

**Fishing Away Marine Conservation:
Poverty, Resource Dependence, and Poor Management in Cuajiniquil, Costa Rica**

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Islas Murciélago, Guanacaste, Costa Rica. Photograph by Helen Joyce.

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Acronyms and Locations

ACG: Área de Conservación Guanacaste (Guanacaste Conservation Area)

IAFA: Instituto sobre Alcolismo y Farmacodependencia (Institute for Alcoholism and Drug-Dependence)

INCOPECA: Instituto Costarricense de Pesca y Acuicultura (Costa Rican Institute of Fishing and Aquaculture)

INA: Instituto Nacional de Aprendizaje (National Training Institute)

INCOP: Instituto Costarricense de Puertos del Pacífico (Costa Rican Institute of Pacific Ports)

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Bahía de Cuajiniquil: the bay on which the coastal town of Cuajiniquil is located.

Cuajiniquil: Fishing town in northwestern Costa Rica of approximately 1,500 residents.

Guanacaste: Northern province in Costa Rica where the ACG and Cuajiniquil are located.

Islas Murciélago: Archipelago off the northern Pacific coast of Costa Rica protected by the ACG.

La Cruz: The district with legal jurisdiction over the town of Cuajiniquil.

Liberia: Closest major city to Cuajiniquil located 100 km south.

Preface



‘Welcome to Cuajiniquil, the most beautiful place in Costa Rica’

I first visited Cuajiniquil in 2001. My best friend Helen and I had been invited by her dad, Frank Joyce, to accompany his group of University of California biology students to the *Islas Murciélago*, a breathtaking chain of islands along Costa Rica’s northwestern coast protected by the Guanacaste Conservation Area (ACG). The easiest route to the islands by boat begins in the coastal town of Cuajiniquil, and so we drove down from our homes in Monteverde, took the Pan American highway north and finally snaked our way down to the ocean. That day, Cuajiniquil was a waypoint only, a place to clamber into a small fishing boat and motor off towards a week of snorkeling and lectures about marine conservation.

Several years and many island trips later, Helen, her twin brothers, and I decided to spend a few weeks in the town of Cuajiniquil leading a marine biology focused summer camp for local children. Our broad idea was to give kids the opportunity to do what we had been afforded every time we visited the coast: explore the beauty of marine ecosystems. Our not-so-subtle agenda was to promote conservation ideals among a new generation of Cuajiniquil residents by educating and spreading enthusiasm about the

ocean. Most families in Cuajiniquil depend on fishing and so are highly resentful of marine conservation in the ACG; we imagined our camp might work to combat local hostility towards conservation.

In July 2005 *Campamento Cuajiniquil* had its début. The four of us led twenty ten-to twelve-year-olds in and out of Cuajiniquil's every corner. We biked furiously to sites where we could collect aquatic macroinvertebrates, kayaked through the crocodile-inhabited mangroves to look at sea birds, and snorkeled around reefs in search of Cortez angelfish and moray eels. Needless to say, it was wonderful chaos. We identified fish species our campers had previously only seen on their dinner tables and taught kids to swim who had lived five minutes from the ocean their entire lives. It felt good. And we couldn't help patting ourselves on the back for our efforts.

I have now spent six summers in Cuajiniquil working with new batches of kids and creating more focused research projects for veteran campers. While our presence is certainly appreciated (the world of Facebook has recently reached Cuajiniquil and I have been receiving enthusiastic inquiries about next summer's *campamento*), I have grown skeptical of our effectiveness as proponents of conservation. One incident epitomizes this skepticism: last summer after a long day of work on group projects, Helen and I passed a band of our campers walking down to the beach with spear guns to hunt for octopus; they grinned sheepishly at us and continued on their way, obviously embarrassed to be 'caught.'

I have come to see the challenges *Campamento Cuajiniquil* faces as representative of the much larger challenges that the ACG confronts in its efforts to promote marine conservation ideals through education outreach. Something is clearly

missing. This thesis seeks to look at those missing pieces. Although I focus on identifying the particular barriers to marine conservation in Cuajiniquil, the broader arguments I make about poverty, resource dependency and fishery management are relevant to marine conservation in Costa Rica and around the world.

Introduction

Marine protected areas are located somewhere. They are not simply laws, regulations, or management measures, but each is a specific place. Understanding the human dimension of marine protected areas requires an acknowledgement that each location has its unique social and ecological context that influences [its] design, implementation, and impact. (Pomeroy *et al.* 2007)

As our *gallo pinto*, a traditional Costa Rican rice and bean breakfast, heated up on the stove I asked Simón if he had a moment to chat with me about his work as a ranger for the *sector marino* (marine sector) of the Guanacaste Conservation Area (ACG) (Figures 1 and 2). He has held this position since 1994 and has lived on the *Islas Murciélago*, the archipelago contained within the protected waters, since before the arrival of the biological station that now houses ACG staff and visiting student groups. Before becoming a ranger, Simón was a fisher based in Cuajiniquil, a small, rural town neighboring both the marine and terrestrial sectors of the ACG (Figure 2). Now he spends his days patrolling the *sector marino*, doling out lectures on the no-take policy, confiscating nets, and revoking fishing licenses.

Originally, Simón's responsibilities as a ranger were limited to providing a conservation presence in the area by talking with fishers about the merits of marine conservation, and explaining that soon enforcement would begin in earnest. Over the last decade, ACG enforcement of the no-take policy has increased dramatically and unofficial warnings have given way to formal penalties (Interview, Simón, Janzen 2010). Tightened enforcement has exacerbated tensions between the ACG and fishers unaccustomed to interference and angry about lost fishing grounds (Interviews, fishers

and ACG staff). “We’ve lived off fishing all our lives,” one fisher explained, “and now they’re using their laws to pressure us and make us poorer” (Interview, Esteban).

Not only do many Cuajiniquil residents greatly resent the fishing restrictions in the *sector marino*, but it is also clear from talking with ACG staff and fishers alike that fishers continue to work within the protected waters despite the possibility of severe repercussions (Interviews, Janzen, Chavarría, Esteban). Resentment about lost fishing grounds has also resulted in violent responses by fishers toward the ACG; Simón has been personally threatened while on patrol and there have been incidences of arson on the islands (Interviews, Simón and Gustavo; Janzen 2010).¹ “There are people who I know whose names I can’t say,” one fisher confided, “who take revenge by burning the park or by killing a few deer—it’s their way of getting back” (Interview, Gustavo). Clearly, non-compliance by fishers is limiting the ACG’s ability to effectively protect the ecosystems within its boundaries, thus dampening the success of conservation goals.

