discusses the importance of understanding socio-economic and environmental determinants that influence natural resource extraction patterns and income generation strategies in coastal communities. The literature reviewed in this part aims to provide the appropriate background information to address the first two objectives of the study. The second part of this literature review discusses the science of marine protected areas, the operative framework under which Coiba National Park has been managed since its establishment. Particularly, this section addresses the achievements and limits of marine protected areas in adjusting to changing socio-economic and environmental conditions and in achieving conservation objectives. This second section of the literature review will mainly serve to analyze CNP's past and current management policies, and how such policies have been able to address changing socio-economic and environmental conditions. Finally, the third section of the literature review addresses the aspects of integrated coastal management, a multi-dimensional management approach to conservation that enhances the understanding of ever-changing anthropological and physical processes, and how they interact in marine and coastal zones. This part has been included in order to build a basis for the discussion and recommendation sections.

2.2. Coastal economies and employment patterns

A thorough understanding of the economic and social processes of coastal zones is essential for effective conservation endeavours in marine and coastal ecosystems, as close to two thirds of the world's population inhabit coastal zones. For centuries, coastal zones have

been exploited for economic growth, resource extraction, tourism, and urbanization (Fabbri, 1998). Increasing population pressure and abusive exploitation of coastal zones have resulted in a multitude of environmental impacts, such as deforestation, land degradation, coastal erosion, sedimentation, eutrophication, and overall reduction of marine and coastal biodiversity. Such problems have raised the necessity to increase planning and management efforts in coastal areas to ensure that human development does not compromise the long-term sustainability of the resources they encompass. The literature abounds with case studies stressing the importance of understanding the interactions between coastal communities, employment and resource-extraction patterns to enhance the conservation of marine and coastal natural resources (see Alder *et al.*, 1994; Gibson *et al.*, 1998; Fabbri, 1998; Sandersen and Koester, 2000; Westmacott, 2002). Sanchirico *et al.* (2003) have stated that conservation endeavours such as marine protected areas should strive to better represent the complex ecological, socio-cultural, and economic contexts in which they operate. Yet, the challenge of understanding the complexity of livelihood dynamics in tropical areas is significant, as the high diversity of natural resources found in such environments promotes the development of a wide array of economic activities, including fishing, agriculture, hunting, and logging (Tasaki *et al.*, 2001; Westmacott, 2002).

There is a scarcity of scholarly articles discussing the dynamics of coastal livelihoods and the strong ties that link fishing and farming in many coastal economies. Notably, few authors have documented how the combination of these two extractive activities affects the planning and management of coastal zones. Christie and White (2000) and Fauzi and Buchary (2002) have both argued that unsustainable agricultural and fishing practices are important drivers of coastal environmental changes in developing countries. Pido *et al.* (1996) discusses the strong ties that coastal inhabitants of the Philippines hold to both farming and fishing, and documents several instances in which communities switched from one extractive activity to

the other, which they attribute to land accessibility or economic necessity. On a similar note, Bailey (1988) found that in Indonesia, fishing acted as a social "safety valve" for landless peasants and the unemployed. Sarch (1996) discusses the "complementarity between fishing and farming" in Lake Chad, and stresses the importance of understanding farming-fishing livelihood dynamics in order to enhance the effectiveness of resource management policies. In a similar context, Takasaki *et al.* (2001) document the livelihood dynamics of riverine people of the Peruvian Amazon and argue that failing to understand such dynamics limits the ability of NGOs to develop effective strategies for the local management of natural resources.

In summary, a clear understanding of coastal resource extraction patterns is imperative in sound planning and management of marine and coastal zones. Such an understanding may be of greater importance in coastal areas where both farming and fishing activities are strongly intertwined, as the two activities affect distinct natural resources and require different management approaches.

2.3. Marine protected areas

To better understand the managerial framework in which Coiba National Park operates, it was felt that conducting an overview of the concept and science behind marine protected areas was necessary. Marine Protected Areas (MPAs) are growing in popularity worldwide and are seen as an effective tool to protect marine environments and manage the world's fisheries (Mascia, 1999; Agardi et al., 2003, Friedlander, 2003; Pomeroy et al., 2004). The first marine protected areas arose in conservation science in the early 20th century. By 1985, Silva et al. (1986) counted 430 MPAs worldwide, and by 1995, Kelleher et al. (1995) had listed some 1306 sub-tidal MPAs.

The most commonly used definition of MPA is the one given by the IUCN, which defines an MPA as: "*any area of inter-tidal or sub-tidal terrain, together with its overlying water and associated flora, fauna, historical, or cultural features, which has been reserved by*

law or other effective means to protect part or all of the enclosed environment" (Kelleher and Kenchington; 1991, p.13). However, the definition, purposes, and underlying concepts of MPAs are subject to debate (Agardy *et al.*, 2003). This is reflected by the large number of MPA definitions found throughout literature. DeFontaubert *et al.* (1996) define MPAs as "coastal or oceanic management areas designed to conserve ecosystems together with their functions and resources", whereas Eichbaum *et al.* (1996) state that marine and coastal protected areas are "areas of the coastal zone or open ocean (or both) that are the target of management for the broad purpose of conservation and sustainable use".

The myriad of MPA definitions has resulted in a great variation of MPA management and conservation objectives, and how each MPA prioritizes these objectives (Jones, 1995; Agardy *et al.*, 2003). While some MPAs adopt a restricting-usage approach (often called "no-take" MPAs[1]), prohibiting most or all extractive activities within their boundaries, others adopt multiple-use approaches, allowing the sustainable extraction of their resources. The fact that MPAs mean different things to different people has created a debate within the scientific community on what the essential elements of an effective MPA should be and how MPAs should be managed. Many authors advocate the need to adopt flexible and multi-dimensional approaches for the establishment of successful MPAs (Mascia, 1999; Elliot *et al.*, 2001; Pollnac *et al.*, 2001; White *et al.*, 2002), though much recent discussions in the North suggest that no-take MPAs can better achieve conservation objectives than multiple-use MPAs (Agardy *et al.*, 2003).

Several authors have articulated the advantages of no-take MPAs (also called marine reserves) for the management of fisheries and marine ecosystems preservation (see Lauck *et al.*, 1998; Bohnsack, 1999; Sale *et al.*, 2005). Advocates of no-take MPAs state that they can be effective tools to conserve biodiversity, protect marine habitats and fish stocks, and that

[1] Sale et al. (2005) define no-take MPAs as "a marine protected area within which extractive fishing activities are regulated (usually not permitted)"

they serve as precautionary measures against future overfishing. No-take MPAs are also said to increase the density, biomass and average size of target species within their limits, and in some instances, help supplementing fish stocks in fished areas by increasing larval supply spillovers (Willis et al, 2003; Sale *et al.*, 2005).

On the other hand, Willis *et al.* (2003) and Sale *et al.* (2005) argue that the science of no-take MPAs is limited, and that there is still much uncertainty about their potential benefits. For example, although theoretical studies exist on the mechanisms of spillover and recruitment within marine reserves, very few case studies have proven them (Sale *et al.*, 2005). Also, much debate has revolved around the minimum size needed for marine reserves to be effective fishery management tools (see Shipp, 2002; and Sale *et al.*, 2005). However, such attempts appear dubious. Many fish species have wide bio-geographical ranges and travel many kilometres annually to reach spawning groups or to respond to temperature fluctuations (Sale *et al.*, 2005). Some fish species' home-range might actually be too large to be effectively protected by marine reserves from being overfished. As mentioned by Sale *et al.* (2005, p.76), "the scale of [marine] reserves currently in place appears to be insufficient to accommodate the mobility of many such valuable groundfish species" like cod, snappers, or groupers. Hence, whether or not closing a marine area to extractive activities protects fish stocks from being over-fished and allows fish populations to re-grow is object of much debate.

While no-take MPAs have been successful in some parts of the North, they have been much less successful in the South (Elliot *et al.*, 2001; Castilla, 2003). Numerous authors have documented cases where MPAs in the South have failed to achieve their objectives because of their restrictive and non-inclusive approach towards park resource-users (Alder *et al.*, 1994; Elliot *et al.*, 2001; Capiniti *et al.*, 2004). As argued by Elliot *et al.* (2001), the imposition of a "core zone" or "strict reserve area" to an MPA may often become issue of conflict with local

resource-users. The case of the Wakatobi National Park in Indonesia illustrates well that adopting a restrictive approach to MPAs can seriously impede conservation efforts when local inhabitants highly depend on the resources they encompass (see Elliott *et al.*, 2001).

Though the science behind MPAs is torn by uncertainties, most will recognize that, if integrated in a broader management scheme, MPAs can play an important role in achieving marine habitat preservation and fish stock restoration. Still, the science behind the concept of MPA is lacking, and particularly for the more controversial no-take MPAs. The limits of MPAs raise the imperative to implement them with a broad understanding of the biological and socio-economic conditions in which they operate and of their potential impacts.

2.4. Integrated Coastal Management

Integrated Coastal Management (ICM) has become the strategy embraced by most environmental-decision makers to address the challenges of managing the world's coasts (Westmacott, 2002) and to overcome the limits of conventional sectorial approaches to coastal planning (Thia-Eng, 1993). As early as 1974, 13 nations had undertaken some 50 ICM efforts to improve the management of their coasts. Following the Rio Earth Summit of 1992, many more nations adhere to the principles of ICM as recommended in Chapter 17 of Agenda 21 (UNCED, 1992). Subsequently, international bodies and organizations such as the World Wildlife Fund, the International Union for the Conservation of Nature, the World Bank, the EU, the FAO, the OEDC, and the Inter-American Development Bank, all embraced the concept of ICM by developing tools and guidelines for the elaboration of ICM strategies. In 2000, Sorensen (2000) counted 380 ICM initiatives in some 92 nations and semi-sovereign states.

Numerous definitions have been put together for Integrated Coastal Management (ICM), also sometimes called Integrated Coastal Zone Management (ICZM) or Integrated Costal Area Management (ICAM). The UNEP defines ICAM as "an adaptive process of

resource management for sustainable development in coastal areas. Sustainable development requires that the quantity and quality of coastal resources are safeguarded in order that they not only satisfy the present needs but provide a sustained yield of economic and environmental services for future generations" (UNEP, 1995). Among all the definitions found in the literature, the one given by Westmacott (2002, p.69) summarizes best the concept of ICM:

> "ICM is a continuous, dynamic, iterative, adaptive, and participatory process in which an integrated strategy is developed and implemented for the allocation of environmental, socio-cultural, and institutional resources to achieve the conservation and sustained multiple use of the coastal zone while taking into account traditional cultural and historical perspectives and conflicting interests and uses"

What distinguishes ICM from environmental management and planning initiatives such as MPAs is that it adopts a systems perspective and multi-sectorial approach. ICM encompasses the management of all aspects of the coastal zone, including the management of existing economic activities, planned developments, and natural resource conservation and utilization. A successful ICM should maintain the functional integrity of coastal systems while facilitating the progress of multi-sectorial development, and should be able to reduce and deal with resource-use conflicts (Thia-Eng, 1993; Westmacott, 2002).

Many authors have raised the benefits of ICM. Ideally, a well developed ICM plan helps reducing damages caused by weather hazards, natural and human-induced coastal erosion, salinity intrusion and over exploitation of marine species and other aquatic resources. As a managerial strategy, it prevents unnecessarily reactive management by allowing problem anticipation, reduces the risks of cumulative impacts resulting from sectorial decision-making

processes, and minimizes transfers of problems from one sector to another. It also prevents the predominance of one sector at the expense of another and fragmented geographical planning (Sorensen, 1997). Its adaptive nature allows it to deal with changing socio-economic situations, technology, government policies, environmental conditions, and changing understanding of coastal processes and of human behaviour (Bower and Turner, 1998). In addition, ICM mitigates stakeholders and resource-users conflicts and provides mechanisms and tools to deal with them when they arise. Greater stakeholder participation fosters a more democratic management process and increase regulatory legitimacy and compliance by giving stakeholders a sense of ownership over regulations (Sandersen and Koester, 2000).

ICM efforts have been described and reviewed by many researchers and institutions (Thia-Eng *et al.*, 1997; Gibson *et al.*, 1998; Rijsberman, 1998; Olsen and Christie, 2000; Sandersen and Koester, 2000; Westmacott, 2002; Shamsul Huda, 2004). Overall, ICM initiatives have led to great advancements in participatory democracy, horizontal management (as opposed to top-down management), and institutional cooperation. Still, few ICM initiatives have fulfilled all their initial objectives (Westmacott, 2002). The relatively young history of the concept, combined with the lengthy time-frame of the exercise, might explain the lack of successful examples of ICM implementation.

In an evaluation of eight ICM initiatives undertaken in Southeast Asia, Thia-Eng (1998) found that after some 13 years, only one had achieved most of its initial objectives. Failures were partly attributed to project design and partly because of ambiguities regarding the role of participating stakeholders had to play in the project. In an analysis of the Soufriere Marine Management Area of St. Lucia, Sandersen and Koester (2000) show that ICM conservation objectives are likely to be achieved if managing authorities incorporate resource-users in planning and management activities. However, they point out the risk that rule compliance can easily cease if resource-users are only partly or temporarily including in the

process, which could eventually lead to the collapse of the whole initiative. Other ICM initiatives show more promising results. In Xiamen, China, Thia-Eng, Yu & Guoqiang (1998) analyzed an on-going ICM initiative which has been serving as a demonstration site for the GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas. Based on a Strategic Environmental Management Plan involving local governments, universities, local media, research institutions, and various national government agencies, the Xiamen ICM initiative has been showing promising results. Since its establishment, it has put in place an effective marine management and coordination mechanism, foster legislation improvement, formulated a joint marine pollution monitoring program, and made important advances in information dissemination and human capacity building.

Although only a few examples of ICM have been qualified as successful by experts in the field, it is important to mention that no common criteria to evaluate the success of ICM initiatives have been agreed upon. Also, implementing a full ICM cycle is a lengthy process, and pre-emptive judgments on ICM's efficiency to achieve sustainable management of marine and coastal zones may be precipitated. Recent works by Christie and White (2000), Sorensen (2000), and Westmacott (2002) have contributed significantly to understanding the causes behind ICM failures and provide invaluable guidance to avoid repeating them in the future. Also, the adaptive and iterative nature of ICM ensures that existing efforts can only improve over time.

Chapter 3: Policy framework and Study Setting

3.1. Coastal development in Panama

With its 75 517 km² of land surface and its 1287 km of Caribbean and 1700 km of Pacific coastline, the Republic of Panama has the highest ratio of coastline to national territory of any continental country of the Americas (Suman, 2002; see Annex 1). About 80% of Panama's 2 839 177 inhabitants live in the Pacific lowlands and coastal zones (Suman, 2002). Characterized by a much less rainy and less humid climate than the Caribbean coast, the Pacific coast of Panama offered, from its early development, a more suitable environment for human development. Its relatively flat physiography allowed for the wide-scale development of cattle ranching and agricultural activities, something the Caribbean coast was less suited for.

Most of Panama's 170 000 ha of mangrove forests grow along the Pacific coast, especially around the numerous estuaries found on this side of the isthmus (Suman, 2002). The marine ecosystems of Panama's pacific coast are among the richest in the Americas. Together, they form an important part of a biological corridor linking the Galapagos Islands to the Coco Islands of Costa Rica, where numerous cetaceans and fish species transit every year. Some of the most important fishing ports, such as Panama City, Puerto Vacamonte, Puerto Vidal, Puerto Mútis, and Puerto Remedios, are located on this side of the Isthmus (see Moretti, 2002). On the other hand, the Caribbean coast has a fairly low level of urban development, and is characterized by high number of species-rich habitats such as fringing mangroves, estuaries, coral reefs, seagrass beds, and sandy beaches (Suman, 2002).

3.2. Marine and Coastal Zones Management in Panama

Article 2 of Decree Law No.7 (1998) lays down the concepts of coastal management in Panama and gives a broad, though perhaps unclear, definition of what the coastal zone of Panama represents ("the interface between land and sea"), and of shoreline ("coastal zone adjacent to the high water line whose landward extension depends on the designated public use assigned in an Integrated Coastal Management program according to the appropriate criteria") (Suman, 2002). Law No.7 also offers a definition for ICM, stating that it consists of "a process that unites government and communities, science and management, public and private interests in the preparation and implementation of an integrated plan for conserving and developing coastal resources and ecosystems".

Coastal zone activities and coastal zone management in Panama fall under the responsibility of a myriad of government agencies, including the Panamanian Maritime Authority (Autoridad Marítima de Panamá - AMP), the National Environmental Authority (Autoridad Nacional del Ambiente - ANAM), the Panamanian Tourism Institute (Instituto Panameño de Turismo - IPAT), the Ministry of Agricultural Development (Ministerio de Desarrollo Agropecuario - MIDA), the Ministry of Commerce and Industry (Ministerio de Comercio e Industria - MICI), the Aqueduct and Sewage Institute (Instituto de Acueductos y Alcantarillados Nacionales - IDAAN), and the Ministry of Health (Ministerio de Salud / MINSA).

Many of these agencies have overlapping responsibilities and therefore, coordination among agencies is necessary (Suman, 2002). As defined by the General Environmental Law (Law no.41 of July 1, 1998), fishery management in Panama is shared responsibility of both the AMP and ANAM. The law recognizes AMP's primary authority over wetlands and marine and coastal resources, though ANAM has the ultimate responsibility to oversee that AMP develops regulations that ensure sustainable fishery practices (Suman, 2002).

Ultimately, Decree Law No.7 defines the Directorate of Marine and Coastal Resources, a branch of AMP, as the main coordinating body for all management activities taking place in marine and coastal zones, which includes a coastal strip of 200m wide measured from the highest high water (Suman, 2002).

Although current legislation clearly recognizes the importance of adopting integrated coastal management for marine and coastal zones, there are no existing nationwide ICM programs in Panama. However, some regional pilot projects are currently underway in two provinces (Darién and Bocas del Toro). As raised by Suman (2002), although AMP appears to be the government body that should be overseeing the development of ICM programs, its coordination mandate is ill-defined and leads to confusion. Current legislation is particularly unclear with regards to which agencies should coordinate ICM activities, how agencies should develop such coordination, and which activities should agencies coordinate. Current marine and coastal zone legislations do not establish the necessary legal framework for the Directorate of Marine and Coastal Resources to effectively coordinate management activities among the different agencies concerned. This might be the missing element preventing the achievement of Integrated Coastal Management in Panama (Suman, 2002).

Responsibility overlaps between the different government bodies operating in marine and coastal areas are significant in the jurisdiction over coastal zone management. While AMP is officially responsible for the management of the coast line (and the 200m wide terrestrial strip it encompasses), coastal zone development and the management of most coastal resources fall under the jurisdiction of other government bodies. For instance, protection of forest resources, such as mangroves, falls under ANAM's authority, although mangroves are predominantly located within the 200m of coastline over which AMP has jurisdiction. Such overlaps also exist in areas where agricultural and cattle ranching activities

developed within the 200m coastline strip. In such cases, both AMP and MIDA have legal authority over the area, raising the need for coordination and legislation harmonization.

3.3. Marine and Coastal Protected Areas Management in Panama

The management of marine and coastal protected areas in Panama has been afflicted by similar problems. Currently, the National System of Protected Areas (*Sistema Nacional de Áreas Protegidas* / SINAP) of Panama overseas two Marine National Parks (Gulf of Chiriqui and Isla Bastimentos), four National Parks with ocean areas, a few wildlife refuges with oceans areas, and four coastal Ramsar sites[2]. Yet, although marine protected areas such as Coiba National Park have been established for more than a decade, their sustainable management has yet to be achieved (see Moretti, 2002). Moreover, no MPAs have yet been integrated in an integrated coastal management program.

As in the case of marine and coastal zones, important jurisdiction overlaps between the various government agencies involved in the management of marine and coastal protected areas exist and impede sound management. In effect, while AMP holds responsibility for managing marine and coastal resources and of ensuring legislation application in marine and coastal zones across the country, such responsibilities are assumed by ANAM in marine and coastal protected areas. Specifically, ANAM is responsible for the planning, management, conservation, and protection of marine and coastal protected areas, and must assume responsibility over rule application, rule compliance, and rule enforcement. Many of the regulations ANAM is in charge of developing and applying in marine and coastal protected areas relate to fishery management. Yet, these are two fields of competence for which AMP appears to have more experience and resources to accomplish well.

[2] Wetland protection sites established after the Convention on Wetlands, held in Ramsar; Iran, in 1971.

To date, few studies have assessed ANAM's effectiveness in the management of marine and coastal protected areas in Panama. In a study examining coastal management policies in Panama, Suman (2002) argues that the ambiguity of ANAM's mandate and its lack of coordination with AMP greatly impede the effective and integrated management of coastal zone activities in Panama. Similarly, Moretti (2002) argues that increasing instances of illegal fishing in Coiba National Park are partly due to ANAM's inability to ensure rule application and enforcement within the park.

3.4. Coiba National Park

3.4.1. Physical aspects

The Panamanian assembly created Coiba National Park by decree on December 17, 1991 through Resolution no. 021-94. Coiba National Park is located in the Gulf of Chiriquí, off-shore of the south-western tip of the Veraguas Province (see Annex 2). The park encompasses 270 125 hectares of both oceanic (80%) and terrestrial (20%) territory, including Coiba Island and 38 smaller islands.

CNP is one of the greatest remaining natural treasures of Panama (Castroviejo & Ibáñez 2001). In 2002, CNP joined the Pacific Biological Corridor, linking the Galapagos to the Cocos Islands of Costa Rica, and has been recently established as a UNESCO World Heritage Site (as of 2005). Eighty percent of Coiba Island's forests are primary, and its diverse ecosystems include an important variety of endemic birds, mammals and plants. Preliminary botanical surveys conducted by Castroviejo & Ibáñez (2001) suggest that there are about 1450 species of vascular plants on Coiba Island. Studies by Ibáñez and Cabot (1997) revealed that Coiba hosts some 147 species of birds. Four cetaceans frequent the waters of CNP, and another nineteen visit occasionally (Aguilar *et al.* 1997; de la Riva 2001). Coiba Island is adjacent to the Ensenada María coral reef, the second largest reef in the entire eastern

Pacific, covering 160 hectares (Glynn & Maté, 1997). In recent studies, Guzman *et al.* (2004) observed 22 coral and 34 octocoral species, and demonstrate through satellite imagery analysis that 1 700 hectares of coral reefs and coral communities are found in the park.

3.4.2. Current management plan

Coiba National Park's first and current management plan was drafted by two foreign agencies; the *Agencia Española de Cooperación Internacional* (AECI) and the *Dirección General para la Conservación de la Naturaleza* (ICONA), along with ANAM (then known as the *Instituto Nacional de Recursos Naturales Renovables* - INRENARE). CNP's original management plan was approved by the government assembly on July 9th of 1996, through Resolution no. 17-97. (see AECI, ICONA, and INRENARE, 1996).

The plan, drafted originally in Spanish, includes six main objectives (author's translation):

1- Determine the limits of CNP

2- Establish a zoning system to divide the different areas of the park into conservation and public use areas.

3- Develop a detailed plan for scientific investigation and establish guiding priorities to follow for investigation work and control and monitoring activities.

4- Regulate existing activities in Coiba National Park

5- Adapt the current public-use system to ecotourism development

6- Define the infrastructure and management strategy of Coiba National Park

The plan established Coiba National Park as a marine protected area with five distinct user-zones. *Zone 1* is reserved for scientific investigations and includes both marine and terrestrial regions; *Zone 2* is reserved for eco-tourism usage and development; *Zone 3* is designed for "extensive use", which includes environmental education and interpretation

activities where fruit and wood collection is permitted for Penal Colony[3] usage; *Zone 4* is reserved for "controlled usage" and was established as an extractive zone to ensure food self-sufficiency for the penal colony and future ecotourism infrastructures; while *Zone 5* is designed for "special usage", and is reserved for existing penal colony installations and for future infrastructures "necessary for the proper development" of Coiba National Park. Non-commercial extractive activities such as logging, fruit gathering, and agricultural activities to meet the necessities of the penal colony staff and occupants are allowed, as well as for the construction, maintenance, and functioning of pre-approved eco-tourism projects. Hunting is prohibited and is considered to be "against the spirit of the park", and so is extractive diving. Recreational, traditional, and artisanal[4] fishing for commercial ends are allowed in certain zones of the park and are subject to various restrictions. Though CNP original management plan does not provide a map of the different usage zones, a map showing the limits of the different marine usage zones can be found in Annex 3 (map provided by Dr. Maté, Smithsonian Tropical Research Institute).

According to CNP's original management plan, artisanal fishing is only allowed in the "extensive use" zone *(Zone 3)*, and is limited by a certain number of rules. Artisanal fishermen wishing to fish in delimited zones must register their boat at the park's station or at the ANAM office in Santiago. The only pieces of equipment they are allowed to use are "líneas" and "cuerdas" with hooks, which are respectively nylon monofilament and braided nylon cord. Any other kind of equipment such as fishing nets (locally called "trasmallo"), harpoons or sticks are prohibited. The only species allowed to be catch are pelagic fish and littoral fish "peces de roca". Failure to comply with these rules results in the revoking of the

[3] From the late 1920s up until 2004, a penal colony was operating on Coiba Island, the biggest island of CNP.
[4] Though CNP's original management plan establishes a set of rules under which artisanal fishing can be practiced, it does not give a definition for it. However, the recently adopted Law No. 44 (2004) defines artisanal fishing as: "Fishing that is done in coastal areas, using traditional fishing techniques, with boats not exceeding 30 feet and powered by a motor of 55 horse power or less. Such fishing usually does not rely on the use of high-tech fishing equipment" (author's translation)

vessel's fishing permit for "a reasonable period of time", which varies according to the gravity of the infraction.

Educational material produced by ARAUCARIA, AECI, and ANAM (2001) have attempted to delimit a buffer zone to Coiba National Park that includes 21 *corregimientos* located on the coast of the province of Veraguas, and the *corregimiento* of Remedios, located in the province of Chiriqui (see Annex 4). Although CNP's management plan does not call specifically for the design of a buffer zone, Article 3.7 addresses the relationship between surrounding communities and the park. It is divided in four main points. Point 1 mentions that park management authorities will work to maintain "fluid and cordial" relations with communities located around the park. Point 2 states that a system will be developed and implemented to promote sustainable development in communities adjacent to the park, with special attention to communities that have traditionally maintained a close socio-economic linkage to the natural resources of the park. Point 3 states the necessity of creating an environmental education programme for surrounding communities, and point 4 mentions that the park management authority will work to train local people for park managerial positions or for ecotourism related work. In addition, Article 3.7 recognizes the importance of including residents from nearby communities in the management of the park and in the development of tourism-related activities. Yet, the measures to achieve these objectives are not outlined.