Conflicts (perceived or otherwise) between preservation and resource extraction/exploitation interests are endemic to conservation efforts worldwide (Adams *et al.* 2004). Even after the significant hurdles of purchasing land or securing legal protection (in the case of marine conservation) have been overcome, conservation areas face the enormous challenge of enforcing boundaries and regulations in order to prevent poaching, illegal logging, etc. The classic approach to enforcing park boundaries is to police them. The appeal of such an approach is its apparent simplicity and clear path of action. Its downside, however, is twofold: (1) it is almost always impossible to

¹ Fires, whether intentional or otherwise, have posed a major threat to ACG conservation efforts throughout its history and consequently significant resources are invested in fire prevention and fire extinguishing every year (*Se Quema el Cielo* 2010; Janzen 2010). The ACG is particularly vulnerable to fire because of its tropical dry forest ecosystem and its proximity to cattle ranches that clear land through ‘controlled’ burning.

adequately guard boundaries,² and (2) harsh policing antagonizes the very people whose cooperation is needed: locals with interests in resource extraction. There is a growing body of literature showing that the most effective marine conservation management plans are those that work closely with neighboring fishing communities to foster a culture of compliance and support (Ban *et al.* 2009; Charles and Wilson 2009; Klein *et al.* 2007).

The ACG has made an exceptional commitment to working with towns that neighbor their boundaries. They believe that successful conservation will only be possible if nearby communities are fully supportive of, and invested in, the areas in question (Janzen 2010). Despite the centralized, top-down approach that the Costa Rican government takes to staffing and patrolling nationally protected sites, the ACG has worked to integrate locals through its hiring practices and motivate environmental stewardship through a well-established biological education program (Elizondo and Blanco 2010). By sharing jobs associated with the conservation area and teaching about the benefits derived from environmental protection (such as clean air and water, fish population protection and fish stock replenishment, and the potential for a growing tourist industry), the ACG hopes to forge positive relationships with local communities that will result in high compliance with regulation.

Although ACG programs have quite successfully educated Cuajiniquil residents about the merits of marine conservation, fishers are still not invested in conservation nor interested in respecting the boundaries of the *sector marino*. Why aren't ACG outreach efforts working? What must be done to ensure successful protection of the *sector marino*? In this thesis, I argue that ACG initiatives are failing because they do not

² The inability to adequately guard boundaries puts enforcement authorities in a precarious position: do you turn your back on what you know you can't stop, do you take bribes from those able to pay?

address community dependence on a declining natural resource and the related poverty that so many fishers are experiencing in Cuajiniquil. The prospect of increased fish stocks in the future due to conservation within the *sector marino* is not enough to stop hungry fishers from entering illegally today. As long as fishers are poor and have no alternative income opportunities, the ACG will not be able to further its mission of protecting the marine ecosystem within its boundaries (Marshall *et al.* 2010). Furthermore, until declining fish stocks *outside* of the *sector marino* are properly managed, fishers will continue to move *into* protected waters in search of scarce resources.

While the ACG cannot confront these larger societal and environmental problems alone, it can play an important role in partnering with other government institutions concerned with community development and resource management outside the *sector marino*. Together, the ACG and its partners must engage the local community as an active collaborator in finding alternative employment strategies while concurrently developing rules and regulations to support a sustainable fishery management plan. This kind of multi-player collaboration or *co-management*, as it has been coined in marine conservation literature, is critical to effective marine conservation (Ban *et al.* 2009; Charles and Wilson 2009; Guidetti and Claudet 2009; Klein *et al.* 2007). The political, economic, and cultural history of Cuajiniquil reveals that the biggest challenges to co-management are internal division within the community and a deep mistrust of state institutions (like the ACG). If conservation in the *sector marino* is going to succeed, the ACG must work to alleviate skepticism and support the Cuajiniquil fishing community in developing a collective voice.



FIGURE 1: Physical map of Costa Rica: Nicaragua borders to the north and Panama to the south. The black box (enlarged in Figure 2) includes the town of Cuajiniquil and the *sector marino* of the ACG.

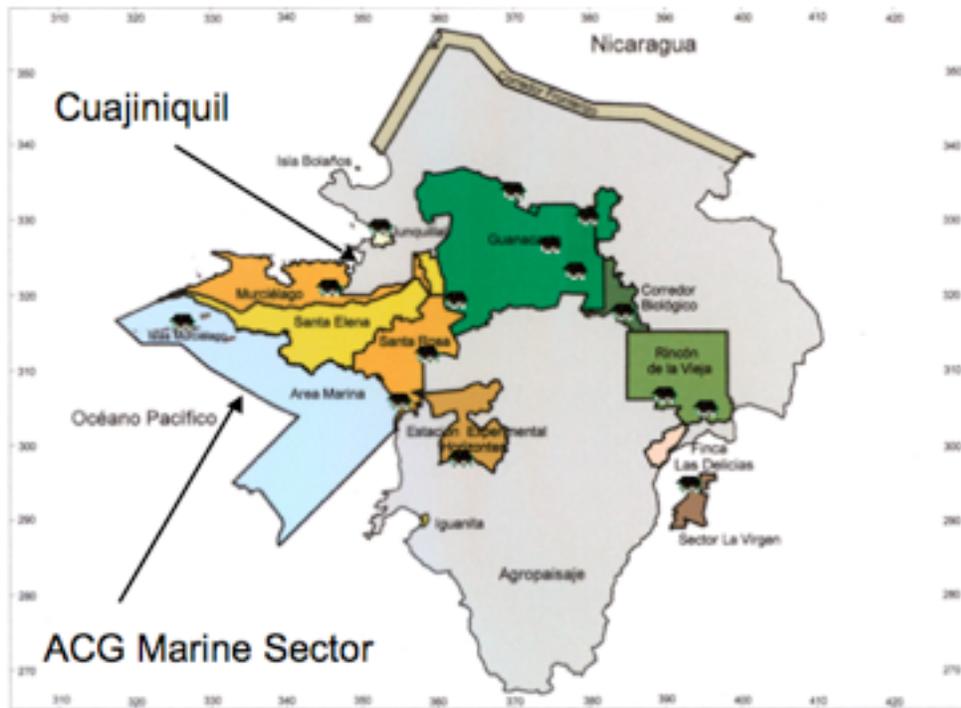


FIGURE 2: The Guanacaste Conservation Area (ACG): areas marked in color are National Parks while the grey area is agricultural landscape. The marine sector is outlined in light blue (“Área de Conservación Guanacaste”).

Research methodology

This thesis draws on biological and economic literatures to distinguish trends among small-scale fisheries and marine conservation efforts around the world. Rural community development studies offer comparative insight into patterns of behavior, management, and policy in areas similar to Cuajiniquil. Place-specific historical narratives from Cuajiniquil are integral to properly documenting and dissecting the many dimensions of individual and organizational relationships within the community. To collect these narratives, I interviewed local fishers and non-fishers in Cuajiniquil, employees of the Costa Rican Institute of Fishing and Aquaculture (INCOPECA), and ACG staff in July 2010 and January 2011. These interviews were critical to my analysis because they provided multiple perspectives on the politics of fishing as well as revealed a previously undocumented history of fishing in Cuajiniquil.

For my interviews with Cuajiniquil residents, I developed standard interview questions based on my background understanding of the central challenges facing Cuajiniquil and insights from the literature on many fishing communities bordering marine protected areas around the world. As I developed a better understanding of Cuajiniquil fishing history through my conversations with residents, I adapted my questions to focus on emerging relevant themes. A list of my standard interview questions can be found in Appendix 1. My interviewees can be broadly divided into two groups: (1) randomly selected locals and (2) park staff, local organization leaders, or locals recommended to me as especially knowledgeable about a particular subject. Often my interviews with fishers attracted neighbors, brothers, wives or children who would

join the conversation. I seized upon these moments as opportunities to bring in multiple voices, which revealed how the community prioritizes the issues it faces.

I used the patterns captured in my interviews to analyze the relationships between conservation efforts/goals and local livelihoods and to explore how environmental resource use and management have shaped the social realities of Cuajiniquil. The results drawn from my interviews are not based on quantitative analysis, and I am not claiming to represent all voices within Cuajiniquil. My interviews were designed to gather information and trace the connections between diverse voices that contribute to an understanding of how fishing and conservation work (or don't work) in Cuajiniquil (Creswell 2009).

Chapter organization

In three chapters, this thesis examines the ACG's efforts to promote community support of conservation in Cuajiniquil and identifies the key barriers to achieving these results. Chapter 1 outlines the origins of the *sector marino*, describes the ACG's philosophical approach to achieving conservation goals, and assesses effectiveness of outreach efforts in Cuajiniquil. Chapter 2 argues that while ACG outreach is successfully educating fishers about the merits of marine conservation, poverty and resource dependency in the Cuajiniquil community pose barriers to successful conservation in the *sector marino*. I illustrate that declining fish stocks in the area (determined by regional catch data and anecdotal evidence from fishers) have contributed to growing poverty in Cuajiniquil and that fishers are unable to escape poverty because they have little to no employment options outside of fishing. Consequently, fishers view the *sector marino*'s

no-take policy as a serious intrusion on their ability to provide for their families and are resentful and non-compliant. Chapter 3 suggests that to confront poverty in Cuajiniquil related to dependence on a declining resource, fishing outside ACG jurisdiction must be regulated to prevent unsustainable and unprofitable exploitation. Until this happens, fishers will inevitably continue to put pressure on the *sector marino*. An analysis of management strategies by INCOPECA and fishers illuminate the challenges to adequate regulation of fishing in the *Bahía de Cuajiniquil*.

Chapter 1

The Birth and Evolution of ACG Conservation Efforts: Strategies to Involve Local Communities

Why involve communities in conservation?

“How important do you think the involvement of local communities is to fostering successful conservation efforts?” I raised my voice to compete with the noise of the ACG Land Rover engine as we bumped over the dirt roads leading to one of the area’s biological stations. Dan Janzen was on his way to check in with a group of local parataxonomists he has trained to identify and sort caterpillars, and had I tagged along for the ride to pick his brain about the founding and development of the ACG. Janzen played an integral role in the ACG’s creation and expansion in the 1980s and continues to contribute enormously to its conservation efforts. If there’s one man to ask about how and why the ACG has become a model conservation force in Costa Rica, it’s Janzen (Allen 2001).

“Without community support in one form or another,” Janzen replied immediately, “you will never conserve anything. Period. That’s like saying how important is community support for keeping everyone from stealing everything in your grocery store. If you don’t have a cultural more or an economic incentive or the combination of the two to protect an area—a bank, a store, a school—it’s dead because individuals for their own individual needs and wants will go and take the resource. It’s very simple” (Interview, Janzen). In not so many words, the ACG has echoed this sentiment since its beginning, making unprecedented (certainly for Costa Rica, but also for conservation around the world) efforts to involve neighboring communities in the

conservation area by hiring locals and implementing biological education programs. In many ways, the ACG has done a model job working to move beyond traditional (and largely ineffective) police enforcement mechanisms for protecting ecosystem integrity and is dedicated to supporting community investment in conservation (Elizondo and Blanco 2010).

This chapter looks at the creation of the ACG and the development of enforcement tactics in its terrestrial and marine sectors. I examine the rationale(s) behind creating marine protected areas (aesthetic, biological, economic) and evaluate how successfully the ACG has communicated these to fishers. I show that by and large, the ACG has a strong outreach presence in Cuajiniquil and has created substantial educational opportunities for residents despite challenges faced working within government constraints on its operation practices. Nevertheless, when asked how they view the ACG and the *sector marino*, most fishers speak angrily about diminished income as a result of lost finishing grounds. To understand what is preventing the ACG from realizing its conservation goals in the *sector marino* we must understand the trajectory of its outreach efforts.

The birth of the ACG

The ACG is located in northwestern Costa Rica and spans 163,000 hectares (43,000 of which are marine) (refer to figures 1 and 2 in the introduction) (Janzen 2010). Created in 1986, the ACG is an extension of Santa Rosa National Park, the second national park created in Costa Rica (Janzen 2010). Santa Rosa, in turn, dates back to 1964-1965 when the Costa Rican government began thinking about turning the *Casona*, a building of national historical importance, and a portion of its surrounding land into a

recreation site for civil service employees. In 1966 the Costa Rican government brought in a young University of Michigan conservation professor, Kenton Miller, to act as a consultant and advise in planning the site. After exploring the region, Miller proposed that, rather than create a recreation area as planned, the state establish a protected national park extending from Naranjo Beach in the Pacific to the Pan American Highway (figure 3). Miller then worked with two of his Costa Rican students to draft the conservation legislation that established Santa Rosa National Park in 1971 (Interview, Janzen; Allen 2001).



FIGURE 3: Santa Rosa National Park delineated in dark blue. Terrestrial area=10,000 Ha. Marine area=20,000 Ha (Janzen 2010).

In 1972 Santa Rosa National Park and biologist Dan Janzen crossed paths for the first time, forever changing the future of conservation in Costa Rica. Janzen, who was studying and describing tropical ecosystems in Guanacaste, Costa Rica as a professor at

the University of Pennsylvania, moved into Santa Rosa to protect his research sites from the cattle ranchers clearing land for pasture and the national electric company cutting out swaths of forest to install electric lines. As Janzen explained, at that point he was just a “hardcore biologist” (Interview, Janzen). Only later, in 1985, did Janzen and his biologist wife Winnie Hallwachs realize that if something were not done to protect more of the tropical dry forest region there would be nothing left to study; Dan and Winnie made a conscious effort to stop being biologists and start working to conserve the biological systems they loved. Janzen, together with several other dedicated Costa Rica and North American conservationists, developed a plan to expand Santa Rosa National Park to protect and restore Costa Rica’s tropical dry forest (Allen 2001).³ Today’s ACG, which contains 2.5% of the world’s biodiversity and continues to expand, now spans three national parks and several other protected areas of varying legal status (ACG website; Allen 2001; Cruz and Blanco 2010).