CNP's management plan is particularly unclear with regards to which organization should assume the responsibility over the development and implementation of integration measures in CNP resource-user communities. The plan states that "park management authorities" (thus ANAM) should assume this responsibility. Interestingly, CNP coastal resource-user communities are all located outside the limits of CNP, an area that falls outside ANAM's legal umbrella. Technically, management and planning activities in the unofficial buffer zone of CNP fall under other agencies' responsibility (AMP or MIDA for instance),

and ANAM only needs to ensure that these agencies' activities conform to applicable environmental legislations. Yet, although CNP's management plan intends to design and implement a "set of actions" to foster sustainable development in resource-user communities (Article 3.7., Point 2), neither AMP, nor MIDA were involved in the drafting of the plan, nor have they been cooperating with ANAM in the planning and management of CNP's buffer zone. CNP's buffer zone thus finds itself in a legislative fog, somewhere in between the ambiguous institutional commitments of the management plan, and the unclear management and planning role AMP and other agencies are responsible to exercise in the buffer zone of CNP.

The vagueness of CNP management plan, combined with the various legislation overlaps and coordination problems between ANAM, AMP, and other government agencies that could play a greater role in the planning and management of coastal zones in Panama might explain why few measures of CNP's original management plan have been implemented. Between 1996 and 2004, only three significant measures or programs recommended in the management plan were developed: [1] a socio-economic need assessment study of the *corregimiento* of Bahía Honda conducted by the *Asociación para la Promoción de Nuevas Alternativas de Desarrollo* (APRONAD) in 2000 (see APRONAD, 2000); [2] an environmental education program conducted by the AECI through the ARAUCARIA initiative conducted between 2001 and 2004, (the *Asociación Nacional para la Conservación de la Naturaleza* (ANCON) is now in charge of continuing the program); [3] and an ongoing training and patrolling support program for park guards initiated in 2002 by MarViva in collaboration with ANAM and ANCON.

3.4.3. Recent legal developments

In the past year, the adoption of Law No.44, 2004 remodelled Coiba National Park's legislative framework in several ways, mainly through the creation of a Directive Council (Consejo Directivo) and a scientific committee. Among the most important changes brought by Law No. 44, Article 15 calls for the revision of the actual management plan, a duty to be assumed by the newly created scientific committee. Though the scientific committee will be in charge of developing CNP's new management plan and formulating recommendations for sound management of the park, the Directive Committee will ultimately be in charge of approving the plan. Composed of members of the national government (ANAM, AMP, IPAT, Ministry of Justice), members of the scientific community, elected representatives from five districts of CNP's buffer zone, one representative of sea product exporters, and one representative from each fishermen association, the Directive Committee will also be in charge of establishing CNP conservation agenda and ensure that the new management plan is carried through. In addition, Law No. 44 establishes a special zone of marine protection, annexing a large area of protection to CNP's current limits which includes Isla Montuosa and Banco Hannibal (see Annex 2). To support the creation of the new special zone of marine protection, Article 12 calls for the establishment of a special commission to establish the necessary legislation for the sustainable management of fisheries within the special zone. As a precautionary measure, Article 11 establishes a core zone within the special zone of protection where the use of nets (redes de cerco) for tuna fishing is forbidden.

Following the adoption of Law No.44, temporary fishing laws were also established in Coiba National Park through Resolución AG-0118 (2005), which will be in place until the new management plan is adopted (which should take about 3 or 4 years, (Capson, pers. comm., 2005). Notably, Resolución AG-0118 (2005) states that all fishing vessels must obtain a fishing permit to park authorities (free of charge) every time they wish to enter the park,

which can only be granted to vessels that were already registered in CNP's artisanal fishery registry book of CNP before Law 44 was adopted in July 2004. Artisanal fishing vessels can only apply for a maximum of two fishing permits per month (each valid for 8 days), and boats caught fishing illegally in CNP or that carry an unsettled infraction record will not be allowed to obtain a fishing permit. Fishing zones remain unchanged and fishing equipment such as long-lines, fishing nets or harpoons remain prohibited. Diving is also strictly forbidden, and artisanal fishermen are only allowed to fish certain species. The capture of sharks, sea turtles or langoustes is also forbidden, and all by-catches must be returned to sea and reported to park authorities after each fishing trip.

3.5. The *corregimiento* of Bahía Honda

3.5.1. Geography and climate

The *corregimiento*[5] of Bahía Honda is located at the south-western tip of the province of Veraguas, and is one of the ten *corregimientos* comprised in the district of Soná (see Annex 5). Its proximity to the park makes it a zone with very high potential for tourism development (APRONAD, 2000). With a total land surface of 172.2 km², the *corregimiento* of Bahía Honda is delimited to the North by the *corregimientos* of Pixvae, Cativé and Calidonia, and to the East by the *corregimientos* of Guarumal, and Rio Grande. The topography of the area is characterized by small mountains, hills, and valleys that stretch along the coast. The area is relatively isolated from the rest of the district, and is almost exclusively accessible by boat, although some will access the area by horse when roads are passable during the dry season. Its climate is tropical humid, and the area receives more than 2 500mm rainfall a year, with months receiving under 60mm of rainfall (APRONAD, 2000). The *corregimiento* of Bahía Honda includes two main rivers; *Rio Managua* and *Rio Gatos*, and a small numbers of islands of which two are inhabited: Isla Talón (locally known as Isla de Bahía Honda), and Isla

[5] In the Republic of Panama, a *corregimiento* represents the smallest political-administrative unit.

Canales de Tierra. The soils of the Bahía Honda *corregimiento* are acidic and characterized by low levels of fertility, though available soil maps indicate the presence of some scattered patches of alluvial, more fertile soils near river banks (see Annex 6; source MIDA, Santiago office).

3.5.2. Demography and Socio-Economic Situation

The Bahía Honda *corregimiento* has a population of approximately 1 287 inhabitants (population density of 7.47 inhabitants per km²) divided into 37 communities[6] (Contraloria General de Panamá, 2001). Average community size is of 34.78 inhabitants (STDEV= 51.86, Median=16), with a range of 1 to 216 inhabitants. The most populous communities are El Zapote (216 inhabitants), Bahía Honda (187 inhabitants), Salmonete (170 inhabitants), Cativón (96 inhabitants), and Cabecera de Managua (77 inhabitants) (Contraloria General, 2001).

There are six primary schools in the *corregimiento*, but no secondary school. Parents who wish to send their children to high school need to send them to neighbouring communities or to urban centers. The literacy rate[7] is 78.83% and the average number of school years completed is of 3.6. (Contraloria General de la República, 2001). There is no electricity in the area, although some families have private generators. Most communities do not have access to potable water, and an important percentage of houses (64%) are built on dirt floors or do not have any latrine system (49%). With a monthly average household income of $US 74.2, most inhabitants of the area live in a state of poverty (Contraloria General de la República, 2001). Basic household economic indicators suggest a certain improvement in living conditions in the past decade (see Table 1).

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[6] In Panamanian national censuses, the word community is translated to *lugar poblado*. A settlement is defined as a *lugar poblado* when it comprises one household or more, and if it has a distinct geographical location.
[7] Population of 10 years and older (Contraloria General, 2001)

Table 1. Basic household socio-economics indicators - Bahía Honda *corregimiento* 1970-2000 (*Source: Censo Nacional de Población y Vivienda 1970, 1980, 1990, 2000, Contraloría General de la República)*

	1970	1980	1990	2000
Percentage of households without potable water	**95.8%**	**91.6%**	**86.6%**	**85.2%**
Percentage of households without a latrine system	**99.2%**	**95.9%**	**90.0%**	**49.2%**
Percentage of households with a dirt floor	**87.8%**	**88.1%**	**78.2%**	**64.0%**
Percentage of households without electricity	**100.0%**	**100.0%**	**100.0%**	**95.1%**
Percentage of households without a radio	**51.5%**	**55.7%**	**56.1%**	**30.7%**

3.5.3. Employment

People of the Bahía Honda *corregimiento* subsist mostly from traditional activities such as agriculture and cattle ranching, and some combine the two to meet ends. In recent years, artisanal fishing has become an important economic activity in the region (see section 5.1), and so has construction wage labour for foreign land speculation ventures recently established in the area (see section 5.3.7.). Commercial logging was once an important economic activity in the area, but the sector disappeared in the late 1970s.

With 64.86% percent of the active working population[8] involved in farming and cattle ranching, these two activities are the backbone of the regional economy (see Table 2). The main crops grown in the area include corn, rice, red beans, lentils, manioc, ñame, otoe, coconut, plantain, and bananas. Cattle ranchers raise cows and/or pigs, and most families own chickens for household consumption. Table 2 shows basic summary statistics on agro-pastoralist activities in the Bahía Honda area.

[8] According to official Panamanian population censuses, an individual is of working age at 10 years old or older.

Table 2. Summary statistics on agro-pastoralist activities - Bahía Honda *corregimiento* 2000-2001
(source: Censo Nacional Agropecuario 2000 - 2001, Contraloría General de la República)

Summary statistics on agro-pastoralist activities in the *corregimiento* of Bahía Honda	2000-2001
Number of farms	**251**
Percentage of households owning or renting a farm	**95.08%**
Number and percentage of total population of working age (10 years and older)	**869 (67.52%)**
Number and percentage of working age population economically active	**370 (42.58%)**
Number and percentage of active working population involved in agro-pastoralist activities	**240 (64.86%)**
Number and percentage of agro-pastoralists, classified as agro-pastoral producers (land owners)	**230 (95.83%)**
Number and percentage of agro-pastoralists classified as wage labourers	**10 (4.17%)**

As we will discuss in more depth later in this work, artisanal fishing has become an important economic activity for many families of the area in recent years (see Chapter 5). Yet, there is little official information available on the importance of artisanal fishing in the regional economy. According to AMP, the province of Veraguas counted 44 fishing communities in 2002, and had 1 108 artisanal fishing boats anchored along its shore, representing the second largest fleet of artisanal fishing vessels of the country after the Province of Panama (Maté, 2005).

3.5.4. The Bahía Honda *corregimiento* and Coiba National Park

The *corregimiento* of Bahía Honda was selected over other *corregimientos* of the buffer zone for three main reasons. First, the immediacy of the area to CNP (see Annex 4) makes its inhabitants particularly sensitive to any management and planning activities that restrict resource extraction activities in the park. Second, as tourism is predicted to develop in the region, it is likely that the *corregimiento* of Bahía Honda will be impacted more than other

areas (positively and/or negatively) in several ways due to its proximity to the park. Third, as previous studies showed, artisanal fishermen of the *corregimiento* of Bahía Honda hold a particular relationship to the waters Coiba National Park and are amongst the fishermen who exert the greatest pressure on the marine resources of CNP (see Moretti, 2002). Hence, it was felt that getting a detailed understanding of resource management decision-making processes, resource extraction patterns, and livelihood dynamics in such a sensitive area could help identifying the broader conditions in which CNP's and CNP's buffer zone operate. According to the principles of ICM, a thorough understanding of these conditions could enhance the management and conservation of Coiba National Park.

Chapter 4: Methodology

4.1. Introduction to the methodology

A wide range of methods was used to collect the information needed for this study. Data were gathered over three different periods spread over two years. Preliminary data collection was conducted in Panama during March and April 2003, while the rest of the data collection was carried during March and August 2004, and February and June 2005. Field work in selected communities was conducted between May and August 2004, and in April 2005. The research methods developed by Bernard (1995) were used to build the methodology used during the carrying out of the study, and the survey guidelines of Fink (2003) were used to develop the questionnaires utilized during semi-structured interviews. The different methods used to collect data were (in chronological order):

1. Collection and analysis of relevant literature and government documents on the study area;
2. Interviewing of government officials, NGO workers, and scientists with knowledge of the area;
3. Focus groups in six communities;
4. Non-structured interviews and informal conversations with residents from three communities selected for more in-depth study; and,
5. Semi-structured interviews with selected agro-pastoralists and fishermen of the three studied communities;

4.2. Analysis of literature and government documents

Various official documents released by the national census bureau (*Contraloria General de Panama*) and from the Panamanian Environmental Authority (*Autoridad Nacional del Ambiente* – ANAM) library were used in this study. Scientific papers and unpublished

documents from NGOs and government agencies were also consulted. Population and agricultural censuses[9] from 1970 to 2000 were gathered and analyzed. Forest cover data from 1986, 1992 and 2000 were obtained from ANAM and subsequently analyzed. Soil maps were provided by MIDA regional office in Santiago, and digital map land use information of the Bahía Honda *corregimiento* was obtained from the PRONAT[10] initiative (*Programa Nacional de Titulación de Tierra*). Reports by APRONAD (2000) and Moretti (2002) provided important background information about the study area.

4.3. Non-structured interviews with government officials, researchers, and NGO representatives

Prior to visiting any communities, a number of non-structured interviews were carried out with government workers, researchers, and NGO workers who had been working in the area. Interviews served to develop background information on the area, and to get a sense of current dynamics between coastal communities of the study area, park authorities, and the various organizations working on conservation and development issues around CNP. Interview results also served in the development of focus group questions (see Section 4.4.). Government officials from MIDA, IDIAP (Instituto de Investigación Agropecuaria de Panamá), ANAM, Probreza Rural y Recursos Naturales, and PRONAT were interviewed, as well as NGO representatives from Conservation International (CI), MarViva, ANCON, APRONAD, the Peace Corps, and ARAUCARIA. Researchers from the Smithsonian Tropical Research Institute and from the National University of Santiago were also interviewed.

Key themes were addressed in each interview, although no specific set of questions was used. Questions aimed to find: the form of government involvement in the area; the

[9] Detailed population censuses are available for the years 1970, 1980, 1990, and 2000. Likewise, detailed agricultural censuses are available for the year 1970, 1980, 1990-1991, and 2000-2001 harvest years.
[10] PRONAT is an ongoing World Bank funded program, administered and executed by the Panamanian government that aims at facilitating land titling across Panama.

existence and nature of agriculture-oriented and fishing development projects in the area since the creation of CNP; the type of strategies developed to integrate people from the buffer zone of CNP into the management of the park; the nature and level of cooperation between NGOs, government bodies, and local residents with regards to park management programs; expectations of residents from the buffer zone towards their local government and towards other organizations working in the area; and, the most important problems they had encountered when working in CNP and its surroundings.

4.4. Focus groups

Six focus groups were conducted over a one-week period in May 2004. Focus groups were conducted on the Island of Bahía Honda (83 households)[11], Salmonete (33 households), Cativón (27 households)[12], Cabecera de Managua (14 households), Corotú (4 households), and Mamey (5 households), selected for their relatively high population size (Contraloría General de la República, 2001). Though official census data from 2001 state that Cativón is only composed of 4 households, a focus group was realized in that community after residents of the area mentioned it was comprised today of about 15 households. The focus group conducted in Mamey was not planned, but an unexpected visit to the community provided the opportunity to realize one. The location of each community can be seen in Annex 5.

Focus groups were conducted with a variable number of community members, generally with community leaders or resourceful-residents such as store-owners or elders. A set of 20 basic open-ended questions was developed for the realization of these focus groups and can be found in Annex 9. Focus groups were carried out in a non-structured interview format, and were generally held in popular gathering places such as around local stores, schools, or churches. Notes were taken during the event (which I led), and a tape recorder was

[11] Including the community of Bahía Honda, El Zapote, and Leon Abajo (see Section 4.6.)
[12] Including the community of Cativón, Cativito, and Playa Lagarto (see Section 4.6.)

used to allow subsequent verification of notes. Focus groups aimed primarily at getting a grasp of salient resource management patterns, employment issues, and park and people relationships, and provided guidelines for the development of the two questionnaires that were later carried out during one-on-one, semi-structured interviews, with agro-pastoralists and fishermen from selected communities (see Section 4.6.). Focus groups also served in the selection of the three communities targeted for more in-depth study and were a useful exercise in evaluating the sense of receptivity of communities towards having a researcher working in their community.

4.5. Non-structured interviews with community residents

An important source of information was non-structured interviews with community residents. Interviews were usually carried out with randomly selected community residents and took the form of informal conversations on various topics. Conversations generally revolved around historical and economical aspects of studied communities, demographic changes, resource management strategies, social and political issues of importance, environmental changes, and employment patterns.

Notes were rarely taken during such informal conversations, as it was felt that community members would open up more if conversations were not recorded. Nonetheless, a note book was always on hand, and information obtained during such informal talks was quickly written down once the interviewee had left. On a few occasions, a note book was used during such informal interviews, particularly when conversation subjects involved numbers or when answers where highly detailed. In such cases, permission to take notes was requested.

4.6. Semi-structured interviews with agro-pastoralists and fishermen

Two distinct questionnaires were developed (see Annexes 10 and 11) and used during one-on-one, semi-structured interviews, one for fishermen and another for agro-pastoralists. Questionnaires were developed in collaboration with researchers from both McGill University and the Smithsonian Tropical Research Institute, and conformed to the Faculty of Agricultural and Environmental Sciences of McGill University Tri-council Policy Statement on ethical conduct for research involving human subjects. The survey design guide book of Fink (2003), and the questionnaire model developed by Cochran (2003) were used as references for the development of the two questionnaires. As mentioned earlier, focus group results also helped define the questionnaire's main themes and facilitated the refining of questions.

Questionnaires were used to gather both qualitative and quantitative base-line information on topics such as resource-use and resource-management, employment, income, social situation, perceived environmental conditions and environmental changes, migration, farming and fishing conditions. The questionnaire used to interview agro-pastoralists mainly served to carry a land use, land management, and land productivity assessment of the area, while the questionnaire used to interview fishermen mainly served to assess the reasons why some of them had left agro-pastoralism to switch to fishing and to obtain information on the effects Coiba National Park's regulations on their fishing activities. Fishermen were also interviewed on various topics related to their perception of the park and their relationship with park management authorities and NGOs operating in the area. Responses were compiled and used for both quantitative and qualitative analyses (see Chapter 5).

Questionnaires included both open-ended and multiple choice questions. Answers from open-ended questions were analyzed and then coded into categorical variables after interviews were conducted. Answers provided by at least two different respondents were put into a distinct category. Answers with only one hit were put in the "other" category. When

respondents provided more than one answer, all answers were recorded and put into distinct categories. In such instances, the total number of answers recorded is greater than the number of respondents. In other instances, some questions were not answers by all respondents, either because the question did not apply to the respondent's situation, or because the respondent did not know the answer to or refused to answer the question.

Following the development of the questionnaires, three test interviews (two with fishermen, one with a farmer) were conducted in two of the sampled communities to assess the relevance and phrasing of questions. Subsequently, some questions were rephrased or discarded, and a few were added. In total, 38 semi-structured interviews were conducted. Twenty-one interviews were conducted with fishermen and 17 with farmers and cattle ranchers. The community of Bahía Honda[13] (or Isla Talón; 83 households), Salmonete (33 households), and Cativón[14] (27 households) were selected after focus groups revealed that residents from these three communities subsisted from the three economic activities of interest to the study (farming, cattle ranching, and fishing), and because they had relatively large population sizes. The community of Bahía Honda was also selected because it had previously been identified as one of the most important fishing communities exploiting the waters of Coiba National Park (Moretti, 2002). Twenty households out of 83 (24%) were interviewed in

[13] According to the latest population census conducted by the Panamanian government (Contraloría General de la República, 2001), Isla Talón comprises three communities; Bahía Honda, El Zapote, and Leon Abajo. Those three communities share the same school, the same medical center, and the same churches. The physical division between the three communities is ambiguous, and there are strong interactions and family linkages between residents of the three different communities. Generally speaking, the people of Isla Talón do not identify themselves by the community they live in, but rather, identify themselves as "Bahía Hondeños", meaning that they live on, or are from, Isla Talón, which is locally referred to as "Bahía Honda" or "Isla de Bahía Honda". Hence, for the conduct of semi-structured interviews, households from the three communities were randomly sampled as if they were one big community. Respondents all happened to live in the communities of Bahía Honda or El Zapote, most likely because those two communities are the most populated of the island. For clarity purposes, the respondents who were interviewed on the island of Bahía Honda will simply be referred to as if they were from the community of "Bahía Honda".

[14] Like the communities of Isla Talón, Cativón serves as the nucleus community for two smaller adjacent communities; Cativito and Playa Lagarto. All together, these communities share the same school, and community life between them is strongly linked. For administrative purposes, school teachers of Cativón usually consider the households of these three communities as part of the community of Cativón. Hence, like in the case of Isla Talón, the three communities were sampled as if they were one bigger community, which we will refer to as the community of "Cativón".

the community of Bahía Honda, 9 households out of 33 (27%) were interviewed in Salmonete, and 9 households out of 27 (33%) were interviewed in the community of Cativón. In total, 37 households out of a sampling pool of 143 were interviewed (26% of households).

Respondents were selected using the following random-sampling method: For each community, a list corresponding to the number of households of the community, including the name of the head of family, was provided by the director of the community's local school. Every household was given a random number, and all numbers were put in a hat. Numbers were raffled, and selected household numbers were put on an interviewee list. The list was then reviewed by the local school director and my field guide, who would then confirm if at least one member of each selected household was engaged in fishing or agro-pastoralist activities. In negative, the household was discarded and another number was picked. In the affirmative, the head of the family was selected for the realization of an interview, unless someone else from the household (usually a son) was the one involved in agro-pastoralist or fishing activities. In that case, that person was interviewed. Only one person per selected household was interviewed.

Interviews were conducted in Spanish,[15] and answers were written in a note book during the interviews. No tape recorder was used during semi-structured interviews, since it was felt this would be too intrusive. Interviews were generally conducted in the interviewees' house, and sometimes in the interviewees' field in the case of agro-pastoralists. It was not uncommon to walk up to the house (or field) of a selected candidate only to find out they were not available for an interview. In such cases, a second visit was paid to the interviewee's house or field. After three unsuccessful attempts, a new candidate was selected following the same random sampling method described above.

[15] Spanish is the predominant language spoken in the Bahía Honda *corregimiento*.

4.7. Justification and limits of methodological approach

Open-ended questions were often preferred over multiple choice questions in the elaboration of questionnaires, as it was felt that they could shed more light, and perhaps, more interesting results than multiple-choice questions. Also, it was felt that respondents would provide more elaborate answers if they were not confined to respond within a pre-established set of answers. Nonetheless, the multiple-choice form was used for a few questions to later facilitate the realization of statistical analysis. Because the codification of open-ended question is often open to interpretation, we recognize the limitations this type of question might have for the realization of statistical analysis.

A few constraints prevented the conduct of more interviews. Limited time allocated to field work, difficult access to communities, bad weather (bad weather and dangerous navigating conditions made it difficult to reach the communities of Salmonete and Cativón, which are only accessible by boat), tidal variations (the community of Salmonete can only be accessed by boat when the tide is high) and early nightfall (for navigation security), are all factors that made it difficult to interview more subjects. Moreover, the random sampling method used for determining interview participants made the planning of interviews difficult, as they were highly dependent on interviewees' availability and physical location. Financial constraints prevented hiring a research assistant to help in the realization of more interviews. Yet, although conducting more one-on-one, semi-structured interviews could have added more statistical power to the study, it was felt that the sampling pool was large enough for conducting basic summary statistical analysis and to shed light on dominant trends.

Chapter 5: Results and analysis

5.1. Assessing the switch

There are very few cases in the literature reporting on situations where people have left their traditional economic activity such as farming or cattle ranching to start dedicating themselves to another traditional economic activity like fishing. Professions such as farming and fishing require quite distinct bodies of knowledge, and a relatively rapid switch from one profession to the other would involve certain technical difficulties. As explained below, many agro-pastoralists of the Bahía Honda *corregimiento* have – over the past three decades - made a switch to artisanal fishing without as many difficulties as one might have expected.

Of the 21 fishermen interviewed in the three communities selected for detailed analysis (representing 15% of households), all had either passed from a farming lifestyle to fishing or had seen their father make the switch during the course of their lives. Nineteen fishermen made the switch themselves (intra-generational switcher), and two turned to artisanal fishing after their father had switched (inter-generational switcher). On average, fishermen of the area have been involved in fishing for 11.17 years (STDEV = 5.28). Although the most experienced switching agro-pastoralists had been involved in artisanal fishing since the early 1980s, the majority of them (12 out 21; 57%) made a switch to fishing during the 1990s. The two most recent switchers interviewed turned to artisanal fishing between 2000 and 2002.

The lack of official data on artisanal fishing activities at the regional level and the impossibility (for time constraint) of surveying each household in the area makes it difficult to determine the exact number of coastal agro-pastoralists who made a switch to artisanal fishing since it was first initiated. However, estimations can be developed based on the fact that there

were not many economic alternatives available to switching agro-pastoralists of the area but artisanal fishing during the years of the switch. According to official population data, 42.58% of the Bahía Honda *corregimiento*'s population was economically active (548 inhabitants) in 2000, and out of them, 64.86% (355 inhabitants) were involved in agro-pastoralist activities (Contraloria General, 2001). Thus, 35.14% of the economically active population of 2000 was involved in an economic activity other than farming or cattle ranching. Assuming that about 5% to 10% of the population was engaged in one of the other marginal economic activity found in the area (store owners, teachers, middle-men, construction workers) [16], we can estimate roughly that about 25% to 30% of the economically active population of the Bahía Honda *corregimiento* had turned to artisanal fishing (equalling to about 137 to 164 fishermen) by the year 2000. Though such a figure is only an approximation, it is consistent with Moretti's data (2002) who documented the presence of about 80 artisanal fishermen in the community of Bahía Honda itself in 2000, which holds about half of the population of the *corregimiento*. Considering that interview results showed that other middle-size communities of the area (such as Salmonete, Cativón, and Corotú) also depend on artisanal fishing, it appears plausible that another 60 to 80 agro-pastoralist families made a switch to artisanal fishing over the past decades.

It is unclear whether the switch in employment was meant to be partial or complete when first initiated. In effect, many switchers interviewed reported practicing both agro-pastoralist and fishing activities in the first years after turning to artisanal fishing, and many mentioned having sold their land only a few years after making the switch. On average, switchers started selling their farmland about 7 years ago (n = 14, Average = 7.25, STDEV = 7.47), while most of them switched to fishing some 11 years ago. This suggests that, for about

[16] According to official population censuses from 1970 and 1980, between 5% and 10% of the economically active population of the Bahía Honda corregimiento was involved in another economic activity than farming or cattle ranching before costal inhabitants started turning to artisanal fishing. By taking a 5% to 10% range, we assume that the percentage of people employed in marginal economic activities has not changed much over time.

4 years, a certain number of agro-pastoralists might have planned to turn to fishing only partly and/or temporarily.

While this falls outside the scope of this thesis, several reasons may explain why agro-pastoralists kept their land for a few years after initiating artisanal fishing. First, coastal switching agro-pastoralists might have turned to fishing only to optimize their usage of available natural resources and to diversify their household economic strategy. Second, switchers may have kept their land for a certain time for security reasons, *i.e.* so they could fall back on farming or cattle ranching in case something went wrong with artisanal fishing. In that case, switching agro-pastoralists may have started selling their land only once they felt that artisanal fishing was enough of a stable/profitable economic activity. Third, some agro-pastoralists might have intended to turn only temporarily to artisanal fishing, thinking they could make a quick profit from exploiting the rich waters of Coiba National Park, and kept their land because they planned on eventually turning back to agro-pastoralist activities. It is also possible that some switching agro-pastoralists hold on to their land for a certain period of time as a financial asset or for inheritance purposes.