From its very beginning, the ACG was committed to making connections with neighboring communities: “We realized that in order to survive at least into the next century, the Costa Rican-conserved wild lands needed to integrate with society, to be ‘occupied’ by society in a non-damaging way, to be welcome members in the economy” (Janzen 2010). In other words, the ACG had the foresight to recognize what has now been demonstrated thoroughly in the literature: conservation areas are most successful when they have the support of their neighbors (Ban *et al.* 2009; Berkes *et al.* 2001; Charles and Wilson 2009). The oldest and most integral program developed by the ACG to connect with communities was the Biological Education Program (PEB) (Janzen 2010;

³ The idea of *restoring* forest was quite revolutionary for Latin America at the time and gained the ACG international attention and support (Allen 2001).

Allen 2001; Cruz and Blanco 2010). Piloted in 1986 and officially launched in 1987, PEB takes students out of the classroom and into a variety of habitats and ecosystems in the ACG to educate children about the natural world and instill values of land stewardship and conservation:

“Biological education is teaching biology and ecology in the field utilizing species, forests, rivers, tide pools, mangroves, and all the ACG’s habitats as labs where the students can see, feel, learn, experiment, and touch this living textbook. The students are then able to identify and comprehend through their own experience the dynamics of an ecosystem and the natural environment in which their community is immersed. This type of hands-on learning allows students to gain a greater sensitivity toward environmental issues, thus developing better criteria for making environmental decisions in the future.”

Through its work with a large range of school children, PEB aims to change community attitudes towards natural resources, a social process the ACG calls ‘biological restoration’ (Cruz and Blanco 2010). Today, PEB has eight ‘bioeducators,’ three buses, four rural access vehicles and four operating centers and reaches over 2,500 students in 52 schools surrounding the ACG (Cruz and Blanco 2010).

There is good evidence that ACG outreach efforts are largely having the intended results in communities bordering the *terrestrial* conservation sectors. A 1994 report by a committee of outside investigators found that much of the population in surrounding communities felt the development of the ACG had brought money and jobs to the area, mostly because of increased tourism. While a portion of the population was found to remain ‘belligerent’ toward the conservation area (resentful of not being able to hunt, resentful that outside tour guides were coming into the zone and angry that the cost of living was going up due to an influx of tourists), the predominant sentiment towards the ACG was positive. Janzen commented that it is widely rumored that the ACG has it easy

because it is embedded in a ‘tame populace’; in reality, the ACG has simply done a good job integrating into surrounding communities and spreading around the benefits of conservation (Allen 2001, 203).

As will be discussed at the end of the chapter, ACG outreach efforts in coastal communities such as Cuajiniquil have not experienced the support or ‘tame populace’ phenomenon described above. This is partially attributable to the fact that the *sector marino* did not receive the same initial level of attention as the terrestrial sectors of the ACG, and so outreach efforts in Cuajiniquil lagged behind those in non-coastal communities. Primarily, however, this is due to the fundamental differences in access rights between the private land-based and ‘common’ ocean-based resources in the area. This will reemerge as an important theme in Chapter 3.

Decentralizing Costa Rican conservation

The emergence of the ACG from Santa Rosa National Park marked a critical shift in motivation and management strategy for conservation in Guanacaste, the consequences of which are still very salient for the ACG *sector marino*. As Janzen reminded me, Santa Rosa (and Costa Rica’s national park system in general) was modeled after the U.S. national park system circa 1965. The U.S. national park system was intended to provide recreation sites for the upper class and similarly, Santa Rosa was envisioned as a recreation site for a centralized government staff (Interview, Dan Janzen). Although Santa Rosa quickly morphed into more than just a vacation spot, Costa Rican national parks have continued to function as extensions of the centralized state. One of the implications of this is that all employees are hired from a central pool of applicants and

distributed around the country on rotational schedules. When this is the case, Janzen explained, conservation becomes a paycheck, not a part of community life and vibrancy. Janzen described a talk he gave when he was ‘young and innocent, just like [me]’ to national park staff proposing a radical new management strategy: decentralization. He presented on the merits of hiring locals to work for protected areas and stressed the value of integrating bordering communities into conservation initiatives (Guidetti and Claudet 2009). “I expected applause,” Janzen told me, “but when I finished, I was met with dead silence because what was I really proposing? I was proposing that all the members in the audience lose their jobs in order to make room for locals” (Interview, Janzen).

Nevertheless, the ACG has largely managed to run its own show over the years (hence Simón’s employment with the *sector marino*). “We got away with this in the beginning because we were so far away from people’s radar—the ACG was on the moon as far as Costa Rican central society was concerned!” (Interview, Dan Janzen). Janzen also fundraised (and continues to fundraise) constantly, which afforded the ACG fiscal independence. “Because we raised the money, we got an illegal agreement to be able to control the national park terrain and hire police, teachers, rangers, etc.” (Interview, Janzen).

Three years ago, however, the ACG ran out of money to maintain an independent budget. “We got the government to give us 80 employees, but in doing so we had to go back under the civil service system. When someone retires today, the positions cannot be filled the way they have for the past 25 years. We’re caught. If we want the freedom to manage this area the way it ought to be managed, we have to pay the bill. And we don’t have the money to pay the bill” (Interview, Dan Janzen). The ACG has resorted to

finding loopholes in the system to continue running its management and education programs as they see fit. For example, legally the ACG can only do its own hiring for staff that perform ‘non-essential’ skills. (“The guys with the guns [park guards],” Janzen tells me, “are considered essential.”) So the ACG pretends what they are doing is non-essential: cooking staffs are non-essential, biological educators are non-essential. Hiring processes can also be manipulated by tricks like advertising a job and closing it the next day to ensure a local hire. “A lot of Alejandro’s (the ACG director) job is illegal and he dances on the line of losing his job or being taken to court. The government turns a blind eye a lot because they like the results we produce.” Still, this puts the ACG in a precarious position because it depends on the silent agreement from the civil service employees in charge, which means the ACG needs to be in good favor with the government. “You do this by doing favors,” Janzen explained. “You develop this political favor relationship with the government” (Interview, Janzen). As the ACG continues to evolve and improve outreach initiatives, the constraints imposed by the national government conservation structure must be kept in mind.

Creating the sector marino

As with the terrestrial sector of the ACG, the *sector marino* was created in large part because Janzen pushed for it to be included. Essentially, the current *sector marino* is a northward extension of the original Santa Rosa marine area and increased the original 20,000 Ha of protected ocean twofold. Centered around the northernmost archipelago in the Costa Rican Pacific where two major currents meet, the *sector marino* includes unique island and reef habitat (Figures 4 and 5) (Janzen, 2010). At the time, however,

very little was actually known about the marine ecosystems to be protected; when I asked Janzen why the *Islas Murciélago* were chosen to be included in the ACG and what research had been done around them, he was quick to tell me: “There wasn’t any research done, there didn’t need to be any research done. You don’t need to do any research to decide to conserve the biodiversity on those islands and around those islands. All you need to do is realize that there aren’t any protected islands” (Interview, Janzen).

One of Janzen’s former graduate students, Frank Joyce, first brought Janzen to the islands and suggested they be included in the ACG. Subsequently, Janzen looked into the implications of including the islands and surrounding waters in the newly-formed ACG: “I remember doing an investigation and asking ‘are there any people living on the islands’ and the answer was no. So I went to the park service and said we want to expropriate the islands and the water around them right now, while there’s no conflict” (Interview, Janzen). Expropriating the islands proved more difficult than expected. Janzen recounts that “it required a lot of under-the-table wheeling and dealing to get them [the national park service] to agree because in their mindset if you add more then that’s more pain in the rear-end to manage—they didn’t want to expand. They had no budget, nothing. So here I am pushing; finally we were successful in getting them to decree the *sector marino* an expansion of the original marine strip. And I purposefully didn’t go farther north because I didn’t want to bug the fishermen in Cuajiniquil. The idea was: that’s their terrain north. The islands had a reputation of being very dangerous [and so no one fished there]” (Interview, Janzen).

Based on my conversations with fishers about their use of the resources around the islands in the past, at the time the *sector marino* of the ACG was created, there were

indeed very few fishers who ventured out to the islands. The motors on most *pangas* in 1987 were too small to safely take fishers out around the peninsula (picture in the maps above) to the *Islas Murciélago*. Besides, resources in the *Bahía de Cuajiniquil* were quite sufficient to provide for fishers' needs; it was not until the fishing population grew and technological advances made it possible for longer trips to sea that fishers began to regularly make the trip out to the islands. The reefs and deep rocky shelves around the islands developed a reputation as particularly rich areas to fish, and many divers looking for lobster, octopus, and parrotfish began to frequent the area (Interviews, Tonya, Conan, José). By the time the ACG had the infrastructure and funding to begin enforcing the no-take policy around the islands, the expansion of fishing ranges meant that Janzen's visions of 'not bugging' fishers were no longer realistic. Manuel Alán, once the major fish exporter in Cuajiniquil, estimates that the *sector marino* displaced 60-70 divers who regularly worked around the *Islas Murciélago* (Interview, Manuel Alán). The ACG made no move to compensate fishers for lost income or help them find employment alternatives (save for a very few, like Simón, who were employed by the ACG), a fact that fishers hold against the conservation area (Mascia and Claus 2008).



FIGURE 4: Aerial view of the Islas Murciélago and adjacent Santa Elena peninsula (photograph taken during the dry season) (Janzen 2010).



FIGURE 5: View from Isla San José, the largest of the Islas Murciélago (Helen Joyce).

The ACG presence in the sector marino

The ACG established a permanent presence within the *sector marino* in 1994 when Simón and one other Cuajiniquil resident were hired to work on the *Islas Murciélago* as rangers. Hiring Cuajiniquil locals was an intentional and strategic decision on behalf of the ACG and reflects a growing understanding that conservation efforts are most successful (and often only successful) if supported locally (Ban *et al.* 2009; Charles and Wilson 2009; Klein *et al.* 2007). Furthermore, hiring locals ensured a certain knowledge base useful for patrolling waters and communicating with fishers. Simón explains that he was given very little training when he began working as a ranger; what the ACG needed most was “that we have a knowledge of the area, the boat routes, which we already had from working here as fishers for so here long. That was very important” (Interview, Simón). Hiring locals and incorporating their voices into the conservation narrative “alleviates their [fishers’] skepticism toward scientists and increases the likelihood they will respond positively to marine reserves” (Guidetti and Claudet 2009).

During the 1990s, there was little active effort to remove fishers from the *sector marino*: “The marine portion [of the ACG] was too distant, too difficult logistically, and too far from the bleeding edge of visible destruction of the terrestrial area (fire, hunting, logging, ranching, cultivating) to be dealt with” (Janzen 2010). In his first years on the islands, Simón served primarily as an advocate for marine conservation: “The idea from the beginning was to educate fishermen. Fishers would come here [to the station] at night, we’d drink a cup of coffee together and they’d stay here for the night. I would try and convince them that this area was going to be closed for fishing, that everything that

involved the extraction of *bichos* (critters) would not be allowed” (Interview, Simón). Simón recalls that he had a very easy-going relationship with fishers at this time.

According to a recent report on the state of the *sector marino* drafted by the ACG, no-take enforcement began in earnest around the year 2000 (Janzen 2010). Two rangers (one of whom, of course, is still Simón) have continued to primarily oversee the *sector marino*, with the occasional visiting support of education, research, and police protection (Janzen 2010). The increased efforts to enforce the no-take policy in the ACG *sector marino* have been made possible financially in the last decade due to the settlement of an adjacent land-expropriation lawsuit (from the national nomination for ACG inclusion as a World Heritage Site). Large commercial trawlers and sport fishermen were targeted first through explicit announcement of the no-take zone and were successfully removed. The ACG has been increasing active expulsion efforts over the past five years to remove the local fishing presence (Janzen 2010) (Figures 6, 7 and 8).

Increased enforcement feels a bit like a betrayal to many Cuajiniquil residents who thought the ACG was going to support limited access for fishers. I spoke with fishers who described their excitement at the construction of the ACG station on the islands because they believed it would serve as a nighttime refuge during fishing trips. Fishers even helped haul materials out to the islands (Interview, Ricardo). During the dedication ceremony for the station on the islands in 1995, the ACG invited president José Maria Figueres to speak to an audience of conservation honchos and Cuajiniquil residents in an explicit attempt to include locals. Fishers at this event expressed concern that the government was going to ban fishing in the region, but ACG biologists

emphasized that they wanted to work with them to ensure sustainable use of the marine ecosystems. “We have to work together. We don’t want to act like ‘the authority’” (Allen 2001).



FIGURE 6: ACG employee Freddy Salazar inspecting fishing vessels passing through protected waters (Janzen 2010).



FIGURE 7: Gill nets confiscated from fishers found in the ACG *sector marino* (Janzen 2010).



FIGURE 8: Diving equipment confiscated from fishers found in the ACG *sector marino* (From Janzen 2010).