Whether or not the switch was first intended to be partial and/or temporary remains unclear. However, for most switching agro-pastoralists, the change of employment has been a complete one. In effect, most switchers interviewed reported having completely left agro-pastoralist activities and sustaining themselves primarily from artisanal fishing. Out of the 21 switching agro-pastoralists identified, five (24%) mentioned being involved in agricultural or horticultural activities still. Those who mentioned still being involved in agro-pastoralist activities either rent land or had a large home garden around the house, or worked as agricultural labourers for local cattle ranchers.

Under present conditions, the switch also appears to be irreversible. As Thomás Gonzalez, the director of the Bahía Honda primary school said to me, "Few people on the

island [Bahía Honda] still retain land on the coast, and most of the island is already inhabited, so a return to agriculture is not really an option for these people." In effect, only two switching agro-pastoralists interviewed still retain their original family land, and only three others mentioned owning land outside of the study area. At the moment, those wishing to turn back to farming could only do so by buying land from other coastal agro-pastoralists interested in selling, or by moving out of the area to find available farmland in other regions of the country. According to interview results, these are unlikely situations. As noted by Mirian Rodirguez and Lexiaira Marín - the PRONAT agents in charge of promoting land titling in the Bahía Honda area - most of the land put up for sale in the area is almost automatically bought by foreign speculators (see section 5.2.4.). Thus, even if other coastal agro-pastoralists were to sell their land, it appears unlikely that it would be bought by local inhabitants since foreign speculators can likely pay a higher price for land than what most locals can afford. In addition, few switching agro-pastoralists appear to have the desire to return to farming. Out of the 21 switchers interviewed, only one mentioned wanting to switch back to agro-pastoralists activities, and only two were thinking of moving out of the area to find better economic conditions elsewhere. It also appears highly unlikely that switchers wishing to go back into agro-pastoralist activities would attempt to squat state-owned land (a common occurrence in Panama) since there are no more state-own land available in the area but the 200m coastal strip where human development is forbidden by law (see Table 9 in Annex 7).

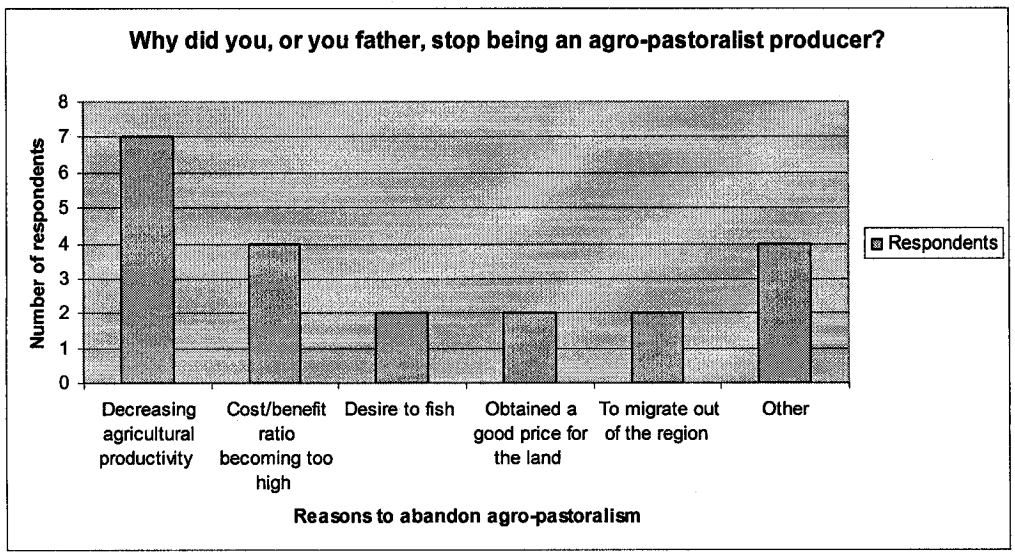
Considering that the most recent switchers turned to fishing some three years ago, it is also unclear at this point whether the tendency to switch to fishing is over or not. None of the non-switching agro-pastoralist interviewed (n=17) planned on turning to artisanal fishing. Yet, 62.5% (n=10) of them would consider changing economic activity if a better opportunity came up. However, the recent reinforcement of CNP fishing legislations makes it unlikely that

new agro-pastoralists would consider switching to artisanal fishing. The perceived declining productivity (and profitability) of fishing activities reported by many fishermen of the area may also deter other coastal agro-pastoralists from venturing into fishing (see section 5.3.6).

5.2. Why the switch?

Several factors contributed to "push" coastal agro-pastoralists of the Bahía Honda *corregimiento* out of farming and/or "pulled" them into fishing. As explained in more details below, the declining productivity of coastal farmlands and the increasing cost/benefit ratio of engaging in agro-pastoralist activities appear to be the two main factors that pushed agro-pastoralists of the area out from farming. On the other hand, the perceived attractiveness of fishing as a more profitable/stable economic activity, land speculation forces, and the general lack of alternative economic activities that characterize the region have seemingly contributed to pull agro-pastoralists into fishing. Such factors were obtained by directly asking switching agro-pastoralists: "Why did you, or your father, stop being an agro-pastoralist producer" (see Figure 1).

Figure 1. Switcher's responses to the question: *"Why did you, or your father, stop being an agro-pastoralist producer"*



5.2.1. Productivity decline of coastal agricultural lands

The perceived decline in coastal land productivity played an important role in pushing coastal inhabitants of the Bahía Honda region out of agro-pastoralism. Figure 1 shows that many switchers interviewed changed employment because they perceived a decrease in the productivity of their farm land (7 out of 21; 33%). Though such a figure does not hold much statistical power (because of the small sample size), information obtained during focus groups and non-structured interviews also support the idea that most agro-pastoralists of the Bahía Honda area turned to artisanal fishing after it was perceived that the productivity of their farm had decreased. This perceived decline in coastal land productivity was also observed in results obtained during interviews with non-switching agro-pastoralists. Indeed, 70.59% (n=11) of non-switching agro-pastoralists also believe that the productivity of their soils has decreased over time.

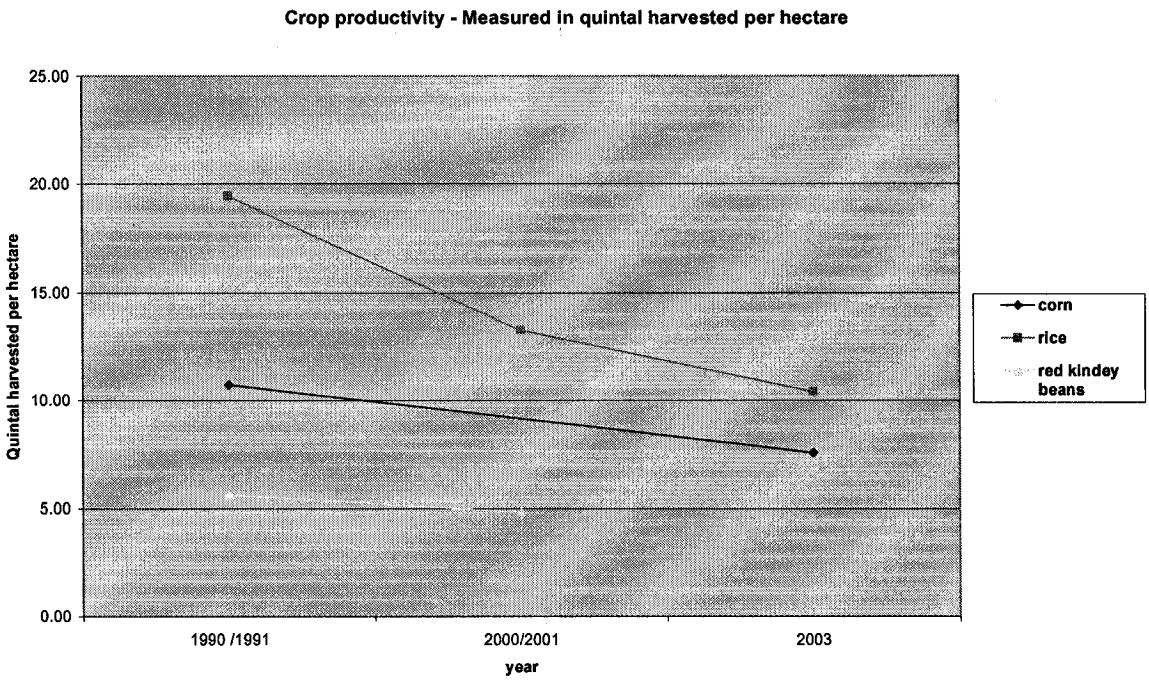
Accounts of coastal farmers having to fall on artisanal fishing after seeing the productivity of their land going down year after year are plentiful. Cirilo Santos, my field guide during my stay in the Bahía Honda area and an experienced fisherman, explained to me that unlike him, his father was involved in agro-pastoralist activities for all his life. Growing up, his family lived on the island of Bahía Honda but owned farmland on the coast. Everyday, they would cross the bay of Bahía Honda to go farm their field where they planted mostly rice, corn, and beans. His parents sold the family land when Cirilo was about 20 years old. He believes his parents left farming because, like many other families of the area, the productivity of their land had decreased over the years and had become too low to sustain his family. When his parents sold their farm, Cirilo turned to fishing. The life of Carlos Espinosas followed a similar path. He said to me: "My parents used to practice agriculture, but they sold the family land some 25-30 years ago because productivity was bad. They lived on the Island of Bahía Honda and would cross the bay everyday to farm our land in Salmonete. They were

not fishermen, but they fished around the island for consumption. Most people living on the Bahía Honda island were farmers before, but many sold their land because "*la tierra no daba más* (the land could not give anymore)". Though Carlos has been working for the enterprise established in Playa del Sol for about three years now (see Section 5.3.6), he had been a fisherman ever since his parents sold the family land. Two of Carlos's oldest sons have followed his path and now rely on artisanal fishing for subsistence.

To corroborate the perceived productivity decline of coastal farmland described above, a productivity assessment of farming activities in real terms was also intended, using both official agricultural census data and harvest information collected during interviews with non-switching agro-pastoralists. Unfortunately, the lack of government data and inconsistencies in survey methods only allowed the realization of a productivity assessment of farming activities for three harvest years and only for three of the main crops grown in the Bahía Honda area (rice, corn, and red kidney beans). Because no harvest data are available[17] for years preceding 1990, it was not possible to extend our productivity assessment so that it included harvest data for the early years of the switch. Still, because most switchers turned to fishing during the 1990s, it was felt that a productivity assessment from 1990 onward could indicate trends in Bahía Honda's coastal agricultural productivity and help determine whether it was linked to the switch of employment. A productivity assessment of three of the main crops grown in the area was thus conducted, measured in average yield per hectare cultivated. Data from the national agricultural censuses for the 1990/1991 and the 2000/2001 harvest years are shown (which include all farms of the *corregimiento* involved in cropping), along with farm output data from the 15 non-switching agro-pastoralists interviewed involved in cropping (see Figure 2).

[17] Switching agro-pastoralists could have been asked to provide output figures to assess the productivity of their past cropping and cattle ranching activities, but it was felt that this would have not shed very accurate results since many of them had left farming several years ago.

Figure 2. Crop productivity assessment for corn, rice, and red kidney beans – Bahía Honda *corregimiento* 1990-2003. *(source: Censo Nacional Agropecurario 1990 y 2000, MIDA; and 2003 harvest data collected during semi-structured interviews with the 15 farmers involved in cropping from the three studied communities)*



From Figure 2, we observe an average decline in productivity for three of the main crops cultivated in the area over a period of 13 years, suggesting a decline in land productivity in real terms. Because the above analysis is not supported by much empirical data[18], we recognize its limits. Yet, it demonstrates a trend that is consistent with the perceived productivity decline documented above.

The lack of government information also made it impossible to calculate a per hectare productivity index for cattle ranching activities for years before 1990. Table 3 shows that cattle ranching productivity in the region has remained more or less stable over the past 15 years or so, ranging under one head of cattle per hectare. However, as explained in more detailed in Section 5.2.5, switchers appeared to be predominantly agro-pastoralists who did

[18] Corn only shows results for two harvest years because of inconsistencies in the measuring units used for the 2000/2001 harvest with respect to the 1990/1991. Red kidney beans also show results for only two harvest years, since none of the farmers interviewed mentioned having planted or harvested beans in 2003.

not own cattle. As such, it is unlikely that changes in the productivity of cattle ranching activities played a role in fostering the employment switch.

Table 3. Productivity of cattle ranching activities – Bahía Honda *corregimiento* 1990-2001 *(Source: Censo Nacional Agropecuario1990-1991 and 2000-2001, Contraloría General de la República)*

	1990-1991	2000-2001
Heads of cattle	**2134**	**2 566**
Surface of pasture land (hectare)	**2883.65**	**3261.56**
Productivity (head per hectare)	**0.74**	**0.79**

5.2.2. Economic marginalization of the agro-pastoralist lifestyle

The increasing cost/benefit ratio of engaging in agro-pastoralist activities appears to be the second most important factor that pushed coastal inhabitants of the Bahía Honda region out of farming and cattle ranching activities. This second "push" factor is directly linked to the decreasing productivity of costal lands just discussed. In effect, as farmers were producing less, they had less to sell, and they were thus receiving less benefits (in cash) from being involved in farming activities. On the other hand, the costs faced by local farmers involved in crop commercialization have only been increasing over time, a situation worsened by the comparatively higher cost of living that characterizes the area over others.

As mentioned by Alcibiades Guerra, the MIDA technician assigned to the area: "...the isolation of the Bahía Honda region makes it hard for farmers to obtain gasoline for their boat to carry their crops to the market or to buy agricultural inputs and tools. Gasoline is hard to buy and is more expensive there than in nearby towns. Most travels in and out of the area have to be done by boat, and carrying people and goods have much higher gasoline related-costs than land transportation. It is much more expensive for farmers and cattle ranchers of the area of Bahía Honda to bring their products to the market...". Facing higher gasoline and

transportations costs, farmers of the area have had an economic disadvantage over farmers who have an easier access to regional agricultural markets by in-land transportation.

Accessing the market becomes even more expensive for farmers who do not own a boat and have to pass through a middle-man, a situation faced by most agro-pastoralists of the area who sell their crops. As Alfredo Barría explained to me: "I used to have an easier access to the market before, when there was more people around who owned a boat. Now, I cannot really access the market directly anymore." Five out of the 9 agro-pastoralists involved in crop commercialization (55.5%) admitted having to rely on a middle man to get their crops onto the market. Three of them mentioned doing occasional trips to town to sell their crops themselves.

By forcing people to depend on water transportation, the geographic isolation of the area not only makes it less profitable for farmers to take their products to the market, but it also inflates the price they have to pay for agricultural tools, agro-chemicals, and for all basic household consumer goods. As mentioned by Enrique Guerra, a store-owner from El Zapote, all the products he sells have a 15% higher mark up price than in nearby towns to cover the higher transportation costs he faces as a middle-man. Consequently, farmers devote more of their money to buy basic consumer goods and agricultural products than they would in less isolated regions, and have less money to buy gasoline or to invest in improving their chances to reach the market. Edwin Espinosa tells me "In the last years before I turned to fishing, the land did not produce much anymore. We did not have the money to buy fertilizers or insecticides to make things better, so I turned to fishing. It paid more, and with the money I obtained from selling my land, I bought a boat and fishing gear".

The increasing cost/benefit ratio of being involved in farming has not only pushed many coastal producers to abandon their agro-pastoralist lifestyle, it also compelled non-switching agro-pastoralists to keep most of their harvest for household consumption or to stop

selling their products. Almost half (46.6%) of non-switching agro-pastoralists interviewed involved in cropping mentioned not commercializing their crops at all. Out of them, three (17.6%) mentioned having recently stopped selling crops after the productivity of their farm had become too low to produce surpluses. Those who can produce enough to commercialize the crops usually sell small quantities and prefer selling crops of high value such as ñame and otoe. This situation has only been worsening through time. In effect, while harvests in the Bahía Honda region have been declining (and so have the benefits from crop commercialization), the cost of most basic commodities was sharply increasing (see Table 4). Notably, energy and transportation prices have more than doubled between 1975 and 1989, limiting the capacity of Bahía Honda agro-pastoralists to bring their crops to the market.

Table 4. Consumer index price by groups of services and products – Panama City 1975-1989; 1975 price index = 100. *(Source: Situación Economica: Indice de precios al por mayor y al consumidor 1980 and 1990, Contraloría General de la República)*

	1975	1979	1989	% change
Energy (gas and electricity)	**100**	**172.3**	**208.3**	**108.3%**
Women's clothing	**100**	**115.9**	**143.7**	**43.7%**
Men's clothing	**100**	**120.8**	**152.4**	**52.4%**
Food products	**100**	**122.2**	**168.7**	**68.7%**
Health care and medications	**100**	**114.7**	**169.0**	**69%**
Transportation	**100**	**134.9**	**205.1**	**105.1%**

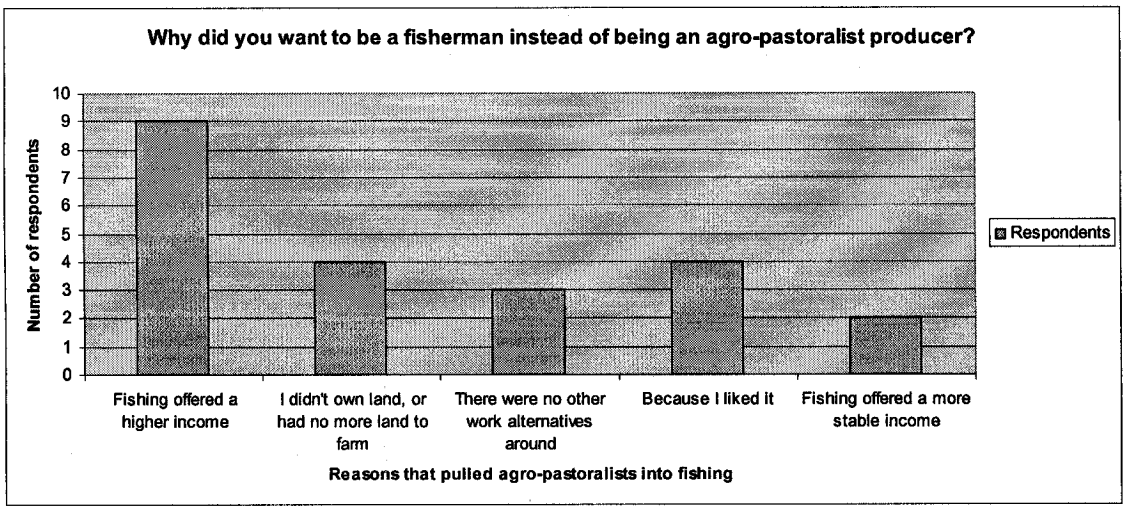
The state of affairs has recently worsened with recent hikes in international oil price, and will not likely improve in the future. Unless a road linking the area to nearby agricultural markets is built, it will always remain difficult for farmers of the area to move beyond subsistence agriculture. Facing yield reductions, difficult access to agricultural market, inflated good and food product prices, and limited governmental support, the benefits

associated with adopting an agro-pastoralist lifestyle in the Bahía Honda area have kept shrinking over the years while costs increased.

5.2.3. The attractiveness of fishing

The desire to fish was cited as the third most important factor that pulled many coastal inhabitants into fishing (see Figure 1). Most switching agro-pastoralists turned to artisanal fishing because they believed it offered a higher income than agro-pastoralist activities (see Figure 3).

Figure 3. Switcher's answers to the question *"Why did you want to be a fisherman instead of being an agro-pastoralist producer?"*



Because it was a more profitable activity than farming (see section 5.3.6), artisanal fishing offered many benefits to adventurous coastal agro-pastoralists. Notably, it allowed switching agro-pastoralists to enter more fully the cash economy. Suddenly, people were able to travel more frequently to nearby cities, buy luxury goods, renovate their house, purchase medicine, and cover the costs to send their children to secondary school or to university. Cirilo Santos explained to me that when he first ventured into fishing, he could make about US$ 1000 a month as a boat captain, a much higher salary than the average monthly per capita

income of the time ($US 230.83 in 1980) [19]. Such improvement in economic status allowed Cirilo to save enough money to make long-planned house repairs and to send his youngest son to complete his preparatory university year in Santiago, the capital of the province. Likewise, Aristide Soto, an experienced Bahía Honda fisherman, mentioned that turning to fishing was quite an economic improvement for his household. He tells me that a few years ago – before the productivity of fishing activities started to decline - one fisherman could easily expect to come back home with 120-130$ after a 5 or 6 days fishing trip. With 3 or 4 fishing trips a month, a fisherman could expect to earn a much higher salary than agro-pastoralists back then.

While artisanal fishing was a more profitable activity than farming, it also ensured switchers a much more stable income. Suddenly, switching agro-pastoralists started earning an income year around, while non-switchers remained with a much more sporadic income, obtaining most of their annual cash income from selling their crops after harvest seasons[20]. But artisanal fishing was not only a more profitable and stable economic activity than farming or cattle ranching, it was also the only real employment alternative available to switching agro-pastoralists of the time. As Ismael Espinosa explained to me "Our land was not really productive anymore, and when we decided to sell it, there was not really any other alternative around but fishing". In effect, aside from a small sport fishing tour company and the penal colony operating in Coiba National Park, there were no major employer in the area until foreign land speculation companies started operating in the region in the late 1990s. Being a more profitable and stable economic activity, artisanal fishing became an easy choice for coastal agro-pastoralists who wished to change economic activity without having to migrate out.

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[19] *Source: United Nations Statistics Division – Common Database-GDP per capita, current international dollars (PPPs) (WB estimates) [166 countries, 1975-2002]*

[20] Though most farmers of the area reported harvesting only once a year, some farmers grow two harvests per year for certain crops, such as rice.

5.2.4. Land speculation

In recent years, land speculation forces driven by foreigners in search of coastal properties have driven up regional land prices and gave an incentive to many agro-pastoralists to sell their farmland. While many sold their land and migrated to find work in the city (see Section 5.3.2), others turned to artisanal fishing. Interestingly, two switching agro-pastoralists interviewed reported having migrated out from the region temporarily and, having sold their land, had no alternative but to turn to artisanal fishing upon coming back (see Figure 1).

Brian, the manager of one of the foreign companies involved in speculation activities in the area, explained to me that his boss has been buying land from farmers of the area for about 9 years now, primarily to restore coastal forest ecosystems from years of unsustainable agricultural practices (see section 5.3.4). Among the 16 switching agro-pastoralists interviewed, 6 mentioned having sold their land to one of the two speculating companies that operate in the region.

Many switching agro-pastoralists were able to obtain a good price for their land, allowing them to afford expenses they had never been able to in the past. Some took the opportunity to invest in their children's education while others spent their money in luxury goods or invested in house repairs. In that sense, the differences in house types between switching agro-pastoralists and non-switching agro-pastoralists is striking. While many switching agro-pastoralists own houses with concrete floor and zinc roofs, non-switching agro-pastoralists largely live in houses with dirt floor, wooden walls, and palm leaves roof. Stories about people spending most of the money they obtained from selling their land at one of the local bars were, sadly, frequent.

Interestingly, many interviewees mentioned that selling their land gave them the financial security to switch to fishing and/or provided them the necessary capital to buy their own boat, motor or fishing equipment. However, as previously discussed in Section 5.1, most

switchers only sold their farmland a few years after turning to artisanal fishing, which puts into perspective the role land speculation forces may have played in pushing people to sell their farmland and pulling them into fishing. Switching to artisanal fishing only required a high start up capital for those wishing to acquire their own boat, motor, and fishing equipment. On the contrary, switching did not require an important investment for those who wished to become *marino*, since fishing equipment was (and is still) usually provided by boat captains. Hence, it remains uncertain how many people sold their land to obtain the necessary capital to relocate into fishing. What is more certain is that the money switching agro-pastoralists obtained by selling their farmland gave them a certain financial security in case they failed in fishing. Having this money also temporarily increased their purchasing power. Interestingly, by giving switching agro-pastoralists the necessary economic incentive to sell their farmland, foreign land speculation activities have jeopardized any eventual attempts by CNP authorities to provide incentives that would encourage switching agro-pastoralists to go back to farming.

5.2.5. Statistical analysis

Non-parametrical statistical testing revealed that a variety of social and economic factors influenced the likelihood of an agro-pastoralist to switch to artisanal fishing. Interestingly, these factors were rarely mentioned during interviews, but came out by assessing variations in answers amongst switchers and non-switchers on topics such as age, migration history, economic situation, employment situation, land-use and land-management practices. In most instances, two sample mean t-tests and proportion z-tests were used.

Age and migratory history

Variables such as respondent's age and migratory history[21] were recorded and tested to determine whether or not they could have affected the likelihood of an agro-pastoralist switching employment. By testing respondent's age and the likeliness to switch, it was assumed that younger agro-pastoralists were more likely to change employment, based on the assumption that younger people are generally more likely to make risky economic decisions such as changing economic activity. It was also assumed that, having less to lose (in terms of financial assets), younger agro-pastoralists would have been more likely to switch than older agro-pastoralists.

A t-test comparing mean age between the two groups was conducted (it was felt that a chi-square test comparing switchers and non-switchers divided into age cohorts would not have had much statistical power due to the small sample size). Results show that respondent's age was directly linked to likeliness to switch to fishing. Indeed, average respondents' age differed significantly between switchers and non-switchers ($n= 36$, $p = 0.0134$, $t = 2.3162$, $df = 34$), the former being on average 37 years old while the later were of 47 years old. This supports the assumption that younger agro-pastoralists were more likely to switch than older ones.

Migration history also appears to have influenced the likelihood of an agro-pastoralist switching to fishing. By looking at respondent's migratory history and likeliness to switch, it was assumed that agro-pastoralists who had recently settled in the area would have been more likely to make a switch than those who had lived in the area for a longer period of time. The assumption was that newly arrived agro-pastoralists families were likely facing more difficulties in finding good farmland, pushing them to farm marginal or rented farmland, or to work as agricultural labourers for local cattle ranchers. As such, limited and/or insecure

[21] Migrant agro-pastoralists were identified as agro-pastoralists whose immediate family had been established in the area for less than 2 generations (*i.e.* respondent himself had migrated to the area during the course of his lifestyle or the respondent's father had migrated to the area during the course of his lifestyle)

access to good farmland would have increased the likeliness of newly arrived families to switch to fishing (assuming that agro-pastoralist families with a longer living history in the area benefited from a better access to land). A two sample t-test of proportion was conducted to test the relationship.

On average, switching agro-pastoralists had a family history in the area of Bahía Honda of at least two generations, and had lived in their community of residence for most of their life. Conversely, non-switching agro-pastoralists were generally born outside the area of Bahía Honda, or were born in their actual community of residence after their father had migrated to the area ($n = 37$, $z = 0.0138$, $t = 2.203$). Thus, long-established agro-pastoralists were seemingly more likely to switch to fishing than newly arrived agro-pastoralists, which goes against our initial hypothesis. A few factors may explain this.

One could assume that, in the years preceding the switch, newly established families were able to acquire sufficient farmland to sustain themselves from agro-pastoralist activities. As such, land may have never been a limiting factor forcing agro-pastoralists out of farming. However, this does not explain why agro-pastoralists with a longer family lineage in the area were ostensibly more likely to switch to artisanal fishing than migrating agro-pastoralists. An alternative explanation is that agro-pastoralists who had a longer living history in the area had a greater knowledge of coastal environments and of fishing techniques than new migrants. Having such knowledge may have been an essential prerequisite to switch to fishing. By looking at the migratory history of non-switchers, one can see that many of them had only recently migrated to the area (only 6 out of 17 were native to the area) from central regions of the country such as Las Palmas, a district relatively far away from the coast. Most of them had likely never fished or navigated before. On the contrary, almost all switching agro-pastoralists were natives to the area (18 out of 21), and many mentioned that their family had always

fished for consumption in the Bay of Bahía Honda and around surrounding islands before they made a complete switch to artisanal fishing.

Land use and land management factors

Contrarily to our initial expectations, land use and land management patterns did not influence coastal agro-pastoralists's likelihood to switch. Indeed, interview results demonstrate that switchers and non-switchers adopted similar land use and land management practices, going against our initial assumption that farmers using more sustainable and/or profitable land use and land management techniques had more productive farms and therefore, would have been less likely to switch to fishing[22].

Among all variables tested (farm size, farm diversity, whether or not the respondent was involved in crop commercialization, cattle ownership, whether or not the respondent engaged in the planting of trees, whether or not the respondent burnt his field), only the lack of cattle ($n = 37$, $p = 0.0003$, $z = 3.435$) and not being involved in hardwood planting ($n = 34$, $p = 0.0104$, $z = 2.312$) appear to be significantly associated with one's likelihood to switch, suggesting that coastal agro-pastoralists with less financial assets (cattle and hardwood trees) were more likely to switch employment. Farm size ($n = 32$, $p = 0.8029$, $t = -0.8670$, $df = 24.7347$), farm diversity[23] ($n = 32$, $p = 0.1156$, $t = 1.2223$, $df = 29.9927$), and whether the respondent was engaged in the selling of his crops ($n = 32$, $p = 0.2567$, $z = 0.654$), did not show any significant statistical relationship with one's likeliness to switch. Only two respondents out of the 33 switching and non-switching agro-pastoralists interviewed admitted not burning their field before planting, and therefore, no statistical test was conducted to assess the relationship between burning (or not) and likelihood to switch.

[22] For a broader description of salient land use, land management, and land tenure issues in the Bahía Honda *corregimiento*, see Annex 8.
[23] Represented by the number or crops planted.

This suggests that other drivers aside from the main push and pull factors obtained during interviews (declining farmland productivity, increasing costs/benefit ratio of engaging in agro-pastoralist activities, desire to fish, and land speculation) might have influenced the likeliness of coastal agro-pastoralists to abandon farming and/or to switch to artisanal fishing. Notably, being younger and having a longer family history in a coastal environment appear to have played a role in determining one's likeliness to switch employment. In addition, being restrained from financial assets such as cattle and hardwood has also seemingly influenced the likelihood of coastal agro-pastoralists switching to artisanal fishing.

5.3. Socio-economic and environmental changes

5.3.1. Introduction

Following the apparent demise of Bahía Honda's cropping activities, important social and economic changes have occurred in the region. While many agro-pastoralists choose to venture in a new profession, others chose to migrate out of the area. Such changes have also had important impacts on the way coastal inhabitants of the region use and manage available natural resources. The following section presents the main social and economic changes that have occurred in the area over the past 30 years, and how such changes have been affecting the political and managerial framework in which Coiba National Park is operating.

5.3.2. Population change and migration

Parallel to the employment switch, it appears that the harsh economic and agricultural conditions of the late 1970s have also pushed many coastal agro-pastoralists of the region to migrate out of the region in search of a better life in nearby cities. As such, the population of the *corregimiento* of Bahía Honda has changed significantly over the past 30 years. As shown

in Table 5, the *corregimiento* of Bahía Honda experienced a population decrease of 26,96%[24] between 1970 and 2000, and 11 of its communities disappeared or were merged to others, suggesting that a large share of the population migrated out of the region over the past three decades.

Table 5. Adjusted demographic figures – Bahía Honda *corregimiento* 1970 – 2000 *(Source: Censo Nacional de Población y Vivienda 1970, 1980, 1990, 2000, Contraloría General de la República)*

	1970	1980	1990	2000
Size of the *corregimiento* (km²)	**172.20**	**172.20**	**172.20**	**172.20**
Number of communities	**48**	**44**	**40**	**37**
Number of inhabitants	**1 762**	**1 351**	**1 297**	**1 287**
Population change (%)		***-23.33%***	***- 4.00%***	***- 0.77%***
Total population change between 1970 and 2000 (%)				***-26.96%***

To understand the importance that migration played in such a decrease in population, a population projection was made, using (adjusted) 1970s population figures (1 762 inhabitants), and an average annual population growth rate of 2.19%[25]. Holding migration rate at zero, a population extrapolation over 30 years indicates that the area would be occupied by about 3010 inhabitants in 2000, a much higher figure than the 1 287 counted in the 2000 census. This analysis suggests that about 57.24% of the population have migrated out of the area between 1970 and 2000.

The population of the *corregimiento* of Bahía Honda not only decreased significantly over time, it did so at a very unequal rate, going down by 23.33% between 1970 to 1980, to 4% between 1980 and 1990, and down to 0.77% between 1990 and 2000. While it remains

[24] Because the territory covered by the *corregimiento* of Bahía Honda in 1970 enclosed a much larger area than it does today (from 286.50 km² to 172.20 km²), official population figures were recalculated according to the *corregimiento*'s 2000 limits. Thus, population figures for all communities that were passed to other bordering *corregimientos* over time are excluded from the following analysis.

[25] Average population growth rate for 1970 to 2000 was obtained by averaging mean national population growth rates for the period corresponding to 1970-1980, 1980-1990, and 1990-2000 with respective growth rates of 2.36%, 2.17%, and 2.03%. (*source: United Nations Statistics Division – Common Database- Population annual growth rate for Panama, 1955-2050*).

unclear why so many people left the area between 1970 and 1980, it is possible that the decline in coastal soil productivity had already started in the 1970s, leading people to move out of the region. Also, the late 1970s marked the beginning of a particularly harsh economic period for the area, which started after the main employer of the time - a Panamanian logging company - stopped its activities and left the area. Economic hardship caused by the lack of employment alternatives and the declining viability of agricultural activities may explain why many coastal inhabitants left the area between the 1970s and the 1980s. Residents of the community Bahía Honda also mentioned that many families sold their farmland and left the area in the 1970s after a terrible land-slide struck the coastal line, leaving many homeless.

5.3.3. Decline in importance of agro-pastoralist activities

While many agro-pastoralist families of the Bahía Honda area migrated to nearby cities, others chose to stay and looked for a more viable economic activity. In most instances, agro-pastoralists turned to artisanal fishing. Not surprisingly, the number of coastal inhabitants of the region involved in agro-pastoralist activities declined quite significantly during that period, and so have anthropogenic pressure on coastal agricultural ecosystems (see section 5.4.2.). Between 1970 and 2000, the percentage of economically active population involved in agro-pastoralist activities in the Bahía Honda *corregimiento* went down from 96.13% to 64.86%[26] (see Table 6).

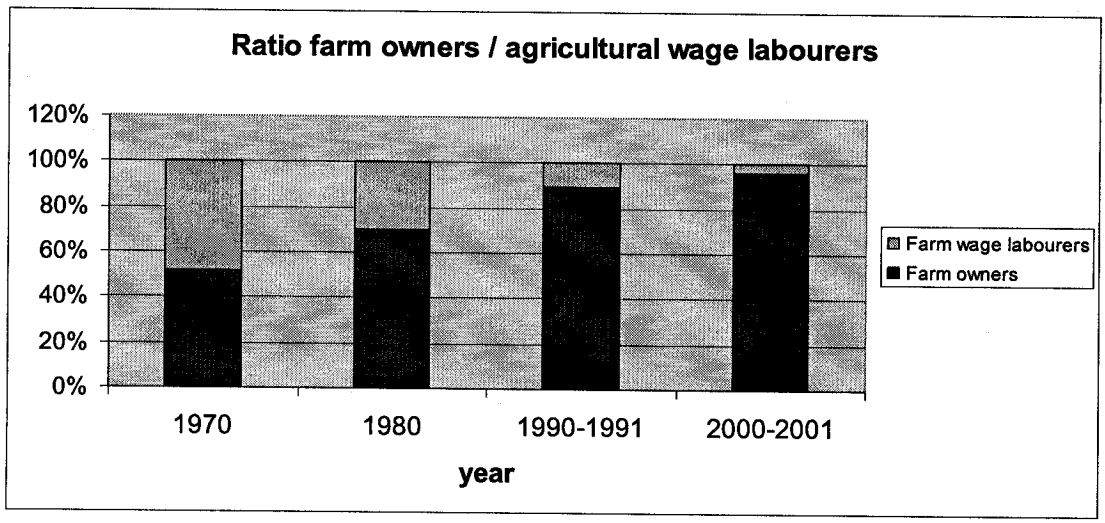
[26] Though adjusted figures are used to analyse population changes in section 5.3.2., it was not possible to use adjusted figures for our analysis of the Bahía Honda agricultural sector (section 5.3.3 and 5.3.4) since official agricultural censuses do not provide any data at the community level. Hence, a certain number of communities that are not part of the Bahía Honda *corregimiento* today are counted in the analysis for the 1970 and 1980 census years. Hence, only percentages are presented. We do not feel that this can significantly affect the conclusions of our analysis as it is unlikely that regional agricultural employment patterns varied significantly between the communities included in the *corregimiento* of Bahía Honda today and the few communities it lost to bordering *corregimiento* through time.

Table 6. Number of farms, average farm size, and proportion of economically active population of the Bahía Honda *corregimiento* involved in agro-pastoralist activities, 1970 – 2001. *(Source: Censo Nacional de Población y Vivienda 1970, 1980, 1990, 2000, Contraloría General de la República; Censo Nacional Agropecuario, 1970, 1980, 1990-1991, 2000-2001, Contraloría General de la República)*

	1970	1980	1990-1991	2000-2001
Number of farms	**409**	**336**	**306**	**251**
Average farm size (hectares)	**29.50**	**43.53**	**39.27**	**50.72**
Percentage of economically active population involved in agro-pastoralist activities	**96.13%**	**90.77%**	**74.93%**	**64.86%**

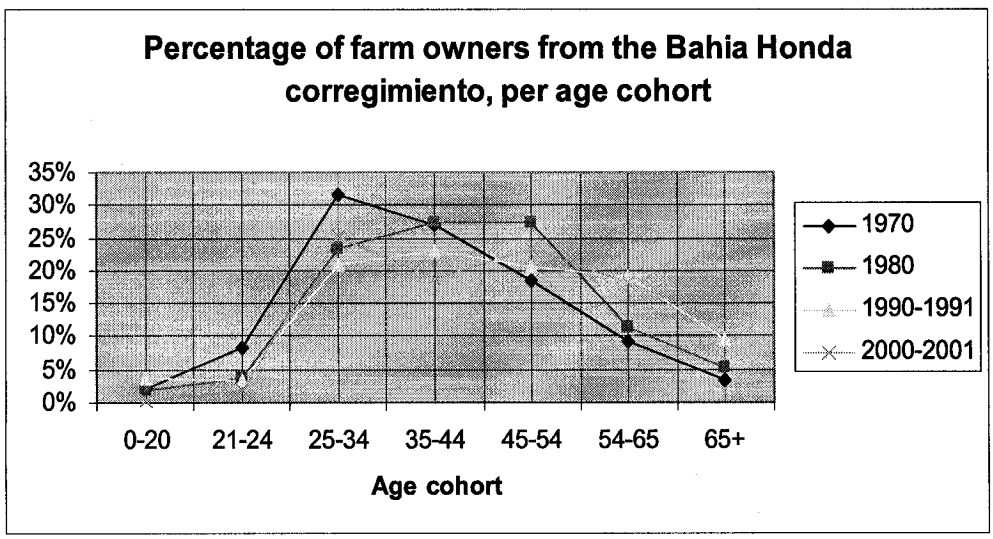
The decreasing productivity and economic viability of farming and cattle ranching activities has not only led to an important reduction in the number of people involved in agro-pastoralist activities, it also altered employment patterns within the agricultural sector itself. Facing declining productivity, many farm owners were forced to work their farm themselves, pushing agricultural wage labourers to look for other sources of employment. While there were almost as many agricultural wage labourers as farm owners in 1970, the proportion of wage labourers was reduced to 4.17% in 2000 (Figure 4).

Figure 4. Ratio of farm owners / agricultural wage labourers - Bahía Honda *corregimiento* 1970 – 2001 *(Source: Censo Nacional Agropecuario, 1970, 1980, 1990-1991, 2000-2001, Contraloría General de la República)*



Interview results corroborate the data presented in Table 6 and suggest that the importance played by farming and cattle ranching activities in the regional economy has significantly decreased over the years, and particularly so for younger generations who are much less involved in agro-pastoralist activities than they were in the past. Among the 17 agro-pastoralists interviewed, only 7 had one child or more venturing into farming or cattle ranching. As mentioned by Roman Rodriguez (pers. comm., 2004), the director of the primary school in Salmonete, youths are not interested in working the land anymore. Most try to find wage labour with one of the two construction companies that operate in the area (see also section 5.3.6.). The increasing ratio of farm owners over agricultural wage labourers also points in that direction. Indeed, youths are often employed as wage labourers before owning their own farm, and they are also the ones who commonly migrate. This also suggests that farm labour supply might have diminished over the past decades due to youth migration. Changes in farm owners' average age through time reflect this trend. As shown in Figure 5, the proportion of younger farm owners has been declining over the years, and conversely, the proportion of older farm owners has been increasing.

Figure 5. Farm owners of the Bahía Honda *corregimiento* 1970-2001, divided by age cohort *(source: Censo Nacional Agropecuario, 1970, 1980, 1990-1991, 2000-2001, Contraloría General de la República)*



5.3.4. Land holding and land ownership changes

Migration patterns and the switch in employment have also greatly affected regional land holding and land ownership patterns. Indeed, as many coastal agro-pastoralists were switching to artisanal fishing or migrating out, non-switching agro-pastoralists of the area were able to consolidate their land holdings. As shown in Table 6, average farm size increased from 29.50 ha to 50.72 ha between 1970 and 2000. However, such figures highly vary amongst and between farmers and cattle ranchers. Results from interviews with non-switchers indicate an average farm size of 62.09 hectare (n= 16, STDEV = 87.9432) with a range of 1.5 ha to 352 ha. Non-switchers involved in cattle ranching[27] hold on average 103.88 ha of farmland (n = 8, STDEV = 111.40), while non-switchers involved only in cropping hold on average 20.31 ha (n =8, STDEV = 13.17).

In recent years, land ownership and land holding dynamics in the Bahía Honda *corregimiento* have also been significantly altered by foreign land speculators (see also Section 5.2.4.). For about eight years now, the *Sociedad Bahía Honda LDC* (now divided in two separate ventures; Liquid Jungle Lab and Playa del Sol) has been particularly active in buying land in the area. By 1999, the two private societies had acquired about 1 200 hectares of land from local farmers and cattle ranchers (see Table 9 of Annex 7). According to the respective managers of the two enterprises, the speculation activities of their companies are not profit-driven. Rather, they are part of a private conservation effort that aims at acquiring degraded coastal lands to foster forest re-growth and restore the fragile coastal ecosystems that characterize the region. Since the establishment of these two societies in the area (sometime around 1996), most of the land they have bought has remained untouched. At this point, it is hard to assess the impact that the land speculation activities of these two companies have had on local ecosystems and in restoring forest cover. Both managers have refused to

[27] For the purpose of this study, agro-pastoralists were considered as being involved in cattle ranching activities when they own at least a total of five heads of cows or pigs, or when agro-pastoralists considered themselves as cattle ranchers.

divulge how much land they now own, and there are no available aerial photographies of the area to look at forest cover changes ever since the two companies have settled in the area.

5.3.5. The switch to fishing, Coiba National Park, and community interactions

Development of fishing

As documented in Section 5.1, the decline in coastal land productivity and the increasing cost/benefit ratio of practicing an agro-pastoralist lifestyle have led many inhabitants of the Bahía Honda area to abandon farming to look for alternative employment. The proximity of the Pacific Ocean, the rich waters that characterize CNP, land speculation activities, and the general lack of employment alternatives that characterize the area made artisanal fishing an easy choice, particularly for young, long-established agro-pastoralists with a precarious economic situation.

According to Cirilo Santos, the first agro-pastoralist families who ventured into artisanal fishing did so with little knowledge of artisanal fishing techniques or navigation skills. Switching agro-pastoralists learned fishing through trial and error, and by asking experienced fishermen from other areas to teach them about fishing techniques. Artisanal fishing equipment includes *linea* (nylon monofilament), *cuerda* (braided nylon rod), *trasmallo* (fishing net), *linea de tiburon* or *linea de cherna* (longline)[28]. Fishing boats were and are still hand-made out of wood, and most are not equipped with any fishing navigation equipment. Fishermen of the area fish mostly for large pelagic fish such as red snapper, *cherna*, *dorado*, *corvina*, and tuna, and many will catch sharks to sell the fins. The landing capacity of artisanal fishing boats varies considerably according to embarkation's size. Eliecer Guerra, an experienced Bahía Honda fisherman, explains that most boats of the area can land between 1000 pounds to 2000 pounds of fish after a good fishing trip, which usually varies between 4

[28] For a more detailed description of most commonly used artisanal fishing equipment, see Moretti (2002) and Maté (2005).

to 8 days. If he catches red snappers of export quality, Eliecer says he can obtain about $US 1.40 a pound for his product by selling in Puerto Mutis. Red snapper of inferior quality go for about $US 0.75 to $US 1.00 a pound. On a good fishing trip, Carlos Espinosa says he can land between 300 to 600 pounds of red snapper alone. All fishermen of the area sell their catch to one of the two nearby port: Puerto Mutis and Puerto Remedios, and usually sell to the port they are the closest to at the end of a fishing trip. A certain number of fishermen interviewed also mentioned being involved in diving, mainly for the extraction of lobster, queen conch, and crab.

Until recently, the waters of Coiba National Park were the main fishing grounds of fishermen of the area, and had been so ever since they first started venturing into fishing in the early 1980s. Even with the creation of CNP in 1991, fishermen of the area continued exploiting the waters of the park freely without being expelled by ANAM patrols, a situation that went on up until about 2002. During that period, the relationship between ANAM and park resource-users was minimal and, according to many residents, fairly harmonious. However, it is important to mention that, between 1991 and 2001, barely any of the planning, management, or protection measures found in CNP's management plan were developed or applied. During that period, ANAM was the sole governing authority in CNP, overlooking at the planning and management of the park and its buffer zone. ANAM was also the only organization with regular contacts with resource-users exploiting CNP, and was the only authority ensuring regulation application and compliance within the limits of the park. With limited staff, no radar system for detecting illegal entries in the park, and only one boat to patrol the 216 543 hectares of CNP's marine territory, the park was hardly protected. As stated by Moretti (2002, p.4) "The small, understaffed, and underfunded ANAM park office on Coiba [island] is entirely incapable of patrolling and enforcing regulations in a park which is larger than Rhode Island."

Legislation development and enforcement

The situation changed unexpectedly in the early 2000s, when a consortium of international conservation organizations (AVINA and Conservation International), international aid agencies (AECI), and non-governmental organizations (ANCON, MarViva) offered their support to ANAM to enhance the protection of CNP and ensure sound management. While all parties have been playing a specific role (financing, education, technical training and assistance) in recent planning and management activities around CNP, a common underlying objective has been to lobby Panamanian authorities to establish more stringent (and better defined) legislations for CNP. Such efforts were recently rewarded. As previously discussed in Section 3.4.3, CNP's legal framework has recently been enforced through the adoption of two new government resolutions (Law No. 44, 2004 and Resolución AG-0118, 2005), which are arguably the direct result of the lobbying efforts made by these conservation organizations. Now facing more stringent access to CNP natural resources, resource-user groups from buffer zone communities have shown growing discontent towards park authorities and towards the myriad of conservation organizations promoting the conservation of CNP.

The relationship between CNP's resource-users and CNP's authorities has become particularly tense after MarViva - an international NGO whose mandate is to ensure the protection and sustainable use of marine resources in the Eastern Tropical Pacific and Caribbean (http://www.marviva.net) - signed a cooperation agreement with ANAM in 2002 to increase patrolling activities in the waters of Coiba National Park. Concretely, MarViva has been providing technical training to ANAM's guards and two extra boats to patrol the park alongside ANAM's boat. According to fishermen interviewed, it is only when MarViva started patrolling CNP along with ANAM that they started realizing that fishing legislations

had been stiffened in CNP. Only then did they really start to understand the implications and impacts the very establishment of CNP would have on their livelihoods.

It is not clear whether fishermen of the area were fully aware of the boundaries of CNP and of fishing regulations before the ANAM – MarViva partnership was established. As discussed by Moretti (2002), there was a general misconception over CNP boundaries amongst fishermen he interviewed, who generally believed that park limits were enclosing a much smaller area that they actually do. Such misunderstandings became apparent during our interviews. In effect, many fishermen believed they simply could not fish at all in the park anymore. This suggests that in many instances, fishermen caught fishing illegally in CNP did not know they were breaching the law.

This situation is not surprising. Indeed, fishermen of the area mentioned having received only one visit by MarViva and ANAM agents (respectively) since the creation of CNP. In addition, no public maps showing CNP boundaries were found in any of the fishing communities visited. According to local fishermen, the visits conducted by ANAM and MarViva took the form of information sessions during which they were explained what area the park encompassed and what the regulations of the park were. They were also told that they would receive some sort of assistance or compensation for the loss of their fishing rights over many areas of the park. Expectations also were raised among fishermen about the upcoming development of eco-tourism in the region, which would bring work to many and help compensate for the new restrictions imposed on their fishing rights. Few fishermen mentioned being present to these sessions as they were held in week days, when most fishermen are at sea fishing. Other similar information sessions might have occurred, although fishermen would unlikely admit it.

Parallel to these information sessions, an environmental education program was developed and carried between 2001 and 2004, through a multi-institutional agreement

between ANAM, the AECI (and ARAUCARIA), and the Panamanian Ministry of Education (Ministerio de Educación / MÉDUC), in CNP's buffer zone communities. Educational activities had the prime objective of promoting the ecological importance of CNP, and targeted mainly primary school children (but not fishermen). Activities were carried during class time by school teachers, who received training from ANAM and ANCON agents. In a few instances, school teachers mentioned having carried educational activities at night, usually during school board meetings to which parents were invited. Yet, ANAM and ANCON agents were never directly involved in carrying educational activities in communities of the area. In fact, up until the involvement of MarViva, contacts between fishermen of the Bahía Honda *corregimiento* and CNP authorities were minimal. Not surprisingly, most fishermen have been mainly directing their complaints at MarViva and ANAM, as they are the only organizations/agencies directly affecting their extractive activities and with whom they have regular contact.

Impacts of recent legal developments on community relationships

The "laissez-faire" approach adopted by CNP authorities towards buffer zone communities recently turned into a more reactive, exclusionary approach with the adoption of Law No.44 (2004) and Resolución AG-0118 (2005). In effect, both pieces of legislation were adopted on precautionary principles, and were drafted and adopted without consulting all resource-user groups, notably Bahía Honda resource-users.

The implications of Law No.44 and Resolución AG-0118 (2005) are clearly indicating the lack of understanding that characterizes the relationship between park authorities and artisanal fishermen of the area. First, Resolución AG-0118 (2005) establishes temporary fishing laws that clarify and enforce existing fishing rules of CNP (until the new management plan is approved), and put an end to the granting of new fishing permits to fishing vessels not

recorded in CNP's directory before Law No.44 was passed (in July 2004). As mentioned in Moretti's study, as much as 50% of fishing vessels exploiting CNP may not be registered (Moretti, 2002, p.11). This suggests that up to 50% of artisanal fishermen exploiting CNP are no longer allowed to fish in CNP's designated fishing zones. Indeed, park authorities may not grant any more fishing permits to would-be fishermen.

Second, Resolución AG-0118 (2005) also forbids the granting of fishing permits to artisanal fishing boats larger than 30 feet or powered by more than 55 hp. A quick visit to artisanal fishing communities of the Bahía Honda region would have allowed park authorities to realize that many artisanal fishing vessels are larger than 30 feet and are powered by more than 55 hp, simply because it would be both difficult and dangerous for fishermen to navigate to CNP from the coast and spend upwards of 4 to 8 days at sea using smaller and/or less powerful vessels. In other words, the recent adoption of Resolución AG-0118 (2005) led to the exclusion of a large share of the artisanal fishing vessels that previously had the right to exploit CNP. In addition, the adoption of Law No. 44 (2004) which creates a new special zone of marine protection annexed to CNP, further restricts artisanal fishermen's activities within an additional area almost as large as CNP's current surface (see Annex 2).

While such regulations have contributed to slow illegal fishing and increase protection of CNP, they have had important direct economic and social impacts on the livelihoods of artisanal fishing communities of the area (see following section; 5.3.6). Moreover, the adoption of more stringent fishing legislations combined with increased patrolling efforts have contributed to widening the gap between CNP's park authorities and resource-user groups. On the ground, the lack of efforts by CNP's park authorities to consult or inform resource-user groups about CNP's new legislations led to many tense encounters between park patrols and fishermen caught fishing illegally in CNP. Many fishermen reported having received fines and seen their equipment confiscated without being fully aware that they were

breaking the law. As of now, no programs to compensate fishermen for reduced fishing rights have been implemented in the area, and the long-time promise of the advent of an eco-tourism industry that would stimulate the local economy has yet been fulfilled. Not surprisingly, the relationship between CNP authorities and resource-users from buffer zone communities has deteriorated ever since park regulations have been enforced. While 67% of the fishermen Moretti (2002) interviewed had a fairly good opinion of CNP, only 15% (n=20) of the fishermen interviewed in this study believed that the laws regulating activities in CNP were necessary, and 70% of respondents had a mix opinion about CNP, generally agreeing over the conservation objectives of the park, but disagreeing that these objectives should be achieved at their expense.