ACG education initiatives in Cuajiniquil

Over the last decade and a half, the ACG has paralleled its enforcement policies with the implementation of a formal education program. Beginning in the late 1980s and through the 1990s, ACG biologist Giovanni Bassei was assigned to work with fishers in the Cuajiniquil community. He sponsored educational trips to the islands where he would lecture on the broad importance of conservation and explain how individual fishing practices such as releasing the largest fish, which likely are bearing eggs, can protect fish stocks for the future. Additionally, Bassei provided instructional courses on simple diver safety for fishermen working at great depths with compressors who were at risk for neurological damage (Interviews, Chavarría, Gustavo). By most accounts, Bassei was a well-liked figure in Cuajiniquil, but he largely abandoned his role as an educator towards the end of his tenure in the town because of his involvement in the local drinking culture (Interviews, MariaMarta, Simón).

Several years after Bassei left Cuajiniquil, MariaMarta Chavarría, ACG Subdirector for Marine Activities, was hired to give ‘special consideration’ to the relationships between the ACG and Cuajiniquil residents on the one hand and the ACG and visiting scientists or conservationists on the other (Janzen 2010). Maria Marta is the leader of the ‘biosensitization program’ in Cuajiniquil, which was imagined as an extension of PEB, the biological education program that has been running since the ACG was formed in 1986. MariaMarta focuses on educating children in Cuajiniquil and neighboring fishing towns about marine ecosystems and the merits of conservation for investigative, aesthetic and sustainable fishing purposes. She brings children out to

snorkel, leads experiments, and lectures about marine biology. “I’m not subtle with my program,” Maria Marta told me, “I tell people why conservation is important to them. I ask: ‘Where is your water from, where is your air from?’ The park is for everyone to appreciate.” The ACG has come to believe that working with children is the most important way to ensure community support for the *sector marino* because it targets a new generation of conservation advocates and works non-aggressively to change fishing behavior through child to parent education. The 2010 ACG report suggests that their ‘biosensitization program’ is perhaps the most successful aspect of their effort to enforce the no-take zone.

Maria Marta now lives part-time in Cuajiniquil and her house has been converted into a center for ‘The Initiative for Environmental Improvement in Cuajiniquil’ (Figure 9). Her student groups have painted marine organisms all over her walls and frequently stop by in the afternoons for help with their science homework; she has become a beloved figure for many in the community (Interview, Chavarría). She is optimistic that her programs with children are also working to change fishers’ opinions about the ACG and marine conservation (although as discussed later, she is skeptical of how effective an opinion change really is). Maria Marta recounts an instance where one of the girls in her program came up to her and reported: “My dad says that you are a terrible witch because you want us all to die of hunger! But I told him that he was wrong, that what you really want is for there to always be fish for us to live from and that’s why we have to take care of mother fishes so that they can have many little babies!” After this interaction between father and daughter, Maria Marta says that this

father started to greet her pleasantly on the streets and that they have since developed a friendly relationship (Interview, Chavarría).

A few of my interviews revealed resentment towards Maria Marta from families whose children had not participated in the biosensitization program. “That Maria Marta is picky about those who she helps. She always works with the same kids—she doesn’t give everyone an equal opportunity. She doesn’t notice the poorest people in town, she mostly works with those who have *more*. She’s never come here [to our home]” (Interview, Carla). Although Maria Marta is certainly not aiming to exclude poorer families from her programs, the children she works must have their parents sign permission forms, pack lunches for field trips, and occasionally contribute very small amounts for expenses. These factors may be limiting the kind of families she reaches.



FIGURE 9: Sign welcoming visitors to the ACG sponsored education center in Cuajiniquil. Program run by biologist MariaMarta Chavarría.

Do marine protected areas work? For whom?

On the one hand, the ACG's mission is to conserve for the sake of conserving. When I ask Janzen whom conservation is for, he immediately responds: "It's for the organisms" (Interview, Janzen). Similarly, aspects of Maria Marta's educational programs children focus on fostering appreciation for, and attachment to, the natural world. On the other hand, the ACG wants to educate the Cuajiniquil community about the benefits fishers will derive from the *sector marino* when healthy fish stocks in the protected waters 'spill over' out into the rest of the ocean.

To assess the mode and content of the ACG's instructional outreach, it is necessary to understand the claims (biological, economic, aesthetic) marine protected areas (MPAs) are making worldwide. I include the detailed findings below, because while they acknowledge that the capacity for species protection in MPAs is complicated by intra-species variation, inter-species differences in migration patterns, and MPA size, they show that MPAs have had marked success; no-take zones ranging from only a few kilometers to hundreds are working to protect individuals and populations and restock surrounding waters.

There has been considerable debate over the ability of MPAs to provide long-term protection for marine populations. In order for conservation of targeted species or ecosystems to be successful, MPA size must be informed by detailed understandings of a species' home-range size and seasonal migration patterns. On the other hand, there is concern surrounding the ability of MPAs to create spillover effects that will bolster external fish stocks. In attempts to address these issues, numerous studies have tagged

individual fish and monitored movement patterns over extended periods of time. Meyer *et al.* (2010) looked at parrotfish, surgeonfish, goatfish and several other reef species in Keleakekua Bay, Hawaii. With the goal of determining whether the 1.3 km² no-take area in Keleakekua Bay is really protecting fish species, 70 individuals of 11 species were tagged using monitors with batteries capable of lasting over one year. An array of receivers allowed for movement detection of fish across distances ranging from several hundred meters to over 100 km. It was found that the Keleakekua Bay no-take zone is large enough and contains sufficiently diverse habitat to protect a broad range of reef fish species during their regular daily movements. During less frequent, larger-range movements (perhaps associated with spawning migrations or home range relocation), however, the no-take zone is insufficient.

Mason and Lowe (2010) offered additional insight by tracking sand bass in the MPA around Santa Catalina Island off the coast of California. It was found that home range size varied among individuals within species (possibly due to differences in body size and sex, although this study did not look specifically at these variables). Furthermore, approximately half of individuals remained within the MPA while the other half left seasonally (this is referred to as site fidelity). Both of these findings suggest that while there is significant variation in individual fish movement, this MPA is successfully protecting fish either annually or seasonally. Mason and Lowe conclude that the effectiveness of MPAs depends on the species present and their variations in home range size and site fidelity. The broader pattern emerging here is supported by a model developed by West *et al.* (2009): the efficacy of a MPA decreases as propensity for migration increases within a fish population.

If we move now from the Pacific Ocean to the Atlantic, Kerwath (2008) provides additional information about fish movement in the context of MPAs in his study of the white stumpnose. The stumpnose was considered an important species for commercial and recreational fisheries, but catch rates have recently declined drastically. Kerwath's study area is the 34 km² no-take zone within Saladnanha Bay north of Cape Town, South Africa. Like Mason and Lowe (2010) Meyer *et al.* (2010), Kerwath recorded both daily and seasonal changes in fish location. Specifically, results indicate that during the winter, stumpnose disperse, but return to the bay before the beginning of the spawning season. Interestingly, because the winter months are associated with lower fishing rates, this migration into unprotected waters has not resulted in a population crash within Saladnanha. In response to observed patterns of high daytime aggregation areas among stumpnose, Kerwath suggests MPAs might strategically be placed to take such patterns into account as fishers presumably fish more during the day. This sort of suggestion is particularly useful to the development of future MPAs and exemplifies the ability of specific case-studies to inform management.