It is not surprising that most fishermen Moretti (2002) interviewed had a fairly good opinion about CNP since at the time the study was conducted (in 2001), MarViva had not started to patrol the park alongside with ANAM and fishermen could exploit the park without risking of being expelled. All fishermen (n =21) interviewed in this study believed they should have the right to fish in CNP still, and many wish that a system of quota and fishing seasons were established. In addition, all fishermen but one expressed that they would like to collaborate with park authorities in the management and planning of the park.

5.3.6. Economic changes

The declining productivity of coastal soils and the subsequent change in buffer zone inhabitants' resource management strategies have had important impacts on the economic situation of both switching and non-switching agro-pastoralists. On the one hand, the declining productivity of farming activities has directly contributed to reducing the economic power of non-switching agro-pastoralists, pushing many to migrate to nearby cities or to look for alternative employments with foreign construction ventures. On the other hand, while the

declining productivity of coastal soils initially led to a reduction of switching agro-pastoralists's economic power, the employment switch allowed them to improve their economic situation as they started extracting more valuable natural resources. However, CNP's recent legal developments have contributed to put a halt on fishing activities in the area, greatly impacting switching agro-pastoralists' newly acquired economic power.

Agro-pastoralism

Because coastal agro-pastoralists of the Bahía Honda area generally earn small and episodic income, quantifying their average salary is a challenging process. Agro-pastoralists' salaries vary according to the extent they are involved in the commercialization of their products, which mainly depends on their capacity to access the market. While most agro-pastoralists interviewed involved in cattle ranching admitted selling their cattle on the market, a high proportion of farmers did not commercialize their crops, either because their yields were too low to produce surpluses or because it was unprofitable for them to do so (see section 5.2.2). Among the 16 non-switching agro-pastoralists interviewed involved in cropping, seven (43.7%) mentioned not selling their crops in the market, subsisting on what they grow for most of the year. Among the 9 non-switching agro-pastoralists involved in crop commercialization, only three sold more than two crops. Most will sell ñame (n = 7) as they can obtain a good price for it, and a few reported selling otoe and manioc. Only one respondent mentioned having sold rice in the last year, and two reported having sold corn. None harvested or sold beans. In general, farmers sell products they do not consume on a regular basis, and will keep the basic products (corn and rice) for household consumption.

The quantity of each product they sell is small, and so are the revenues obtained from commercializing their crops. The average quantity of ñame sold by producers interviewed from the 2003 harvest was 11.25 quintals per farm (n = 7), while average quantity of otoe sold

in the last harvest year was 4.67 quintals (n = 5). For 2002, the average buying price (on-farm) for a quintal of ñame in the province of Veraguas varied between $US 20.00 and $US 25.00, whereas the buying price (on-farm) for a quintal of otoe varied between $US 13.00 and $US 23.00 (Contraloría General de la República, 2004). Considering that most respondents sell two crops or less, the average farmer involved in cropping could expect to make a total of about $US 337 a year by selling 11.25 quintal of ñame and 4.67 quintal of otoe (taking an average buying price of $US 22.50 and $US 18.00, respectively).

Agro-pastoralists who own and sell cattle are usually wealthier. Most cattle ranchers interviewed were involved in cattle commercialization (6 out of 8; 75%); all sell cattle and/or pigs. Average number of cattle sold per farm for the year 2003 was 16.80 (n = 5), though substantial variations exist among cattle ranchers (range = 2 to 52). Because only one cattle rancher stands out from the other (52 heads of cattle), it was felt more appropriate to exclude him to obtain a more representative figure, with an average of 8 heads of cattle sold per farm (range = 2 to 20). The average number of pigs sold was 4.43 (n = 4), with a range between 4 and 12. Small cattle ranchers usually sell their cattle within their respective community, but larger cattle ranchers will make the 8 hour walk through the mountains to reach the road and bring their cattle by truck to nearby slaughter house (bringing their cattle by boat would incur much higher transportation costs).

The current on-farm selling price for a slaughtered beef cattle is about $US 150, while a slaughtered pig goes for about $US 40. As such, an agro-pastoralist selling both cows and pigs could expect to make an average annual gain of $US 1 377. An agro-pastoralist involved in both crop and cattle commercialization could make an annual average income of $US 1 714.20, corresponding to about $US 143/month or $US 4.70/day. Out of the 7 agro-pastoralists interviewed and involved in both farming and cattle ranching, only two commercialized both crops and cattle. Such analysis suggests that the average non-switching

agro-pastoralist of the Bahía Honda area makes an annual income somewhere between $US 377 to $US 1 714.

Fishing

From the early development of fishing until recently, the productivity of fishing activities in CNP was, according to fishermen interviewed, high. Although the income of fishermen was and is still somewhat higher than the income of non-switching agro-pastoralists, important income variations have always existed among fishermen, depending on whether one is a captain or a *marino*, and depending on fishing boat capacity. In the early years of the switch, a boat captain could make around $US 250 for a four-day fishing trip, while a *marino* could expect to make somewhere between $US 100 to $US 130. With an average of four fishing trips a month, a boat captain could earn an average monthly income of $US 1000 (about $US 33 a day), and a *marino* could make about $US 400 to $US 520 (between $US 13 and $US 17 a day)[29]. Things are much different today.

As previously documented by Moretti (2002), a large proportion of fishermen exploiting the waters of CNP believe that fishing has become a much less productive activity in recent years. On a similar note, 20 of the 21 fishermen interviewed during this study admitted that fishing conditions had gotten worse over time (and *de facto*, less profitable). Nowadays, fishermen reported spending up to eight days at sea to catch the same amount of fish as before, only to make a fraction of what they used to make. As a result, many fishermen mentioned going less frequently on fishing trips, sometimes once or twice a month, sometimes less. A *marino* can now expect to earn between $US 60 to $US 80 after a 4 to 8 day fishing trip (captains take a 10% mark up). A few fishermen mentioned that productivity

29 All salary figures presented in Section 5.3.7 are estimates based on information obtained during non-structured interviews with community leaders and fishermen of the Bahía Honda area. It was felt that directly asking fishermen about salary figures in semi-structured interviews would be too intrusive.

has become so low lately that they sometimes come back with not enough money to cover their initial costs. Thus, a fisherman going for an eight-day fishing trip twice a month could now expect to earn an average of $US 120-160 a month (or $US 4-5 a day), about one third of what they used to make.

On the other hand, the costs involved in practicing artisanal fishing have recently gone up. Indeed, facing a more stringent access to CNP, many fishermen reported fishing further away from their communities and from park boundaries, thus increasing their spending in gasoline. Costs for the purchase of food supply and gasoline have also increased as fishermen now need to spend more time at sea to make a reasonable profit. Facing lower profitability and higher costs, all fishermen interviewed during the summer of 2004 mentioned (n=21) having experienced a decrease in income in recent years. Thus, while switching agro-pastoralists were able to increase their yearly income substantially in the good years of fishing, those who still subsist on artisanal fishing today have recently experienced quite an important decrease in income, reducing the income gap that once existed between them and their non-switching agro-pastoralist counterparts.

The recent decline in productivity of fishing has also led many switching agro-pastoralists to stop fishing completely, preferring to be unemployed. While in 2001, Moretti (2002) found that there were about 20 artisanal fishing boats operating in the community of Bahía Honda (employing about 80 fishermen), this number had gone down to 10 boats during the first period of field work (during May and August 2004). Only 4 fishing boats were still going on regular fishing trips during the last period of field work in April 2005. Because there are no baseline data on fishing activities in the communities of Salmonete and Cativón, it is not possible to evaluate how the number of people involved in artisanal fishing in these two communities has changed over time. Yet, residents from both communities mentioned that there are fewer people involved in artisanal fishing now than in the past. Focus groups and

one-on-one interviews revealed that, in the last year, only one fishing boat from Salmonete and four from Cativón were still in operation.

At this point, the causes of this observed decrease in productivity/profitability of artisanal fishing activities remain unclear. While Moretti's study (2002) suggests that rampant illegal and destructive fishing practices taking place in CNP could eventually be driving fish stocks (and productivity) down, only six respondents out of 20 (30%) interviewed during this study believed that artisanal fishing had become less productive due to unsustainable fishing practices which would have caused stocks to decline. In fact, most fishermen interviewed (13 respondents out of 20; 65%) believed that artisanal fishing had become less productive since they have been contained by CNP authorities to fish less productive fishing sites using equipment that do not allow them to harvest sufficient catches to cover their cost. The majority of fishermen (17 out of 21, 81%) believed that the productivity of fishing sites located outside the limits of CNP was lower than the productivity of fishing sites inside the limits of CNP. Eliecer Guerra, one of the few fishermen of the Bahía Honda area still involved in artisanal fishing, believes that the other fishing boats of the area "disappeared" because their owners could not invest in more specialized fishing equipment that would allow to exploit fishing sites located outside CNP (offshore). He believed that most fishermen of the area were forced to stop fishing because deep water fishing requires the use of radar and compass, and because the fishing nets used by local fishermen only serve in shallow waters.

Whether the number of people practicing artisanal fishing has been decreasing because of CNP's stricter protection measures or because of a reduction in fish stocks remains uncertain. The same is true for the observed decline in the productivity of artisanal fishing activities documented in the study. At this point, there is little scientific evidence available indicating that CNP's fish stocks have been recently declining, though most scientists and NGO workers that have worked in the area of CNP generally believe that fish stocks have

decreased importantly in recent years (see Section 5.4.2). Interview results presented in this section indicate that artisanal fishermen of the Bahía Honda area have mixed opinions on the causes of the observed declining productivity of artisanal fishing activities documented in this study.

Economic alternatives

In recent years, many agro-pastoralist and fishing families of the area have diversified their household income generation strategies to cope with the reduced productivity of their respective economic activities. Results from semi-structured interviews show that a large proportion of respondents have at least one other occupation besides their main economic activity from which they derive income. Secondary employment includes construction work, logging, agricultural wage work, fishing net making, transportation service, subsistence fishing, and a few respondents run a small store (*tienda*) where they sell various food and household products within their community. An important share of respondents also admitted having worked as wage labourer in the past year, mainly helping on occasional construction projects in their community, or working as wage labourer for local cattle ranchers, or doing short-term contracts for one of the two private companies established in the area. Only a small number of respondents (4 out of 38) admitted receiving financial assistance from relatives or friends. Table 7 shows division of labour, percentage of respondents having secondary employment, and the percentage having worked as wage labourer in the last year.

Table 7. Primary occupation and secondary sources of income of selected interviewees – Bahía Honda *corregimiento* 2003 *(source: results obtained during semi-structured interviews with 21 fishermen and 17 agro-pastoralists from the Bahía Honda corregimiento)*

Occupation	Nbr. of respondents	Respondents with at least one other employment	Respondents who have done wage work in the last year
Fisherman	**21**	**52.4%**	**57.1%**
Farmer	**9**	**44.4%**	**44.4%**
Cattle Rancher	**1**	**100.0%**	**100.0%**
Farmer and Cattle Rancher	**7**	**42.9%**	**57.1%**

The declining profitability of agro-pastoralist and fishing activities in the area has led many coastal inhabitants to look for work labour at one of the two private companies operating in the area. Since their establishment about 9 years ago, both private companies have been contracting local residents, mainly to work on construction projects or to help with night-watching, cooking, and lawn maintenance duties. At the moment of the study, the company established in Playa del Sol employed some 13 permanent employees, while the company established in Isla Canales de Tierra was employing 57 employees from the communities of Bahía Honda and Salmonete in April 2005. Although some residents of Bahía Honda have had permanent jobs at the company in Isla Canales de Tierra for a few years now, many of the positions the company offer are temporary contracts that vary from three to twelve months. Most people employed in Playa del Sol are permanent employees. The manager of Playa del Sol admitted that when they first started operating in the area, the company was employing about 50 people from surrounding communities, who they had to lay off after construction work ended.

The jobs offered by the companies at Playa del Sol and in Isla Canales de Tierra are highly desired by local residents. As the manager from Playa del Sol explained, their employees earn a relatively high salary compared to the national minimum wage. On average, their employees received a daily wage of $US 10 to $US 12, corresponding to about two to three times the average wage of nowadays fishermen and agro-pastoralists. Work is steadier

than fishing or farming, and by joining the formal job-market, people become part of the national pension plan. Because artisanal fishing is not the economic alternative it used to be, both the manager at Playa del Sol and at Isla Canales de Tierra mentioned that they have recently been turning down residents from Bahía Honda looking for jobs almost on a daily basis. Though the company at Isla Canales de Tierra is an important source of employment for the region at the moment, most people hired by the company will eventually lose their jobs, as all construction operations are expected to end within the next two or three years. As such, there is a high probability that most switching and non-switching agro-pastoralists employed in Canales de Tierra will become unemployed or return to farming or fishing in the next few years.

5.3.7. Conclusion

As demonstrated throughout Section 5.3, changes in coastal agricultural productivity, employment patterns, and resource management decision-making processes have affected the social and economic conditions of CNP buffer zone inhabitants in several ways. While an important number of agro-pastoralists chose to migrate out of the region, others chose to switch employment and turned to artisanal fishing. The switch considerably altered income patterns among and between non-switching and switching agro-pastoralists, widening the gap between the two groups as both were adopting different resource management strategies. In addition, while the switch has contributed to reducing the importance agro-pastoral activities in the Bahía Honda employment sector, it also permitted non-switching agro-pastoralists to consolidate their landholding and arguably facilitated the alienation of a large share of the Bahía Honda territory. On the other hand, the switch directly led to an increase in the number of resource-user exploiting Coiba National Park, which in return has had several implications for the planning and management of the park. Facing an increasing number of resource-users,

the limited institutional capacity of ANAM pushed them to establish a cooperation agreement with several international and national conservation agencies to redefine and reinforce CNP's protection measures. As of now, such measures have been mainly reactive and exclusionary in nature, creating much discontent and mistrust amongst CNP resource-users towards park authorities. In addition, park authorities have shown little interest in compensating fishermen of the Bahía Honda area for the further restriction of their fishing rights, which has contributed to a decrease in illegal fishing but has increased unemployment in a region in dire need of new economic alternatives. As such, the recent modification of CNP's operational and legal framework has reduced the newly acquired economic power of most switching agro-pastoralists.

5.4. Environmental changes

5.4.1. Introduction

Changes in resource management strategies, in employment patterns, and in land holding and land use patterns that have occurred in the buffer zone of Coiba National Park during the past three decades have not only affected the socio-economic situation of CNP resource-users, they have also altered the physical landscape in which CNP management authorities are operating today. While on the one hand, migration and the switch in employment have contributed to reduce pressure on buffer zone agricultural and forest ecosystems, the switch has considerably increased anthropogenic pressures on CNP's marine ecosystems. The two following sections present some of the most important coastal and marine environmental changes that have occurred in and around CNP over the past 30 years, and how such changes are linked to Bahía Honda people's changing employment patterns and resource management strategies.

5.4.2. Coastal environmental changes

As demonstrated in Section 5.2, there is evidence indicating that the productivity of Bahía Honda's coastal lands has been decreasing over the past two or three decades, yet, the causes of this decrease in productivity are difficult to assess. Eric Quirós, the chief agricultural engineer of the regional IDIAP office based in Guarumal, believes that small farmers of the Bahía Honda area have exhausted their fields because they did not allow them to fallow for enough time. Most small farmers can not afford to buy a lot of new land he says, and they end up over-cropping and exhausting their land only to sell it to cattle ranchers afterward, who are in a better financial situation to buy it. He compares the situation of the Soná district to what is happening in the Azuero peninsula,, where cattle ranchers have been pushing the agricultural frontier to the coast, forcing small farmers to leave the area to open new agricultural fronts elsewhere. The main difference between the two areas is the amount of rainfall they get he says. Whereas the Azuero peninsula receives little yearly rainfall, the Soná district receives much more precipitation. According to Eric Quirós, this is what is saving the area from desertification. The area is not yet experiencing a shortage of land, but he believes it is not far from reaching that point.

An analysis of forest cover changes for the Bahía Honda *corregimiento* through time would have allowed us to see how human-driven activities such as slash-and-burn agriculture may have led to unsustainable deforestation rates and subsequent soil degradation. However, the lack of aerial photographs and the lack of regional forest cover data (only available at the district level from 1986 onward) only allow us to speculate on how the regional forest cover has evolved through time, and how it might have affected the productivity of Bahía Honda's coastal lands. Available national forest cover data suggest that anthropogenic pressures from slash-and-burn agriculture and cattle ranching expansion have for decades exerted great

pressure on forest ecosystems nationwide. Indeed, between 1947 and 1992, the deforestation rate in Panama was of 41 927 ha per year (INRENARE, 1995).

Though land scarcity has seemingly never been a problem in the Bahía Honda *corregimiento*, the poor quality of soils that characterize the area (see section 3.5.1) may have pushed many agro-pastoralists to farm highly marginal lands for a few years before abandoning them to local cattle ranchers. According to Eric Quirós, this is a common occurrence in the area. In the 1970s, farming of marginal lands was likely causing more rapid land depletion, when about 96.13% of the economically active population was involved in agricultural activities and the area was more heavily populated. As such, a rapid expansion of slash-and-burn agriculture and cattle ranching activities in the Bahía Honda may have led to a decrease in coastal soil productivity.

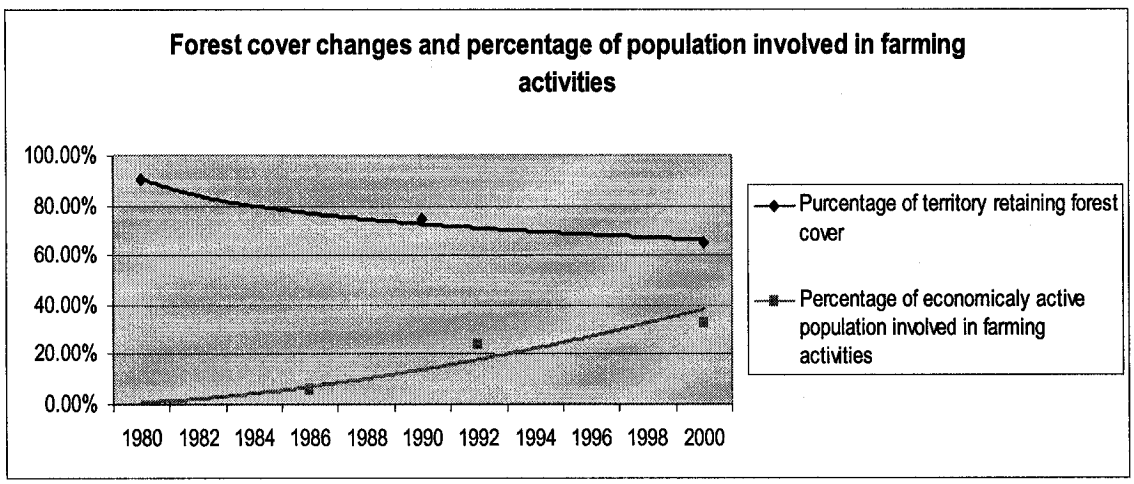
Though our results indicate that the productivity of cropping activities in Bahía Honda is still declining today, available forest cover data at the district level indicate that forest cover has rapidly increased in the region over the past two decades. Between 1986 and 2000, forest cover in the Soná district increased at a rate of 12.5% per year (see Table 8). Between 1986 and 1992 only, forest cover increased at a rate of 25.6% per year. Such phenomenon contrast sharply with provincial trends. Indeed, between 1992 and 2000, the Province of Veraguas only saw its forest cover increasing at a rate of 1.4% per year.

Table 8. Forest cover assessment and forest cover change – Soná District, 1986-2000. *(source: INRENARE, 1995; ANAM, 2003)*

	1986	1992	2000
Land surface of Soná district (hectares)	**1530.8**	**1512.5**	**1512.5**
Forest cover (hectares)	**93.16**	**365.55**	**486.99**
Percentage of territory retaining forest cover	**6.1%**	**24.2%**	**32.4%**
Annual forest cover change between 1986 to 2000			**12.5%**

It is difficult to determine what has caused forest cover to increase in this particular region of Panama. The possibility that forest cover has been evaluated using different methodologies should not be discarded. Nonetheless, data presented in Table 8 suggest that the switch of employment documented in this study might have shifted anthropogenic pressures from coastal to marine resources significantly enough to foster substantial regional forest re-growth. As discussed in section 5.3.4, already in 1999, foreign land speculation activities had contributed to turning 1 200 ha of Bahía Honda's farmland and pasture land into secondary forest. The recent decline in population observed in the area also likely contributed to putting less pressure on regional forest and agricultural ecosystems. Figure 6 shows how regional forest cover has evolved over the past two decades alongside the number of Bahía Honda inhabitants involved in agro-pastoralists activities.

Figure 6. Forest cover change in the Soná District between 1986 to 2000 over percentage of economically active population of the Bahía Honda *corregimiento* involved in agro-pastoralist activities between 1980 to 2000. *(Source: INRENARE, 1995; ANAM, 2003, and Censo Nacional Agropecuario, 1980, 1990-1991, 2000-2001)*



5.4.3. Marine environmental changes

Though ground breaking efforts have been made to document the flora and fauna of Coiba Island (see, among other studies, Ibáñez and Cabot, 1997, Castroviejo & Ibáñez; 2001),

only a handful of empirical studies have examined the state of marine ecosystems of CNP and how they have evolved over time.

In a key study that aimed at assessing the state of CNP coral reefs and coral communities, Guzman *et al.* (2004) reported high instances of mortality among coral reefs and coral communities of the park in recent years, though they attributed this to climatic variations such as past El Niño warming events of 1982-1983 and 1997-1998 and not to anthropogenic pressures. In another effort, Moretti (2002) documented CNP's most frequently caught fish species, and provided valuable estimations of the intensity of fishing activities in Coiba National Park. As discussed in previous sections, Moretti (200) demonstrated that many fishermen exploiting the waters of CNP have been spending more time at sea in recent years to catch the same amount of fish as in the past, suggesting that fish stocks in CNP may be declining. According to Moretti's study, widespread illegal and destructive fisheries in CNP may be at cause.

As of now, no empirical studies have attempted to verify this perceived decline of CNP's fish stocks, nor has there been any empirical assessment of the state of CNP's crustacean populations. Nonetheless, there seems to be a general consensus among sea product exporters, researchers, and NGO workers that fish stocks in Coiba National Park have indeed been declining in recent years, a situation readily attributed to illegal and destructive fishing practices (D'Croz et al., 1999; Maté, 2005; Watts and Wu, 2005). It is widely believed that shark, red snapper, and lobster populations, three prize catches among artisanal fishermen of the region, have been declining sharply in recent years due to the increasing intensity of fishing activities in the Gulf of Montijo (D'Croz et al., 1999; Maté, 2005). While commercial fishing boats may have their share of responsibility in the observed decline of CNP's fish stocks, Watts and Wu (2005) suggest that artisanal fishermen from the coast of Veraguas may be the greatest threat to the marine resources of the Gulf of Chiriqui in the long run.

5.4.4. Conclusion

As demonstrated in the above section, factors such as land speculation, out-migration, and changes in the resource-management strategy of Bahía Honda inhabitants have contributed to reduce human pressures on coastal forest and agricultural ecosystems. The district of Soná as a whole has seen its forest cover increasing in recent years, a surprising situation considering provincial trends. Though the lack of forest data at the *corregimiento* level did not permit us to verify the linkage, it is likely that the employment switch documented in this study and the important land use changes that subsequently occurred in the Bahía Honda *corregimiento* may have directly contributed to forest regeneration in the region. On the other hand, the changing resource management strategy of Bahía Honda inhabitants has contributed to increased pressure on CNP's marine resources, a situation that led CNP's park authorities to increase their efforts in protecting the resources of the park against illegal fishing.

Chapter 6: Discussion and Conclusions

6.1. Discussion

The employment switch documented in this study shows that CNP's resource-users are dynamic actors who can change their household resource management strategy according to various factors such as resource availability, resource condition, economic opportunities, and/or economic necessity. While one might expect that the establishment of Coiba National Park in 1991 would have deterred coastal agro-pastoralists from turning to artisanal fishing, this study demonstrates that the number of resource-users exploiting the waters of Coiba National Park has instead been increasing since the creation of the park.

It is hard to say whether or not ANAM was aware that the pool of CNP resource-users was increasing as coastal agro-pastoralists were leaving their farm. Only in recent years have there been scientific contributions addressing the physical and socio-economic processes that characterize the livelihoods of CNP's buffer zone inhabitants, and this research is a first attempt to understand the drivers and implications of the employment switch that occurred in the area. As such, it appears unlikely that ANAM was aware that an important number of coastal agro-pastoralists were deserting their farms to turn to artisanal fishing, and of the implications this entailed. If they did, they never addressed the problem directly. A few reasons may explain this.

ANAM's initial lack of financial and institutional support may partly explain why illegal fishing became widespread in CNP, and why it became difficult to counter. However, the financial and management framework in which CNP authorities operate is quite different today. ANAM has received recently the support (financial, technical, and institutional) of multiple organizations and agencies that hold significant experience in the field of

conservation. Although the rather exclusionary and restrictive strategy adopted by ANAM and by the consortium of conservation organizations that support ANAM's activities has had some success in keeping fishermen from the Bahía Honda area outside the limits of the park, illegal fishing stills persist in CNP. In addition, CNP's park authorities have not yet been able to obtain the support of resource-user communities. Thus, the situation deserves a fresh look.

Additional factors other than ANAM's lack of financial support need to be taken into consideration to explain the flaws currently observed in the planning and management of Coiba National Park. [1] The lack of science behind the implementation of Coiba National Park; [2] the lack of community outreach efforts, and [3] the sectorial and restrictive approach adopted by park management authorities in the planning and management of CNP are all reasons that have contributed to alienate local communities from CNP's conservation endeavour and prevented CNP authorities from putting a definitive halt to illegal fishing.

6.1.1. Lack of science behind the implementation of CNP

Since the establishment of Coiba National Park, the park has been planned and managed as a no-take marine protected area, notwithstanding the fact that little is known about the state of the local resources it encompasses and without knowing the level of threat the park is facing. While groundbreaking efforts have been made to assess the state of CNP terrestrial ecosystems (see Section 3.4.), little is known about the state of CNP marine resources. Considering that 80% of the park's territory is marine and that CNP's resource-users are mainly fishermen, it is surprising that no fish stock assessment have yet been undertaken. Also, large sections of the park have been closed off to fishing without having tangible scientific evidence to support such management measures. While there is reasonable evidence that illegal fisheries have caused CNP's fish stocks to decline in recent years, little

empirical data exist to support the view that stocks are exhausted or have been declining at unsustainable rates.

Furthermore, little is known about CNP resource-users' livelihoods or about the level of threat the park is facing. It took ten years after the park was created before a first study attempted to identify CNP resource-users (see Moretti, 2002). Though Moretti made significant advances in documenting the patterns and impact of illegal (and legal) fishing activities taking place in CNP, the absence of landing figures in his study does not allow the evaluation of the level of threat illegal fishing activities represent to CNP's marine resources.

Moreover, the possibility that CNP may be facing more threats than just illegal or unsustainable fisheries has not been explored. Scientists such as Dr. Guzman (Smithsonian Tropical Research Institute) have raised the possibility that climatic events such as the past 1997-1998 El Nino event may have affected the dynamics of CNP's marine ecosystems and could have pushed fish stocks to shift their bio-geographical range away from the park (Guzman, pers. comm., 2005). Many authors have documented the effects of climatic disturbances on the composition and biogeographical range of coral reef, reef fish, zooplankton and phytoplankton, and small and large pelagic fish communities (Hayward, 1997; Victor *et al.*, 2001; Bakun and Broad, 2003; Guzman *et al.*, 2004). The effects of oceanic climatic variations and how they have changed the biogeographical range of cod and skipjack tuna have been well documented (see Stenseth *et al.*, 2002).

As many scientists have demonstrated, the El Niño event of 1997-98 had important impacts on both marine and terrestrial ecosystems all across Panama (see Victor *et al.*, 2001; Glynn *et al.*, 2001; Stenseth *et al.*, 2002; Guzman et al., 2004). As mentioned in Section 5.4.3, recent attempts to catalogue and assess the state of coral species of CNP by Guzman *et al.* (2004) demonstrated that most instances of coral deaths in CNP were directly caused by climatic fluctuations and were not due to anthropogenic pressures (such as unsustainable or

destructive fishing practices). Anecdotally, a Salmonete cattle-rancher and ex-fisherman mentioned having stopped fishing after the 1997-1998 El Niño event, which he said drove all the fish away from CNP.

Though Moretti's results (2002) demonstrate a perceived decline of fish stocks, it is worth noting that his study was conducted only two years after the 1997-98 El Niño event. The perceived decline of CNP's fish stocks that Moretti noted may have been partly driven by changing marine climatic conditions. If indeed climatic variations have changed CNP marine ecosystem dynamics, implications for the management and monitoring of CNP could be quite significant. As of now, most management efforts in CNP have been devoted to countering illegal fishing, based on the assumption that this is the only threat the park is facing.

While many observers will recognize that illegal fishing is an important threat to the long-term sustainability of CNP's marine resources, few efforts have been made by park management authorities to understand the root causes behind it. In fact, only one independent need-assessment study was conducted in CNP's buffer zone since the creation of the park (see APRONAD, 2000), and that study only addressed the situation of the Bahía Honda *corregimiento*. Though the report concluded that the area had pressing economic needs, lacked basic services, and that few employment opportunities were available for people of the area, no compensation measures or employment programs have yet been put in place by CNP's authorities to mitigate the economic impacts of the park on buffer zone communities. This has remained the case ever since CNP's legal and managerial framework was upgraded and reinforced.

As such, important scientific uncertainties exist with regards to the state of CNP's marine resources, but also with respect to the types and level of threat faced by CNP. In addition, very little is known about the processes that govern resource management decision-making in coastal communities. As demonstrated in this study, changes in resource

management patterns in CNP's buffer zone communities can have important implications for the conservation of the park. In the face of such lack of information, it is difficult to see how park authorities can develop and implement management measures that can effectively meet CNP's conservation requirements and obtain resource-users' endorsement.

6.1.2. Lack of community outreach efforts

While uncertainty persists on the state of CNP marine resources and on the extent to which illegal fishing is affecting them, one could argue that the case of CNP calls for the adoption of precautionary protection measures. Though this may be appropriate in the short term, such a non-scientific and non-transparent strategy is not likely to be endorsed by resource-user groups; thus leading to failure in the long term.

As such, it appears imperative that resource-users from buffer zone communities be well informed of the state-of-affairs in CNP and provided with some type of compensation or employment alternatives for restricting their fishing rights. As demonstrated in this study, this has not been the case. Residents of studied communities were not aware of the new legal developments in CNP, and few efforts have been made by park authorities to integrate resource-user groups in the planning and management of the park. In addition, no employment or community development programs have yet been put in place to compensate fishermen for restriction of fishing rights. The window of economic opportunities the park offers will likely remain attractive to many coastal inhabitants as long as the productivity of coastal land continues to decline and that no economic alternatives are offered to them. As Bailey (1988) has pointed out, fishing often acts as a social "safety valve" for the landless and unemployed. Known as Malthusian overfishing, the concept suggests that the number of artisanal fishermen will keep increasing as long as economic alternatives are not created for would-be fishermen.

Since the APRONAD (2000) report was produced, efforts mainly focused on the development of environmental education programs to the exclusion of putting in place alternative employment opportunities for CNP resource-users. Although environmental education is an important component to any conservation effort, it will not likely reach the desired objectives if not matched by compensation measures or alternative employment programs.

To date, the extent to which educational activities carried out in CNP's buffer zone have achieved their initial objectives is questionable. Much of the effort has been placed on educating children about the ecological importance of CNP, but few attempts have been made to educate fishermen directly. Though providing environmental education to children may help in enhancing environmental stewardship in the long run, it has little immediate effect on fishermen's attitudes and practices. With little information at hand and no alternative employment or compensation measures offered to them, it is difficult to see how CNP resource-users would support a conservation endeavour based on precautionary principles.

6.1.3. The sectorial approach to CNP and the limits of MPAs

It is likely that the planning and management difficulties faced by CNP's authorities are due to the inherent limits of the management framework they have been using since the establishment of Coiba National Park. By choosing to manage CNP under a no-take MPA approach that is not integrated into a broader Integrated Coastal Management strategy, CNP's authorities have likely impeded their own ability to understand the dynamics that govern resource management decision-making processes in buffer zone communities, as well as their ability to mitigate the impacts of such processes on CNP. Consequently, the steady increase in the number of CNP's resource-users documented in this study has pushed park authorities to

adopt highly localized and reactive management measures that aim at keeping resource-users outside the park.

Though such a strategy has had some success in reducing instances of illegal fishing, its long-term success is unlikely. Indeed, though a few case studies have documented the success of no-take approaches in the North, the literature abounds with case studies demonstrating that restrictive and exclusionary approaches to MPAs often fail in the South. Adoption of a more flexible and integrated management approach would have enhanced park authorities' ability to understand why the pool of CNP's resource-users had been increasing over time. Also, it would have given ANAM the means to collaborate with other agencies (such as MIDA) to develop proactive measures to prevent more coastal agro-pastoralists from switching to artisanal fishing. In short, incorporating Coiba National Park into a broader Integrated Coastal Management scheme would have given park authorities the tools needed to avoid or prevent some of the backlash that the park is now suffering.

Some observers might argue that turning CNP into a no-take MPA was the best available alternative to put a halt to destructive fishing practices and to manage CNP's fisheries. Yet, MPAs' effectiveness in achieving habitat protection and sustainable fishery management has been subject to much debate. Many argue that MPAs, and particularly no-take MPAs, have clear limitations (see Boersma and Parrish, 1999; Jameson *et al.*, 2002; Agardy *et al.*, 2003; Hilborn, 2003; Grimes and Ralston, 2003). Logically, MPAs just shift the problems of over-fishing to less-fished areas. Moreover, while MPA advocates argue that MPAs increase fish yields, recent scientific reviews find no supporting scientific evidence on the matter (Sale *et al.*, 2005). Whether or not the benefits of closing one area to fishing out weight the costs of increasing fishing pressure in another area is a subjective matter. MPAs will only benefit a species if it is over-fished, and if the size of the MPA is big enough to cover the bio-geographical range of that species so that spawning individuals can reproduce

within the MPA's limits and be subtracted from fishing pressure. According to Ship (2002), such conditions are rather unusual. As the moment, the lack of scientific baseline data on CNP's marine resources does not allow verification of whether CNP meets these conditions or not.

6.1.4. The need for a more integrated management approach for Coiba National Park

The difficulties faced by CNP's management authorities is countering illegal fishing and in obtaining the support and participation of buffer zone community residents to improve the conservation of CNP reflects a misunderstanding of the dynamic socio-economic framework in which the park operates. The lack of science behind the implementation of CNP, the lack of outreach efforts in buffer zone communities, and the sectorial and restrictive approach that park authorities have so-far adopted has limited their own capacity to develop such an understanding.

As demonstrated throughout this study, CNP is intrinsically linked to the social ecology of its buffer zone, and the efficiency of future management efforts will likely depend on how well park managers can adjust in the face of ever-changing social, economic, and environmental conditions. As such, incorporating Coiba National Park into a broader Integrated Coastal Management program may be an ideal solution. The recent adoption of Law No.44 (2004), which calls for a revision of the park's actual management plan may be a good occasion for CNP authorities to formulate a more integrated strategy for the management of CNP. In the long-run such a plan could lay the basis of a genuine, cooperative relationship between park managers and resource-user communities, which would benefit long-term conservation of Coiba National Park. However, before this can be made possible, several institutional and legal challenges lie ahead.

Institutional challenges

A multi-dimensional approach to the management of CNP would require a considerable re-modelling of the institutional framework in which CNP operates. Legislation application and enforcement in fishery management are responsibilities that require solid institutional capacity, something ANAM seems to currently lack. As pointed out by the director of ANCON, ANAM does not have the resources or organizational capacity to ensure that rules are applied and enforced in CNP (see Hernández, 2002). Though the ANAM-MarViva alliance has improved the efficiency of patrolling efforts in CNP, illegal fishing still persists.

At this point, AMP has not been called to play a greater role in CNP's conservation endeavour, though most of CNP's buffer zone falls under its legislative umbrella. In addition, AMP has more experience and more trained personnel than ANAM in fishery management and regulation enforcement in marine and coastal zones in Panama. In that sense, AMP is in an appropriate position to collaborate with ANAM in patrolling the park. This could allow ANAM-MarViva to divert some of their efforts in protecting the park towards much needed community outreach efforts. It would also allow them to devote more effort in resource assessment and monitoring.

MIDA could also be called on to assume a greater responsibility in the planning and management of CNP's buffer zone. At the moment, MIDA's presence in the *corregimiento* of Bahía Honda is minimal[30], though the area holds particular importance in the conservation scheme of CNP. MIDA could be providing agricultural technical assistance and economic incentives to coastal producers. Considering the interconnectivity between the viability of coastal agricultural activities and the number of coastal inhabitants involved in artisanal fishing, this might result in fewer households switching to fishing. As such, MIDA could be an important player in regulating and improving the sustainability of coastal agricultural

[30] Only one MIDA extension agent has been appointed for the entire area, and according to local producers, the agent visits the area only once every two or three months.

activities. To achieve this, existing park and buffer zone legislation needs to be harmonized so that MIDA has the legal support and resources to operate efficiently. The same applies to IPAT. At this point, their presence in CNP has been minimal, yet, IPAT is the government agency responsible for developing and promoting tourism across the country.

To develop an integrated park management strategy run with multi-institutional cooperation, roles need to be clarified, applicable legislation on marine and coastal protected areas needs to be harmonized, and one agency should be given the legal tools needed to coordinate the activities of all agencies operating in the park and its buffer zone. As noted by Suman (2002), AMP may well be the most appropriate governmental agency to assume such a position.

Legal challenges

The recent adoption of Law No. 44 (2004) demonstrates the desire of park authorities to adjust their strategy towards a more integrated approach for the management of CNP. Notably, Law No.44 sets out the mechanisms to increase multi-institutional cooperation and to carry more studies in and around CNP. However, the operational framework established by Law No.44 offers little space to resource-user groups and non resource-users to participate in CNP's planning activities. Although Law No.44 grants seats to representatives from each fishermen' association (artisanal, commercial, recreational) and to political representatives of selected buffer zone districts on the directive committee, it does not give them representation on the scientific committee, which will be ultimately in charge of drafting any new management plan. Hence, representatives of resource-user groups and of buffer zone communities will be able to vote with other members of the directive committee on new management plans, but will not be able to participate in its design. Being a minority on the committee, buffer zone community and resource-user representatives may not be able to

promote and/defend their interests on an equal footing. Since the committee is only in its first year of operation and the scientific committee has yet to be put in place, it is unclear whether this will be the case. At the moment, although Law No.44 represents a step towards integrated coastal management, more effort will be required before a genuine cooperative framework between CNP stakeholders and buffer zone communities can emerge.

6.1.5. The prospect of tourism

So far, the common response of park management authorities and NGO workers to Bahía Honda resource-users has been to advocate tourism will soon spread to the area, providing alternative jobs to many. As discussed in the APRONAD report (2000), the *corregimiento* of Bahía Honda has a privileged geographical location over other areas of the buffer zone for developing a successful (eco)tourism sector. The pressing economic needs of CNP's buffer zone communities, combined with the lack of alternative employment to fishing raises the imperative to find a new regional economic driver. As such, (eco) tourism may be the logical alternative to explore.

However, as noted by Alder *et al.* (1994), tourism often offers only limited development opportunities and sometimes even further damages local natural resources. In the case of Bahía Honda, it is difficult to see how tourism or eco-tourism could be a viable economic alternative for people of the area any time soon. There is still no road access into the area, no basic infrastructure (no potable water or electricity), no hotels where tourists could stay, no restaurants. Also, an increasing proportion of the territory is now in the hands of two foreign societies that show no desire to sell their properties to foster tourism development in the area. Under such conditions, it appears unlikely that (eco) tourism development could provide direct employment to artisanal fishermen of the area in the near future.

Moreover, the community of Bahía Honda (where ANCON has recently initiated a capacity building program to foster tourism-entrepreneurship development among community residents) suffers from significant alcoholism problems, which does not make it an attractive tourism destination. Though the area's preferential geographic position vis-à-vis CNP makes it a prime location for tourism development, important obstacles need to be overcome before tourism can really become a significant source of employment in the region. Most importantly, park authorities will have to increase their presence in CNP's buffer zone to be capable of developing a tourism model that does not further damage the sensitive eco-systems that characterize the area.

6.2. Conclusions

The richness and fragility of Coiba National Park's ecosystems combined with the economic precariousness of coastal inhabitants living in its buffer zone have caused the formation of a complex operational framework that has greatly complicated the task of management for stakeholders involved in the conservation of the park. In recent decades, the declining productivity of Bahía Honda's coastal lands, the declining profitability of farming activities, land speculation forces, and the window of economic opportunities offered by the rich waters of Coiba National Park have pushed many young, asset-poor, and long-established agro-pastoralists of the area to leave their farm and to venture into artisanal fishing. Furthermore, these factors have pushed many others to leave the region in search of a better life in nearby towns.

Such changes in coastal employment patterns and resource management strategies have had several impacts on the social life of Bahía Honda people and on their economic situation. By turning to artisanal fishing, switching agro-pastoralists improved their economic situation significantly (although only perhaps temporarily), which in return opened them to

new economic and social opportunities. On the other hand, the employment switch contributed directly to reduce the importance of agro-pastoralist activities in the local economy. This has had marked impacts on coastal land holding and land-use patterns. Indeed, the employment switch has allowed non-switching agro-pastoralists to consolidate their landholdings, and has facilitated the alienation of a large share of coastal land. Nowadays, an increasing proportion of the Bahía Honda *corregimiento* territory is in the hands of foreign land speculators. In addition to catalyzing the employment switch, the declining productivity (and profitability) of coastal agricultural activities has led to an important restructuring of Bahía Honda's agricultural sector. Farmers of the region are now on average much older and employ less people on their farm then in the past. Furthermore, the young have been deserting farmlife, either to venture into artisanal fishing or to look for wage labour.

The physical, social, and economic changes that have occurred in the buffer zone of CNP have directly contributed to shifting local anthropogenic pressures from coastal agricultural/forest ecosystems to marine ecosystems. Contrary to other areas of the province, the district of Soná has seen its forest cover increase over the past two decades, something that can be attributed to the employment switch, foreign land speculation, and to the substantial out-migration that has recently occurred in the Bahía Honda *corregimiento*. On the other hand, the switch from farming to fishing has had important impacts on regional marine ecosystems, particularly on CNP's fish and crustacean communities. Though there is only limited scientific information yet available to verify the observed decline in CNP's fish stocks documented in this study and by Moretti (2002), NGO workers and marine biologists familiar with the fishery situation in Coiba National Park are almost unanimous in saying that CNP's fish and crustaceans stocks have declined significantly in recent years due to an increase in illegal and/or unsustainable fishing.

The employment switch has had several implications for the conservation and management of Coiba National Park, the most important being that park authorities have had to deal with an increasing number of resource-users over the years. In the first 10 years or so ANAM's limited institutional and financial capacity prevented it from effectively countering increasing instances of illegal fishing and from implementing the measures found in CNP's original management plan. Arguably, ANAM's limited institutional capacity undermined their capacity to understand the socio-economic and environmental changes that were occurring in buffer zone communities, thus limiting their ability to adapt their managerial strategy to such changes.

The recent involvement of a consortium of international and national NGOs in Coiba National Park greatly modified the legal and managerial framework in which the park operates and enhanced ANAM's capacity to manage CNP effectively. The arrival of organizations such as MarViva contributed to increasing patrolling efforts in CNP, which directly enhanced ANAM's ability to protect the park. In addition, NGO's lobbying efforts led to the adoption of two important legislation projects (Law No.44, 2004 and Resolución AG-0118, 2005) and to the establishment of CNP as a World Heritage Site, which, among other things, significantly reinforced CNP's fishing rules. Though legislation such as Law No.44 (2004) proposes a certain number of pro-active measures to increase resource-user participation in the planning and management of CNP, it shows some limitations. The adoption of Resolución AG-0118 (2005) without consulting or informing resource-user groups (notably artisanal fishing communities of the Bahía Honda region) demonstrates that park authorities' recent openness to increase public input in the planning and management of CNP may be limited. As of now, the stiffening of CNP's fishing rules, combined to park authorities' lack of transparency in planning and management activities has contributed to worsening the relationship between buffer zone communities and park authorities. Moreover,

despite increased assistance from international and local NGOs, park authorities still have a limited knowledge of the socio-economic and biological conditions in which CNP and its buffer zone operate.

Though programs to integrate local communities in the planning and management of the park are likely to attenuate ongoing tensions, such measures have yet been put in place. Recent efforts to foster tourism-related entrepreneurship are heading in the right direction, though considerable obstacles will have to be surmounted before tourism gives the area the economic sparkle it needs. The development of employment alternatives or compensation plans for the people most affected by the recent stiffening of CNP's fishing legislation might be imperative to appease local discontent and to obtain buffer zone residents' endorsement. However, the provision of compensation and alternative employment may only be part of the requisites needed to obtain the collaboration of buffer zone communities in conserving CNP. The long-term conservation of Coiba National Park will likely depend on how park authorities and conservation stakeholders understand the social, economic, and environmental changes that govern CNP and its buffer zone communities, and how they can develop a managerial framework that can adapt to such changes. Most importantly, the long-term conservation of Coiba National Park will depend on how park authorities and conservation NGOs involved in CNP can engage in a transparent, participatory relationship with buffer zone residents, one that does not see buffer zone inhabitants and resource-users as agents of environmental destruction, but one that sees them as essential partners in the conservation of the park.

Chapter 7: Recommendations

In an attempt to address the problems and limitations faced by Coiba National Park's current management plan and by park authorities, eight recommendations were developed, based on respondents' comments, investigation results, and personal observations.

- An institutional cooperative agreement be made between ANAM, AMP, MIDA, IDIAP, MarViva, ANCON, and other governmental and non-governmental organizations whose legislative authority and/or mandate call them to play a role in the planning and management activities in CNP and in its buffer zone, so that agencies' responsibilities are established, legislative ambiguities are clarified, and coordination mechanisms settled. Such an institutional cooperative agreement ought to be open to public scrutiny and include participatory and conflict-resolution mechanisms to involve CNP resource-user groups in the process.
- Park management authorities must engage in a genuine, non-conflictive, participatory, and inclusive consultation process with CNP resource-user groups to develop the basis of a new managerial strategy that would enhance the role of resource-users and buffer zone community members in the planning and management of Coiba National Park.
- CNP's fish and crustacean stocks need to be assessed and monitored so as to determine their current state and the extent to which they are being impacted by anthropogenic and/or environmental factors. Particularly, obtaining detailed resource extraction information (rate, products) for each user-group (commercial fishermen, artisanal fishermen, divers) would increase park authorities' ability to assess the state of CNP marine resources and to which extent they can be harvested sustainably. This

would allow park management authorities to explore the possibility of establishing quota systems and fishing seasons for each species harvested, a measure that has been called for repeatedly by artisanal fishermen interviewed during this study.

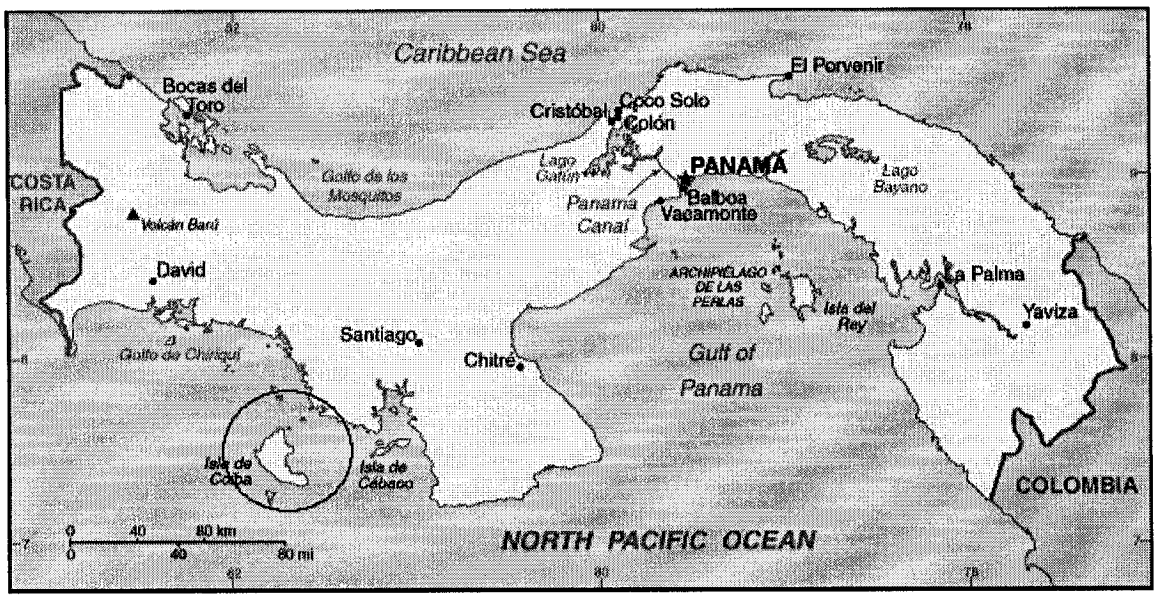
- More studies need to be undertaken to understand the socio-economic conditions driving coastal inhabitants to engage in illegal fishing and to assess the current and future social and economic impacts of restricting fishing activities in CNP on resource-user communities.
- A cooperative relationship must be developed between park authorities and the MIDA to promulgate sustainable land-use and land-management practices in coastal communities located in the buffer zone of Coiba National Park. In addition to offering new economic opportunities in the agricultural sector, such measures could prevent more agro-pastoralists from switching to fishing and avoid that fishing becomes a "safety economic valve" for coastal agro-pastoralists.
- Alternative employments and/or compensation measures must be provided to artisanal fishermen affected by the recent reinforcement of CNP's legal framework.
    - Give resource-users and community residents positions in planning and managing activities of the park. Such employment could include park guards, environmental educators, and research assistantship or field guide positions.
    - Provide training courses to artisanal fishermen and offer them economic incentives to fish offshore. Fishermen of the area of Bahía Honda have relatively rudimentary fishing boats with limited navigation equipment, making it dangerous for them to venture far off the coast. Technical assistance and subsidies could help convince some to pursue fishing activities away from the park.

- Promote the development of sustainable forestry and agro-forestry alternatives in CNP's buffer zone communities. Since forestry was once an important economic activity in the region, such measures could be worth looking into. Recent developments in carbon trading efforts and the promise of the Clean Development Mechanisms could be interesting avenues to explore for the area.
- Programs and economic incentives should be developed to foster interest among entrepreneurs (local or foreign) in developing a vibrant eco-tourism sector in the area. Tourism development efforts should be coordinated with the IPAT and local communities, and should ensure that the health of CNP's ecosystems and of buffer zone's ecosystems is not compromised in the process.

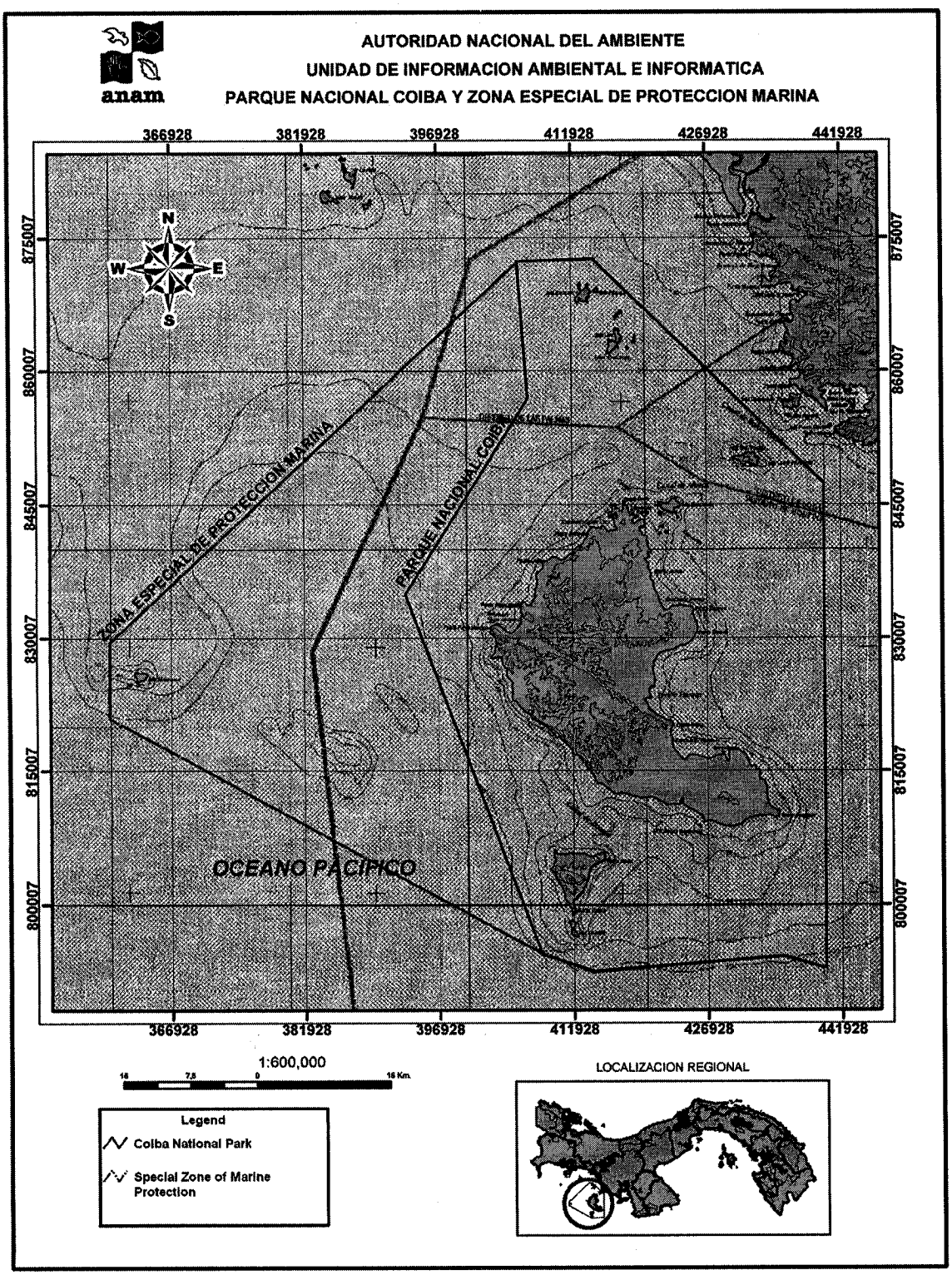
- Consider building a road connecting the area of Bahía Honda to adjacent in-land roads. This ranks as one of the top necessities listed by respondents during interviews. A road would create a wider range of new economic opportunities to local residents, who could consequently rely less on fishing for their livelihood. Costs and difficulties involved in sending children to higher education would be reduced; prices of essential goods such as food products, clothing, agricultural intrants or gasoline would be less inflated; farmers, cattle ranchers, and traditional fishermen alike would have better access to market to nearby town markets; and tourists could access the area more easily. Unless a road is built in the area, it is difficult to imagine how an eco-tourism sector could develop, or how viable economic alternatives to artisanal fishing could emerge. Moreover, the building of a road would likely enhance the frequency and quality of government and NGO assistance to the area, since limited accessibility appears to be the main impediment to the provision of more constant and effective assistance to the region.