In Cabrera National Park in the Western Mediterranean Sea (covering 87 km² of marine habitat), Crec'hriou *et al.* (2010) focused on distribution of eggs and young larvae rather than adult fish. The target fish were several species of grouper. Tows and net distribution (including both passive and active sampling) ensured that data were collected at a range of distances from island shores and at a range of depths. A few interesting trends emerged: (1) there was a detectable gradient of decreasing egg density from the inside to the outside of the MPA, which the authors suggest is due to an increase of adult grouper biomass in the MPA thanks to protection and (2) egg dispersal from inside the

MPA was abundant and detectable up to 15 nautical miles, suggesting that spawning inside protected waters contributes to the replenishment of surrounding areas. While careful to acknowledge complications to these results (such as the difficulty of separating MPA effects with oceanographic ones or the potential differing larval behavior between grouper species), Crec'hriou *et al.* (2010) are optimistic that their results demonstrate the ability of a MPA to protect and export a commercially targeted species. While Kerwath (2008) provides us with evidence of egg-dispersal from an area less than half the size of Cabrera, it is important to note, that both these cases deal with a much larger MPA than previous examples, and so cannot simply be applied to smaller conservation areas.

Given the observed trends in fish range and dispersal in reef ecosystems similar to those around the *Islas Murciélago* (Crec'hriou *et al.* 2010; Kerwath *et al.* 2008; Mason and Lowe 2010; Meyer *et al.* 2010) it is reasonable to conclude that the ACG *sector marino* (at 20,000 Ha) is large enough to have the capacity to both provide protection for species within its boundaries and increase fish populations in surrounding waters. The majority of heavy fishing in the *sector marino* pre-enforcement was by divers looking for octopus, lobster, and reef fish, which have relatively small host-ranges. Thus a properly-enforced ACG would effectively protect these exploited species (Interviews, Conan, Alán, Ricardo).

Have ACG outreach efforts been working?

The ACG is clearly making a significant effort to move beyond classic policing tactics to enforce the no-take policy in the *sector marino*. By hiring locals and bringing biological education to adults and children, the ACG is attempting to generate the support

of the Cuajiniquil community and spread awareness about the merits of conservation for the future of fishing. But is education enough? There is a great deal of literature showing that although conservation-motivated education can be successful in terms of knowledge sharing, it does not guarantee changed behavior. Several studies have revealed that education initiatives often result in short-term attitudinal or even behavioral changes that dwindle with time (Bettinger *et al.* 2010; Dolins *et al.* 2010; Kuhar *et al.* 2010). In Cayos Cochinos Marine Protected Area in Honduras, for example, management plans expressly worked with bordering communities and incorporated community opinions into policy, but positive sentiment did not last. Many Cayos residents supported a protected area in theory and recognized the benefits of a protected area for improving fish stocks, but over time the restriction of the no-take zones resulted in negative associations with the conservation efforts (Lansing 2009).

When I asked Cuajiniquil fishers what they thought about the *sector marino*, I was often told that while marine conservation is great in theory, the no-take policy has displaced fishers from a much needed source of income without providing alternatives. Fishers feel that their only source of income has been curtailed by the loss in fish grounds so that they are no longer able to support their families. “Protected areas are good for the future,” Conan told me, “but there is no other work [besides fishing] right now” (Interview, Conan). Fishers are resentful of the *sector marino* because they feel that conservation has failed to take their lives into account. “Conservation?” Gustavo asked rhetorically when I brought up the subject. “The park protects and protects and protects—they protect animals more than they protect children, human beings, those who need most. They protect a deer, a monkey, a turtle and I am in agreement with that, yes. But

humans need that too. The park hasn't given as any form of help" (Interview, Gustavo). One fisher explains that removing fishers from the *sector marino* without considering how their incomes would be affected has resulted in non-compliance with the no-take policy: "Conservation is good. But they closed the area without looking at the consequence for the town. And so what do people do? They enter secretly and *pa, pa, pa*, in two nights you know they have something to take home" (Interview, Sergio).

Maria Marta may be fostering a young generation of interested, educated, and science-minded individuals, but the tangible effects of this education for the ACG of this education are still clearly limited. As one Cuajiniquil resident so clearly puts it: "Maria Marta works with kids, which is good because they are the future. She even tells them that their parents have done damage to the ocean and that we have to protect the fish. But those parents bring the rice and beans home every night, and without that children would be dying of hunger" (Interview, Alán). Maria Marta herself firmly believes that the ACG must do more to reach out to, and support fishers, if they wish to see *sector marino* succeed: "We [the ACG employees] need to open our minds and find points of contact that give real work and promote development, otherwise the park is destined to die. I think some people will leave the area because of poverty, but I wouldn't be surprised if people invaded the park as a last resort" (Interview, Chavarría). It is pressing that the ACG move beyond their current outreach programs and address the roots of fishers' resentment. Education initiatives may be changing attitudes in the abstract, but they are not helping put food on Cuajiniquil's tables, and this poses a major barrier to successful conservation.

Chapter 2

Poverty and Resource Dependency: Barriers to Successful ACG Community Outreach

Poverty, resource dependency and conservation

In the 1980s when Santiago started fishing, you could go out in your *panga* with a five horse-powered engine and bring back hundreds of kilograms of snapper, lobster, octopus, shark, and parrot fish. On the morning I visited Santiago in January 2011, I found him sitting outside his house, cutting up an old pair of blue jeans and rocking back and forth on a metal-framed chair. I asked if he was willing to talk with me about his fishing experience in Cuajiniquil. With a smile that revealed his three solitary teeth, Santiago motioned for me to come sit down. Wholeheartedly he described how he has seen fishing change over the years and shared his opinions on particularly destructive extraction practices and the utility of marine conservation and management.

Towards the end of our discussion, Santiago stopped rocking for a moment to carefully unwrap a bundle containing the pieces of his *panga*'s (a small fishing boat) motor. For several weeks now, he had been unable to fish because he can't afford to get the motor fixed: "There's no money to fix this, there's barely money for a bag of rice!" (Interview, Santiago). He tried to make money cutting neighboring lawns with a machete, but because of his neighbors increasing access to gas-powered mowers he doesn't have many takers. Even before his motor broke, Santiago was making very little fishing: "We used to make 60, 70 thousand colones a day(\$120-\$140)," Santiago told me. "Now if you make 1,000 colones (\$2), you're lucky. There have been too many nets in

the ocean, too many spear guns. People are starving, there are days when we don't have anything" (Interview, Santiago).