Annexes

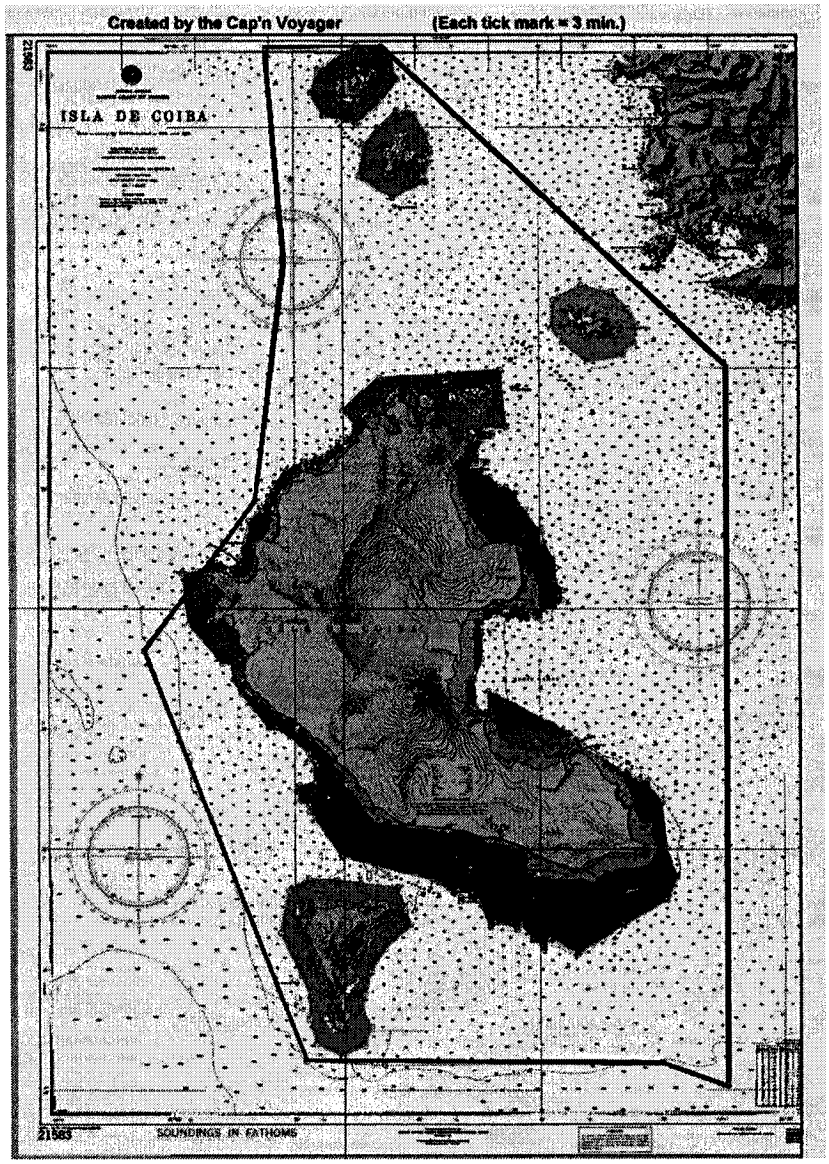
Annex 1. The Republic of Panama and study site location (encircled)



Annex 2. Coiba National Park and the Special Zone of Marine Protection



Annex 3. Coiba National Park and its different use-zones



Zona de uso ecoturistico marina donde no se permite ningun genero extractivo de los recursos naturales, comprende todas aquellas aguas costeras por la isobata de 20 brazas, no incluidas en otras

Zona de Reserva Cientifica Marina excluida de uso publico y aprovechamiento pesquero(Isla de Uva y Roques Vecinos, una milla alrededor de su costa)

Zona de Reserva Cientifica Marina excluda del uso publico y el aprovechamiento pesquero(Islas de Canal de afuera, una milla alrededor de su costa)

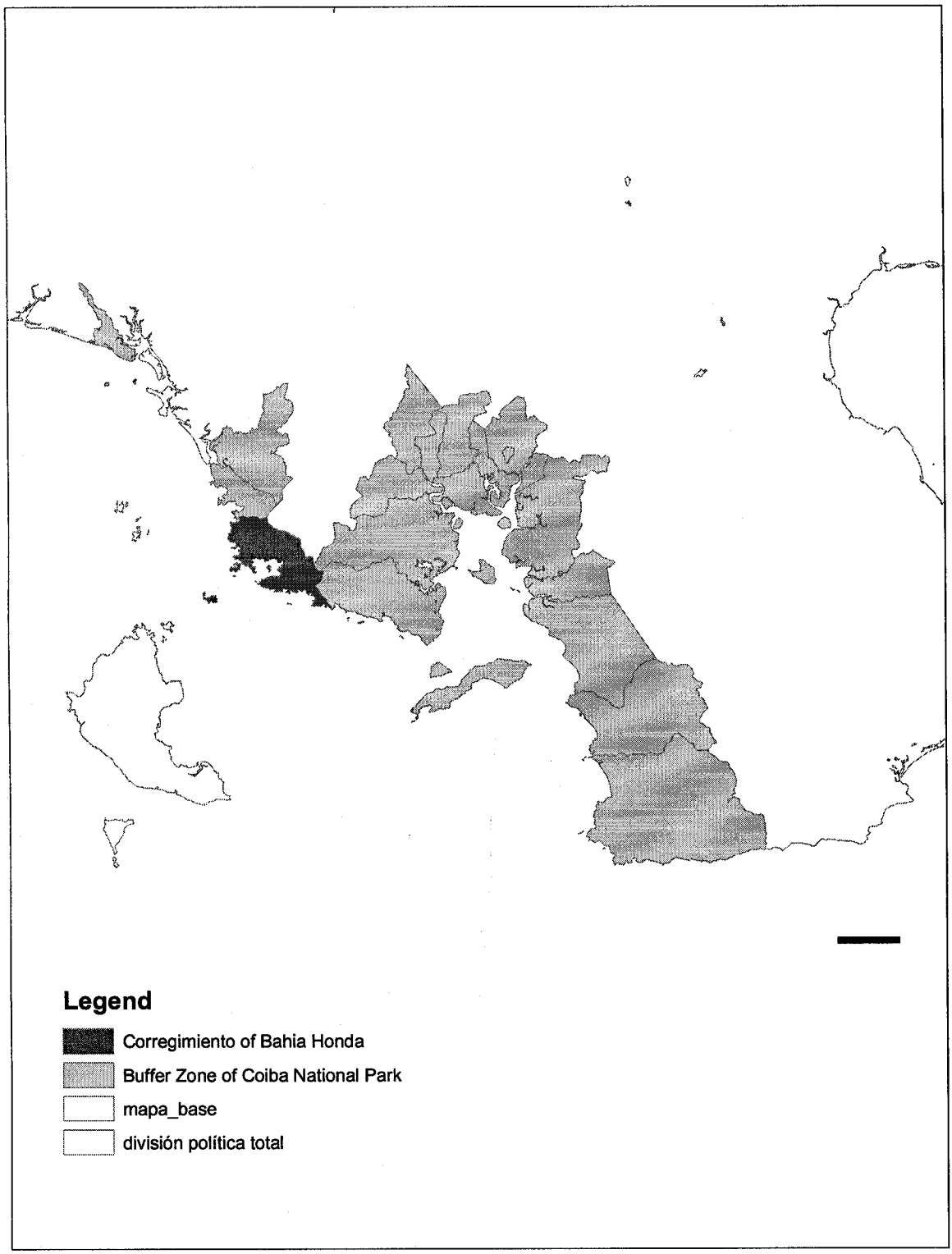
Zona de Reserva Cientifica Marina excluda del uso publico y el aprovechamiento pesquero(Isla Jicarita, una milla alrededor de su costa)

Costa Norte de Coiba, una milla fuera de punta valoratas hasta una milla fuera de punta Cristo, de ahí hasta un punto situado a una milla al noreste de la punta norte de Rancheria, de ahí hasta un punto situado a una milla al sureste del extremo sur de la misma isla y de aquí hasta la punta del Cambute.

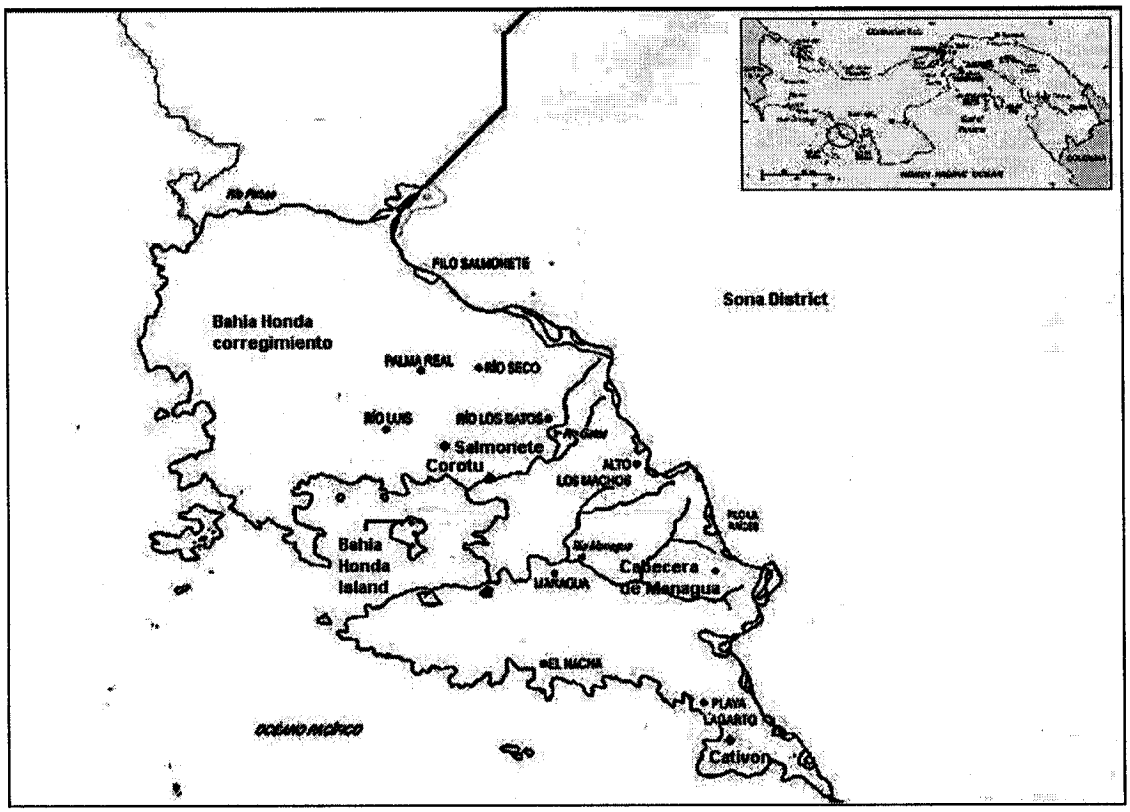
Ensenada Maria, area definida por punta Felipa, desde aquí una milla al norte hasta al punto situado una milla al norte del extremo oeste de la desembocadura de Rio Grande, desde este al sitado extremo oeste siguiendo la costa hasta punta felipa.

Area desde una milla afuera de los siguientes puntos: Punta Playa Hermosa, Punta Adelaida – Punta Sur de la desembocadura del Rio Santa Clara

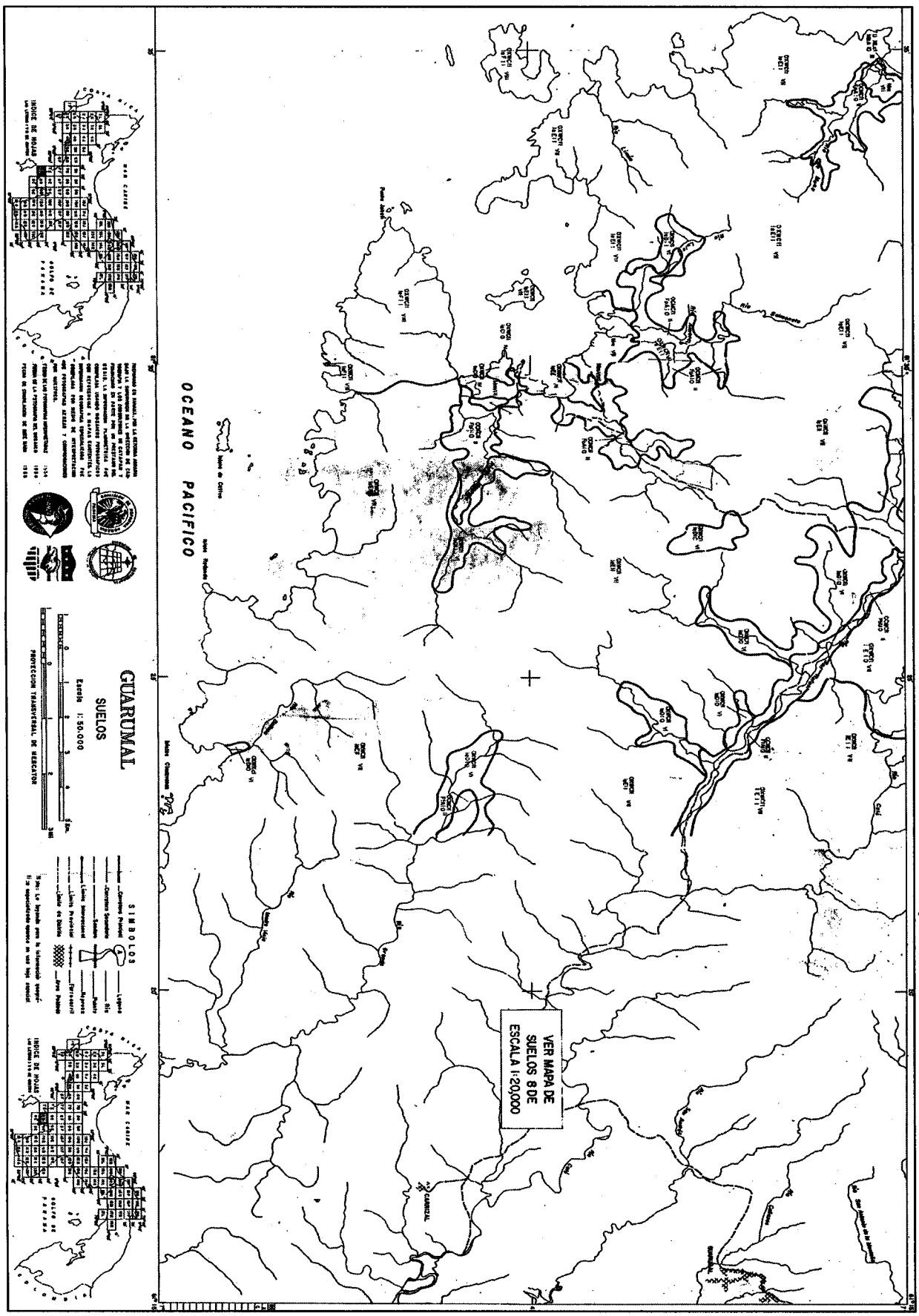
Annex 4. Coiba National Park, its buffer zone, and the *corregimiento* of Bahía Honda



Annex 5. The *Corregimiento* of Bahía Honda and location of studied communities



Annex 6. Soil map of the *corregimiento* of Bahía Honda



Soil fertility index (based on my translation)
Source: Ministerio de Desarollo Agropecuario (MIDA)'s regional office, Santiago, Panama. Unpublished source

I. Fertile, with few crop or management limitations
II. Fertile, with some limitations with regards to crop selection. Requires moderate erosion management
III. Fertile, with severe limitations with regards to crop selection. Requires erosion management
IV. Fertile, with highly severe limitations with regards to crop selection. Requires rigorous land management
V. Non fertile, low risks of erosion, but with other limitations. With good potential for pasture land or forested land
VI. Non fertile, with severe limitations. With good potential for pasture land, forested land, or for protection purposes.
VII. Non fertile, with really severe limitations. With good potential for pasture land, forested land, or for protection purposes.
VIII. Non fertile. Does not allow the production of commercial crops. With limited usage.

Annex 7. Land-use map of the *corregimiento* of Bahía Honda

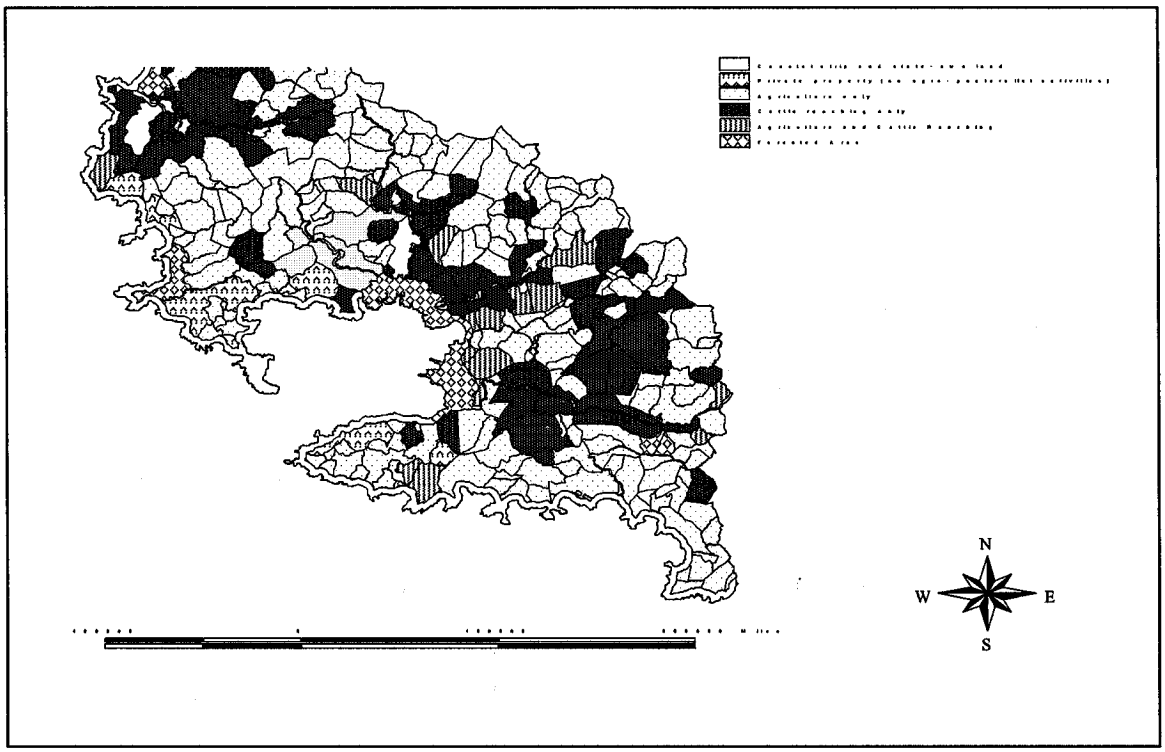


Table 9. Land use types, Bahía Honda *corregimiento*, 1999. *(Source: Programa Nacional de Titulación de Tierra)*

Land use types	Area covered (hectares)	Percentage of territory occupied by each land use
Coastal strip and state-own land	**126.66**	**0.74%**
Residential use	**1225.00**	**7.11%**
Agriculture only	**8204.85**	**47.65%**
Cattle Ranching only	**4264.20**	**24.76%**
Agriculture and Cattle Ranching	**756.50**	**4.39%**
Forested Area	**60.00**	**0.35%**
Island area (no agro-pastoralist activities)	**2582.79**	**15.00%**
Total area	***17 220.00***	***100%***

Annex 8. Land use, land management and land tenure patterns in the Bahía Honda *corregimiento*

Land use

Digital land-use information recently compiled during the mapping stage of the PRONAT program reveals that in 1999[31], about 77% of the territory of the Bahía Honda *corregimiento* was devoted to agricultural and cattle ranching activities[32] (see Table 9). As shown in Table 9, a much greater proportion of the territory is set for agriculture than for cattle ranching. This is consistent with our interview results. Among the 17 non-switching agro-pastoralists interviewed, 12 (70.58%) were farmers, one (5.88 %) practiced only cattle ranching, and four (23.53%) interviewees were involved both in farming and cattle ranching.

Non-switching agro-pastoralists of the area generally divide their farm between four different categories of land uses; cultivated area, pasture land, forested area, and fallow land. Altogether, both groups set about 17% of their farm into forest land, with important variations between farmers and cattle ranchers (cattle ranchers, 31.38%; farmers, 2.75%), likely because cattle ranchers hold on average more land than farmers and can afford to set a larger portion of their land into forest.

Land tenure

Among the 17 non-switching agro-pastoralists interviewed, five (29%) had legal title over their land, eight (47.01%) had ancestral right (locally called *derecho posesorio*) over their land, two (11.76%) rented the land they farmed, and two (11.76%) combined different tenure regimes (ex.: some mentioned having legal title over a certain part of their land and

[31] Data was compiled mainly in 1999, but the data collection process went on until 2004.

[32] The area covered by each land use reflects the economic activity or usage given to each parcel that was surveyed. For example, the 8204.85 hectares that fall under the "agriculture only" category are not necessarily all under cultivation, but the respective owner of every single parcel falling under this category mentioned being only involved in cropping and not in cattle ranching.

ancestral right over the rest). At the broader *corregimiento* level, official government data show slightly different tenure trends. As we can see from Table 10, more than 50% of the Bahía Honda *corregimiento* territory holds legal title.

Table 10. Land tenure types and surface covered – Bahía Honda *corregimiento*, 2000-2001. ***(Source: Censo Nacional Agropecuario 2000 - 2001, Contraloría General de la República)***

Land tenure types (hectares)	2000-2001
Titled land	**6 305.89**
Ancestral right (*derecho posesorio*)	**5 198.72**
Mixed regime	**1 214.00**
Rented land	**12.60**
Total	***12 731.21***

Land management

All farmers interviewed (n = 16) practiced slash and burn agriculture. Farmers of the area usually slash their field early in February, gather fuel wood and burn remaining bushes and branches, and then plant their field towards the end of March before the rainy season begins. Some farmers make arrangements with local cattle ranchers to farm parcels of their land; farmers provide labour to clear the land, get the permission to farm it for 1 year or 2, and then leave into pasture so that the owner can use the parcel for grazing its cattle. In return, cattle ranchers usually get a share of the harvest or rent payment.

Planting is done by hand using a *coja* (local name for a stick that farmers use to make holes where the seeds are laid), though some farmers mention just casting the seeds randomly by hand. Most people admitted burning simply because it is an easy way to clear weeds and kill insects, although many admitted burning the vegetation of their field to obtain a nutrient-rich ash that they use as natural fertilizer. Only one farmer (n = 16) mentioned using chemical

fertilizers on his farm, but 10 farmers out of 16 (63%) mentioned using some kind of insecticide / herbicide / fungicides to control pest and weed invasions.

The main two crops planted in the area are corn and rice, although most farmers will plant red kidney beans, lentils, manioc, *ñame*, *otoe*, and plantain. A few farmers also stated growing coconut, pineapple, bananas, *niampe*, avocados, and *tayo*. Many also mentioned planting fruit trees such as orange, avocado, peach, *pixva*, cashew, and guaba trees. Most farmers harvest corn and rice once a year, usually around the months of July and August, although some farmers will re-plant after their first harvest and get a second harvest of rice and/or corn in December.

Eighty eight percent of agro-pastoralists (14 out of 16 respondents) mentioned not having any water shortage problems on their farm, and none of the interviewees had an irrigation system on their farm. Sixty six percent of respondents (9 out of 16) face erosion problems on their farm, although only two of them used erosion controlling techniques (in both cases, live-tree fences were used). Agro-pastoralists selected for semi-structured interviews were also asked to state the most important problems they faced on their farm. In order of importance, they were: [1] pest and weed invasions, [2] low soil fertility, [3] lack of financial resources to buy agricultural inputs, and [4] lack of technical assistance. Pest invasions appear to be a particularly serious problem for most farmers interviewed. Many of them mentioned barely growing rice anymore because of pest invasions, and most had recently stopped growing beans for the same reasons. Only 4 farmers out of 16 admitted growing beans still, though they form the basis of the regional diet along with corn and rice.

Eric Quirós, the chief agricultural engineer of the regional IDIAP office based in Guarumal, states that the people of the Bahía Honda area practice a type of agriculture he calls "migratoria" (migratory) or "de subsistencia" (subsistence). Because they do not let their land to fallow for long enough time, small farmers; who cannot afford to buy a lot of land, end up

exhausting their land and eventually selling it to cattle ranchers who have enough capital to buy it. They then move on to find another parcel to farm. Eric Quirós compares the situation of the Soná district to what is happening in the Azuero peninsula (a well known desertification front of Panama), where cattle ranchers are pushing the agricultural frontier to the borders of the ocean, a phenomenon that leads small farmers to leave the area and result in important rate of deforestation, land degradation, and desertification. The area is not yet experiencing a shortage of land he says, but it is not far from reaching that point.

Annex 9. Questionnaire model used during focus groups

Buenos días (buenas tarde) señores y señoras. Yo me llamo Philippe Crête y soy un estudiante de maestría canadiense. Y yo estoy aquí en Panamá para hacer mi tesis con la Universidad de McGill de Canadá y el Instituto Smithsonian de Investigaciones Tropicales de Panamá. Como yo oí que se han hecho muy pocos estudios en la región de Bahía Honda, yo me interesé por esta área de Panamá, y me gustaría dedicar mi estudio sobre la situación de los agricultores de las comunidades de esta área. Mi estudio tiene algunos objetivos. En este estudio, yo quiero averiguar si existe un vínculo entre el aumento de las actividades pesqueras y la disminución de la productividad agropecuaria en el corregimiento de Bahía Honda, identificar las prácticas agropecuarias dominante del área, los factores que influyen las decisiones de manejo del suelo, y las limitaciones y oportunidades de cambio. Yo creo que este estudio podría ayudar a organizaciones gobiernamentales y no gobiernamentales a formular estrategias futuras para mejorar la sostenibilidad del manejo de los suelos en Bahía Honda, además de desarrollar estrategias para mejorar la seguridad económica de la gente que vive en la zona de amortiguamiento del parque. Esto a su vez podría disminuir las presiones ejercidas sobre los recursos marinos del Parque Nacional Coiba y estabilizar los ecosistemas terrestres del área. Me gustaría hablar con ustedes hoy para conocer un poco más sobre la situación general de la comunidad. Yo tengo algunas preguntas que me gustarían preguntarle. Su opinión me ayudara bastante para cumplir a los requisitos de mi tesis. ¿Ustedes piensan que podrían darme un poco de su tiempo?

1. ¿Hace más o menos cuantos años que existe la comunidad?

2. ¿Cuales son las actividades económicas más importantes de la comunidad, por orden de importancia?

3. ¿Hay muchas personas que se dedican a la agricultura en la comunidad? ¿Cuál es el porcentaje de la comunidad que se dedica a esta actividad más o menos?

4. ¿Hay muchas personas que se dedican a la ganadería en la comunidad? ¿Cuál es el porcentaje de la comunidad que se dedica a esta actividad más o menos?

5. ¿Hay muchas personas que se dedican a la pesca en la comunidad? ¿Cuál es el porcentaje de la comunidad que se dedica a esta actividad más o menos?

6. ¿Cuáles son los cultivos que generan más ingresos en la comunidad? ¿Donde o a quienes se los venden?

7. ¿Cuáles son los 5 problemas mas graves que tienen los agricultores?

8. ¿Cómo describirían ustedes la productividad de les actividades agrícolas en el área? ¿Baja? ¿Media? ¿Alta?

9. ¿Qué tipo de ganado se cría en la comunidad? ¿Dónde o a quienes se vende el ganado producido en la comunidad?

10. ¿Cuáles son los 5 problemas más graves que tienen los ganaderos?

11. ¿Cómo describirían ustedes la productividad de les actividades ganaderas en el área? ¿Baja? ¿Media? ¿Alta?

12. ¿Cuáles los productos marinos que generan más ingresos en la comunidad? ¿Donde o a quienes se los venden?

13. ¿Cuáles son los 5 problemas más graves que tienen los pescadores?

14. ¿Cómo describirían ustedes la productividad de las actividades pesqueras en el área? ¿Baja? ¿Media? ¿Alta?

15. ¿Cuáles son las actividades productivas que dan más dinero en la comunidad? La agricultura, la ganadería o la pesca?

16. ¿Ha habido cambios en las actividades productivas de la comunidad desde su creación? ¿Las personas cambian mucho de actividad económica?

17. ¿La población de la comunidad esta aumentando o disminuyendo? ¿Por qué?

18. ¿Hay muchas personas que han vendiendo su tierra en los últimos años en la comunidad?

    No / Sí → ¿Por qué la gente esta vendiendo?

    → ¿Qué está haciendo la gente, ahora que ha vendiendo su tierra, para sobrevivir?

19. ¿Cuáles son los 5 problemas más importantes que tiene la comunidad en la actualidad?

20. ¿Cómo ven ustedes el futuro de la comunidad en los años que vienen?

Annex 10. Questionnaire model used during semi-structured interviews with fishermen

Buenos días (buenas tarde) señores y señoras. Yo me llamo Philippe Crête y soy un estudiante de maestría canadiense. Yo estoy aquí en Panamá para hacer una investigación para cumplir con los requisitos de mi tesis que yo hago a través de la Universidad de McGill de Canadá y el Instituto Smithsonian de Investigaciones Tropicales de Panamá. Yo me gustaría obtener su participación en esta encuesta, pero a la vez, yo quiero informarle que su participación es totalmente voluntaria. Como yo oí que se han hecho muy pocos estudios en la región de Bahía Honda, yo me interesé por esta área de Panamá, y me gustaría hacer un estudio sobre la situación de los agricultores y pescadores de primera generación de las comunidades de esta área. Mi estudio tiene algunos objetivos. En este estudio, yo quiero averiguar si existe un vínculo entre el aumento de las actividades pesqueras y la disminución de la productividad agropecuaria en el corregimiento de Bahía Honda, identificar las prácticas agropecuarias dominante del área, los factores que influyen las decisiones de uso y de manejo del suelo, y las limitaciones y oportunidades socio-económicas de los productores agro-pecuarios y pescadores de primer generación del área. Yo quiero asegurarle que yo no trabajo con ninguno gobierno, pero yo creo que este estudio podría ayudar a organizaciones gobiernamentales y no gobiernamentales a formular estrategias futuras para mejorar la sostenibilidad del manejo de los suelos en Bahía Honda, además de desarrollar estrategias para mejorar la seguridad económica de la gente que vive en la zona de amortiguamiento del parque. Esto a su vez podría disminuir las presiones ejercidas sobre los recursos marinos del Parque Nacional Coiba y estabilizar los ecosistemas terrestres del área. Si usted desee participar, recuerde que no hay respuestas correctas o incorrectas, y que usted puede exprimir su opinión propia libremente. Si p1or cualquier razón, hay algunas preguntas que usted no quiere contestar o si hay preguntas que usted no sabe la respuesta, usted puede saltar esas preguntas sin problemas. Además, yo quiero informarle que en cualquier momento y por cualquier razón, usted puede decidir de terminar la entrevista. Si desee participar a esta encuesta, le preguntaría de contestar a las preguntas lo más honestamente posible. Le garantizo que la información que usted brinde será absolutamente confidencial y que en ninguna manera sus respuestas serán asociadas con su nombre. Usted desee participar? Le tomará aproximadamente 40 minutos.

Fecha:
Lugar poblado de residencia:
Nombre del entrevistado:

Hora del inicio de la entrevista:
Hora de termina de la entrevista:

Sexo: M / F

A. Información demográfica

1. ¿Hace cuánto tiempo que usted vive aquí en la comunidad?

2. ¿Donde nació usted?

***** If somewhere different than the community where the interviewee lives**

a. ¿Donde vivió antes de mudarse aquí?

3. ¿En qué año nació usted?

4. ¿Cual es la religión de usted?

5. ¿Dónde nacieron sus padres?

6. ¿Cuántas personas viven en su casa con usted?

7. ¿A que se dedican las otras personas que viven en su casa con usted?

8. ¿Cuantos hijos tiene usted?

*****If the interviewee does not have kids, skip to question 10**

a) ¿Que edad tienen ellos?

9. ¿Dónde viven ellos?

***** If the interviewee has kids that are 15 years old and older**

10. ¿Qué tipo de profesión tienen ellos o si estudian, que quieren hacer ellos en sus vidas?

*****If they do or want to do a different job than the parents**

a. Por qué ellos no se dedican o quieren dedicarse a la pesca?

11. ¿Usted se dedicaba a la agricultura o a la ganadería antes de ser pescador artesanal?

No / **Sí** → a. agricultura
b. ganadería
c. agricultura y ganadería
d. still involved in agro-pastoralist activities

a) ¿En que año ha parado usted de ser productor agro-pecuario?

12. ¿A que se dedica o se dedicaba su padre?

a. agricultura
b. ganadería
c. agricultura y ganadería
d. pesca
e. otra profesión → ¿Qué era?

*****If the father is still involved in fishing activities**

a) ¿Hace cuantos años que su padre se dedica a la pesca?

b) ¿Su padre siempre se ha dedicado a la pesca?

Si / **No** → ¿A que se dedicaba su padre antes de ser pescador?

*****If neither the interviewee nor his parents were farmers / cattle ranchers, skip to section C**

B. Preguntas sobre las actividades agropecuarias

13. ¿Cuántas hectáreas tenía su finca (o la finca de sus padres)?

*****If the interviewee or the interviewee's father were only involved in agro-pastoralist activities as *peones*, skip to question 22**

14. ¿Dónde estaba su finca (o la finca de sus padres)?

15. ¿Hace cuantos años que usted o su padre vendió la finca?

16. ¿Qué sembraba usted (o su padre) en la finca?

17. ¿Usted (o su padre) vendían el producto de su finca en el mercado?

Sí → a. ¿Que vendía usted (o su padre)?

No → b. ¿Por qué usted (o su padre) no vendían productos agrícolas en el mercado?

18. ¿Tenía usted (o su padre) animales en la finca?

No / **Sí** → a. ¿Que tipo de animales tenía?

b. ¿Vendía usted (o su padre) animales?

No / **Sí** → i. ¿Qué tipo de animales vendía?

19. ¿Sembraba usted (o su padre) árboles en su finca?

No / **Si** → a) ¿Qué tipo?

b) ¿Por qué usted (o su padre) sembraba árboles en su finca?

20. ¿Usted (o su padre) quemaba el pasto para preparar el suelo?

21. ¿Cómo era la productividad de su finca (o de la finca de su padre)?

a. Baja productividad
b. Mediana productividad
c. Alta productividad

22. ¿Por qué usted (o su padre) decidió dejar de ser un productor agropecuario?

23. ¿Por qué usted quiso ser pescador en lugar de ser un productor agropecuario?

24. ¿Su familia recibía más ingresos cuando usted (o su padre) se dedicaba a la agricultura/ganadería o recibe más ahora que usted se dedica a la pesca?

C. Preguntas sobre la situación pescara y sobre el parque de Coiba

25. ¿Hace cuantos años que se dedica usted a la pesca artesanal?

26. ¿Cómo son las condiciones de la pesca al momento?

a. Malas
b. Normales

c. Buenas

27. ¿Las condiciones de la pesca han cambiado en los últimos años?

No / **Si** → a. ¿Cómo han cambiado?

b. ¿Por qué las condiciones de la pesca han cambiado?

28. ¿Cómo es el rendimiento de la pesca fuera de los límites del parque?

a. Bajo
b. Mediano
c. Alto

29. ¿Pescaba usted dentro de los límites del Parque Coiba antes que las patrullas empezaran a restringir los pescadores?

Si / **No → Skip to question 43**

30. ¿Hace cuanto tiempo que las patrullas del parque han comenzado a restringir más que antes a los pescadores de Bahía Honda?

31. ¿Cuándo usted tiene la oportunidad, usted pesca dentro de los límites del parque?

Si / **No → Skip to question 33**

32. ¿Cómo es el rendimiento de la pesca dentro de los límites del parque ahora?

a. Bajo
b. Mediano
c. Alto

33. ¿Cómo las leyes de protección del parque de Coiba están afectando el ingreso de su familia?

a. Lo ha aumentado
b. Lo ha bajando
c. No lo ha cambiado
d. No sé

34. ¿Piensa usted que las leyes para cuidar a los recursos marinos del parque de Coiba son necesarias?

    Sí → a. ¿Por qué piense eso?

    No → b. ¿Por qué piense eso?

35. ¿Piensa usted que los pescadores de le comunidad deberían tener derecho a pescar adentro de los limites del parque todavía?

36. ¿Que se podría hacer para que los pescadores de la comunidad puedan seguir pescando dentro de los límites del parque y, al mismo tiempo, que no se acaben los recursos marinos del parque?

37. ¿MarViva está ayudando a los pescadores a buscar otras alternativas de trabajo a la pesca?

38. ¿MarViva está ayudando a los pescadores a desarrollar formas de pesca más sostenibles (que permitan que los recursos pesqueros se reproduzcan)?

39. ¿Le gustaría a usted trabajar en cooperación con las autoridades del parque para desarrollar planes de manejo que permitan a los pescadores seguir pescando en el parque y al mismo tiempo asegurar que los recursos marinos del parque no se acaben?

40. ¿Cuáles son los 5 problemas más importantes que tienen los pescadores de la comunidad?

D. Situación socio-económica

41. ¿Aparte del terreno de su casa, tiene usted otros terreno por otro lugar?

    No / Si → a. ¿Dónde es?

    b. ¿A que sirve?

42. ¿Aparte de la pesca, realiza usted otros trabajos al momento?

43. ¿En el último año, fue empleado usted como peón para hacer algún trabajo temporal?

No / **Sí**→ a. ¿Qué tipo y cuantas veces?

44. ¿Cómo era su situación económica antes?

    a. No ha cambiado
    b. Era mejor
    c. Era peor

***** If the economic situation of the interviewee has changed**

a. ¿Por qué ha cambiado?

45. ¿Tiene usted algún miembro de su familia que viva en la ciudad y le dé un apoyo financiero para el sustento de su hogar?

46. ¿Cuáles son las principales fuentes de ingreso de su familia?

E. Estado general de la comunidad y futuro

47. ¿El número de habitantes de la comunidad ha cambiado en los últimos años?

    No / Si → a. ¿Cómo?

    b. ¿Por qué la población está disminuyendo (o aumentado)?

48. ¿Aparte de la pesca, qué otras fuentes de ingreso podrían ser desarrolladas aquí en la comunidad en el futuro?

49. ¿Esta pensando usted en cambiar de actividad económica en el futuro?

    No / **Si** → a. ¿Para dedicarse a qué?

50. ¿Piense usted en mudarse por otro lugar en los años que vienen?

    No / **Sí** → ¿Adonde?

Annex 11. Questionnaire model used during semi-structured interviews with agro-pastoralists

Buenos días (buenas tarde) señores y señoras. Yo me llamo Philippe Crête y soy un estudiante de maestría canadiense. Yo estoy aquí en Panamá para hacer una investigación para cumplir con los requisitos de mi tesis que yo hago a través de la Universidad de McGill de Canadá y el Instituto Smithsonian de Investigaciones Tropicales de Panamá. Yo me gustaría obtener su participación en esta encuesta, pero a la vez, yo quiero informarle que su participación es totalmente voluntaria. Como yo oí que se han hecho muy pocos estudios en la región de Bahía Honda, yo me interesé por esta área de Panamá, y me gustaría hacer un estudio sobre la situación de los agricultores y pescadores de primera generación de las comunidades de esta área. Mi estudio tiene algunos objetivos. En este estudio, yo quiero averiguar si existe un vínculo entre el aumento de las actividades pesqueras y la disminución de la productividad agropecuaria en el corregimiento de Bahía Honda, identificar las prácticas agropecuarias dominante del área, los factores que influyen las decisiones de uso y de manejo del suelo, y las limitaciones y oportunidades socio-económicas de los productores agro-pecuarios y pescadores de primer generación del área. Yo quiero asegurarle que yo no trabajo con ninguno gobierno, pero yo creo que este estudio podría ayudar a organizaciones gobiernamentales y no gobiernamentales a formular estrategias futuras para mejorar la sostenibilidad del manejo de los suelos en Bahía Honda, además de desarrollar estrategias para mejorar la seguridad económica de la gente que vive en la zona de amortiguamiento del parque. Esto a su vez podría disminuir las presiones ejercidas sobre los recursos marinos del Parque Nacional Coiba y estabilizar los ecosistemas terrestres del área. Si usted desee participar, recuerde que no hay respuestas correctas o incorrectas, y que usted puede exprimir su opinión propia libremente. Si por cualquier razón, hay algunas preguntas que usted no quiere contestar o si hay preguntas que usted no sabe la respuesta, usted puede saltar esas preguntas sin problemas. Además, yo quiero informarle que en cualquier momento y por cualquier razón, usted puede decidir de terminar la entrevista. Si desee participar a esta encuesta, le preguntaría de contestar a las preguntas lo más honestamente posible. Le garantizo que la información que usted brinde será absolutamente confidencial y que en ninguna manera sus respuestas serán asociadas con su nombre. Usted desee participar? Le tomará aproximadamente 40 minutos.

Fecha:
Lugar poblado de residencia:
Nombre del entrevisto:

Hora del inicio de la entrevista:
Hora de terminación de la entrevista:

Sexo: M / F

A. Información demográfica

1. ¿Hace cuando tiempo que usted vive aquí en la comunidad?

2. ¿Donde nació usted?

   ***** If somewhere different than the community where the interviewee lives**

   a. ¿Donde vivió antes de mudarse aquí?

3. ¿En qué año nació usted?

4. ¿Dónde nacieron sus padres?

5. ¿A que se dedica usted?

    a. Agricultura
    b. Ganadería
    c. Agricultura y Ganadería

6. ¿A qué se dedicaba (o se dedica) su padre?

7. ¿Cuantas personas viven en su casa con usted?

8. ¿A que se dedican las otras personas que viven en su casa con usted?

9. ¿Cuántos hijos tiene usted?

    *****If the interviewee does not have kids, skip to question 12.**

    a. ¿Cuántos años tienen ellos?

10. ¿Dónde viven ellos?

*****If the interviewee has sons that are 15 years old or older**

11. ¿Qué tipo de profesión tienen ellos o si estudian, que quieren hacer ellos en sus vidas?

    *****If the sons do or want to do a different job than the parents**

    a. ¿Por qué ellos no se dedican o quieren dedicarse a la misma actividad que usted?

B. Información general sobre el tipo de tenencia y el uso del suelo.

12. ¿Usted tiene?

    a. El titulo de su finca
    b. El derecho posesorio de su finca
    c. Tiene su finca en arrendamiento
    d. Otros: _____

13. ¿Tiene usted o su familia otros terrenos en esta comunidad o en otros lugares?

    No / Sí → a. ¿A dónde?

    b. ¿A que sirve(n)?

14. ¿Cuantas hectáreas tiene su finca (o la finca que usted tiende en arrendamiento)?

***** If the interviewee does not cultivate anything, skip to question 16**

15. ¿Cuantas hectáreas tiene en cultivo en su finca?

    a. ¿Que productos siembra en su finca?

    b. ¿Qué superficie tiene sembrada de cada unos de esos productos?

    c. ¿Qué cantidad cosechó usted de cada producto el año pasado?

    d. ¿Vende usted parte de su cosecha?

    Si →

    i. ¿Que vende usted?

    ii. ¿Qué cantidad usted ha vendido el último año?

    iii. ¿En el pasado, usted vendía más, o menos productos cultivados?

    iv. ¿En dónde vende su cosecha?

    v. ¿Cómo saca su cosecha del pueblo hasta el mercado?

No → i. ¿Usted vendía sus productos en el mercado en el pasado?

No / **Sí →** ii. ¿Por qué paro usted de vender en el mercado?

iii. ¿Que productos vendía usted en el pasado?

iv. ¿En que cantidad al año vendía usted sus productos en el pasado?

v. ¿En dónde vendía usted su cosecha?

vi. ¿Cómo sacaba sus productos del pueblo hasta el mercado?

16. ¿Cuantas hectáreas tienen en potrero en su finca?

17. ¿Tiene usted animales en su finca?

***** If the interviewee does not own any cattle, skip to question 19**

a. Ganado Vacuno? No / Si → cuantos: _____

b. Puercos? No / Si → cuantos: _____

c. Gallinas? No / Si → cuantos: _____

d. Otros:_____

18. ¿Vende usted animales?

Si → i. ¿Que tipo de animales vende?

ii. ¿Cuántos animales vendió usted el año pasado?

iii. ¿En el pasado, vendía usted más, o menos animales?

iv. ¿En donde vende sus animales?

v. ¿Cómo usted trae su ganado para venderlo?

No → i. ¿Vendía usted animales en el mercado antes?

No / **Sí** → ii. ¿Por qué paro usted de vender en el mercado?

iii. ¿Qué tipos de animales vendía en al pasado?

iv. ¿Que cantidad de animales vendía al año en el pasado?

v. ¿En dónde vendía sus animales?

vi. ¿Cómo trajo su ganado para venderlo?

19. ¿Cuantas hectáreas tiene en bosque maduro (grande) en su finca?

20. ¿Siembra usted árboles en su finca?

No / **Si** → a. ¿Que tipo?

b. ¿Por qué usted siembra árboles en su finca?

21. ¿Cuántas hectáreas de su finca están en descanso (que no esta cultivado, que no esta en potrero, y que no esta en bosque grande)?

*****If the interviewee does not farm, skip to section D**

*C. Información sobre las técnicas de manejo del suelo de los **agricultores***

22. ¿Quema usted el pasto antes de sembrar sus semillas?

*****If the interviewee <u>burns</u> its field before planting**

a. ¿En que meses del año usted quema para sembrar?

b. ¿Por qué usted quema el pasto antes de sembrar?

*****If the interviewee <u>does not burn</u> his field before planting**

c. ¿En que meses del año prepara usted el suelo para sembrarlo?

d. ¿Por qué usted no quema el pasto antes de sembrar?

23. ¿Qué técnica utiliza usted para sembrar?

24. ¿Utiliza usted fertilizantes o abono para preparar el suelo de su finca antes de sembrar?

No / **Si** → a. Que tipo?

25. ¿Tiene usted problemas con insectos, malezas, o hongos en su finca?

No / **Si** → a. ¿Qué tipo?

26. ¿Utiliza usted insecticidas, herbicidas, fungicidas, o otros productos contra las malezas o enfermedades en su finca?

No / **Si** → a. ¿Qué tipo?

27. Tiene usted problemas de falta de agua en su finca?

28. ¿Tiene usted cualquier sistema de irrigación o de riego en su finca?

29. ¿Tiene usted problemas con la erosión del suelo en su finca?

30. ¿Utiliza usted técnicas para controlar la erosión en su finca, como sistemas de terrazas, o barreras de árboles?

No / **Si** → a. ¿Qué tipo?

31. ¿Ha recibido usted asistencia técnica o ha participando en charlas de capacitación para los productores agrícolas?

No / **Sí** → a. De cual organización?

32. ¿Cómo desarrollado es el mercado agrícola para los productores de la comunidad?

a. No hay mercado
b. Poco desarrollado
c. Buen desarrollado

33. ¿El mercado para los productores agrícolas era diferente antes?

a. No ha cambiado
b. Era menos desarrollado
c. Era más desarrollado

***If different than now**

i. ¿Por qué ha cambiado?

34. ¿Cómo describiría usted la productividad de sus actividades agrícolas?

a. Baja productividad
b. Mediana productividad
c. Alta productividad

35. ¿La productividad de sus actividades agrícolas ha cambiado en los últimos anos?

No / **Si** → a. ¿Cómo ha cambiado?

b. ¿Por qué la productividad ha cambiado?

36. ¿Cómo productor agrícola, cuáles son los 5 problemas los más importantes en su finca?

37. ¿Qué podría ayudarle para resolver esos problemas?

***If the interviewee is not involved in cattle ranching, skip to section E**

*D. Información sobre las técnicas de manejo del ganado por los **ganaderos***

38. ¿Tiene usted su ganado cercado?

39. ¿Tiene usted problemas de falta de pasto en el verano?

40. ¿Tiene usted problemas de compactación de suelo en su finca?

41. ¿Hace usted rotaciones con su ganado para que descanse parte de su potrero?

42. ¿Tiene usted problemas con enfermedades de ganado en su finca?

No / **Si** → a. ¿Cuales son?

43. ¿Da usted inyecciones o medicamentos a su ganado para controlar las enfermedades o el peso?

44. ¿Ha recibido usted asistencia técnica o ha participando en charlas de capacitación para ayudar a los ganaderos?

No / **Si** → a. De cual organización?

45. ¿Cómo desarrollado es el mercado para la ganadería?

a. No hay mercado
b. Poco desarrollado
c. Bien desarrollado

46. ¿El mercado para la ganadería era diferente antes?

a. No ha cambiado
b. Era menos desarrollado
c. Era más desarrollado

*****If different than now**

i. ¿Por qué ha cambiado?

47. ¿Cómo usted describirá la productividad de sus actividades ganaderas?

a. Baja productividad
b. Mediana productividad
c. Alta productividad

48. ¿La productividad de sus actividades ganaderas ha cambiado en los últimos anos?

No / **Sí** → a. ¿Cómo ha cambiado?

b. ¿Por qué piensa usted que la productividad ha cambiado?

49. ¿Cómo ganadero, cuáles son los 5 problemas más importantes que tiene usted en su finca?

50. ¿Qué podría ayudarle para resolver esos problemas?

E. Información socio-económica

51. ¿Aparte de sus actividades agro-pecuarias, realiza usted otros trabajos al momento?

52. ¿En el último año, fue empleado usted como peón para hacer algún trabajo temporal?

53. ¿Usted se dedica a la pesca?

    No / **Sí** → ¿Hace cuanto tiempo que se dedica usted a la pesca?

54. ¿Alguien en su familia se dedica a la pesca?

    No / **Si** → a. ¿Dónde vive(n) el / ellos?

55. ¿Tiene usted algún miembro de su familia que vive en la ciudad y que le da un apoyo financiero para el sustento de su hogar?

56. ¿Cuales son las principales fuentes de ingreso de su familia?

*****If the interviewee is involved in both agricultural and cattle ranching activities**

57. ¿Recibe usted más ingreso por sus actividades ganaderas o por sus actividades agrícolas?

58. ¿Tiene usted un préstamo agrícola?

    No / **Sí** → a. ¿Con cual institución usted tiene este préstamo?

59. ¿Come era su situación económica antes?

a. No ha cambiado
b. Era mejor
c. Era peor

***** If the economic situation of the interviewee has changed**

a. ¿Por qué ha cambiado?

F. Estado general de la comunidad y futuro

60. ¿El número de habitantes de la comunidad ha cambiado en los últimos anos?

No / **Si** → a. ¿Cómo?

b. ¿Por qué la población esta disminuyendo (o aumentado)?

61. ¿Aparte de la agricultura o la ganadería, qué otras fuentes de ingreso podrían ser desarrolladas aquí en la comunidad?

*****If the interviewee is from Bahía Honda, skip to question 66**

62. Había muchas personas que vivían en la comunidad y que practicaban agricultura aquí en el pasado, y que vendieron su tierra para dedicarse a la pesca?

63. ¿Cuáles son los 5 problemas más importantes que tiene su comunidad?

64. ¿Piensa usted que el turismo va a desarrollarse en el área en los años que vienen?

65. ¿Piensa usted que podría tener la habilidad de trabajar en el sector turístico?

66. ¿Piense usted en cambiar de actividad económica en el futuro?

No / **Si** → a. ¿Para dedicarse a qué?

67. ¿Piense usted en mudarse por otro lugar en los años que vienen?

No / **Sí** → a. ¿Por dónde?

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