Santiago is one of many Cuajiniquil fishers who have experienced dramatic decreases in income due to changes in fish stocks over the last several decades. The current scarcity of marine resources in the *Bahía de Cuajiniquil* has resulted in increasing poverty among fishers. As there are very few income alternatives in the region, fishers have no choice but to increase their extraction efforts by extending trips to sea, expanding fishing ranges, and settling for less valuable catch, thus exacerbating declining fish stocks and trapping residents in a non-lucrative enterprise. Cuajiniquil's dependence on fishing due to the lack of available employment opportunities will henceforth be referred to as *resource dependency*. Poverty and resource dependency in small-scale fishing towns have emerged in conservation literature as important factors for predicting marine protected area success (Bene 2003; Gordon 1954; Marshall *et al.* 2007; Marshall *et al.* 2010; Mascia and Claus 2008). Previous studies show that when fishers are heavily dependent on marine resources, their incentives to continue extractive activities tend to outweigh consequences such as fines, confiscation of nets or fishing licenses, or even jail (Marshall *et al.* 2007).

Poverty in Cuajiniquil due to resource decline and resource dependency is linked directly to fishers' resentment of and lack of cooperation with the ACG *sector marino*. If fishers can't provide for their families with what they can catch in legal waters, they will quite logically head south into restricted waters, regardless of how they understand the merits of marine conservation. Furthermore, they will resent any ACG enforcement that limits their ability to derive much-needed income. One fisher forcefully described how

the ACG has overlooked the consequences it is having on Cuajiniquil saying: “I wish that those people would understand—God, enlighten them!—that fishermen are being oppressed. Our children go to school hungry! It’s a huge problem. They don’t give us any solutions and every day there are more laws that hurt the poor” (Interview, Sergio). So, while the ACG may have largely succeeded in conveying to the Cuajiniquil community that conservation within the *sector marino* will increase fish yields outside of it, poverty and resource dependency among fishers are limiting the ability of ACG programs to eliminate illegal fishing.

While it is not explicitly the ACG’s objective to alleviate poverty in neighboring communities, providing income alternatives for fishers is central to the realization of conservation goals. Tackling poverty is no mean feat, however. To imagine how the ACG can most effectively couple its current education outreach efforts with other initiatives promoting diversified employment we must look closely at Cuajiniquil’s history as an emerging fishing town, must identify the specific factors responsible for current poverty and resource dependency among fishers. We must ask how and why the have fish stocks changed? How do fishers understand these changes? Framing the economic, political and cultural role of fishing in Cuajiniquil will help articulate the particular challenges the ACG faces in enforcing its *sector marino*.

Declining resources: the fishing boom busts

A comparison of the total quantity of fish caught in the Guanacaste region from 1996 to 2004 reveals a net increase in catch during the 1990s, which peaked at the turn of the century. Beginning in 2001, catch decreased steadily and reached its lowest ever

recorded level in 2004 (Figure 10).⁴ Note that the vast majority of this catch comes from small-scale (labeled as *artisanal*) fishing from towns like Cuajiniquil, while only a very small fraction is derived from the industrial fleet.

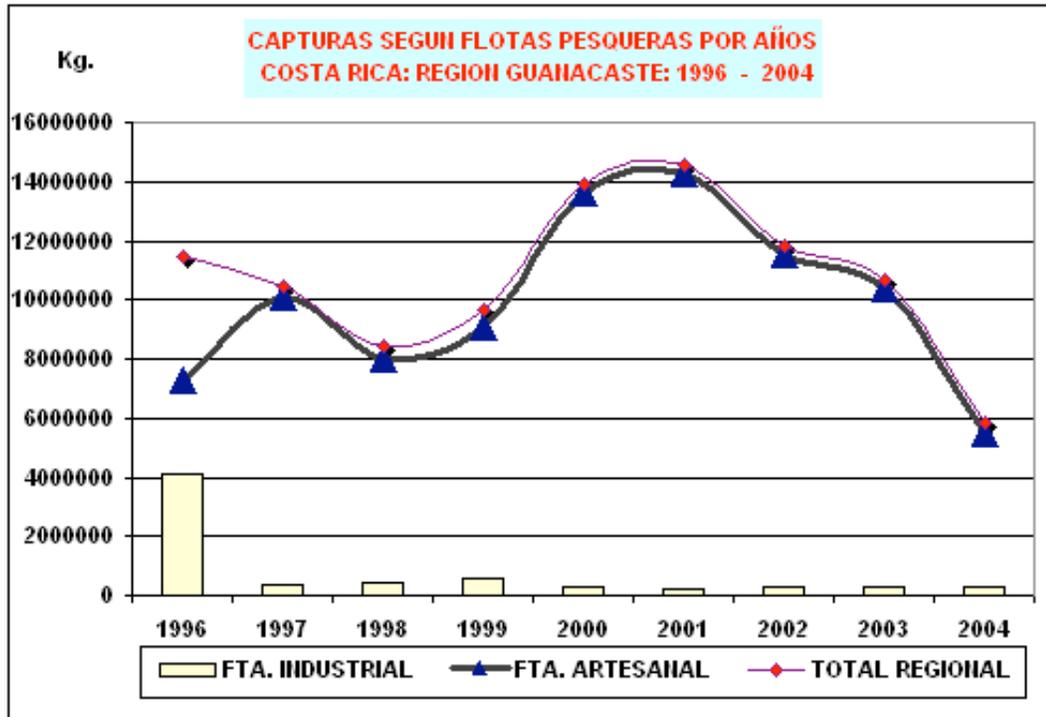


FIGURE 10: Capture (in kilograms) by fishing fleets: Guacaste: 1996-2004. The blue triangles correspond to the artisanal fleet, small-scale fishers such as those in Cuajiniquil. The tan bars correspond to the industrial fish and the red triangles are the regional totals. Note that the majority of the total catch in Guacaste comes from the artisanal fleet.

The initial increase in yield is likely due to increasing number of fishers in coastal communities and technological advances such as larger motors or improved fishing gear (FAO 2004). The subsequent decrease in yield suggests that fish populations could no longer sustain the harvesting levels and so began to decline. The level of effort that

⁴ I was unable to obtain more recent catch data from INCOPECA despite my visit to the regional office in *La Cruz* and numerous e-mail exchanges with employees in charge of national fishing statistics. While unfortunate because I could not analyze the catch data from the last six years, the difficulty I had trying to get that information tells an important story about INCOPECA's organization and the availability of information on the state of fishing in Costa Rica.

corresponds to the maximum extraction rate at which fish stocks can continue to produce sustainably is known as ‘maximum biological yield.’ Although the decrease in yield corresponds roughly to the first years of ACG enforcement of the *sector marino* no-take policy, it must be emphasized that these events are unrelated. First, the ACG *sector marino* is not large enough or well enough enforced to have caused such a marked decrease in yield for the entire province of Guanacaste. Second, had ACG enforcement indeed resulted in this decreased catch due to the loss of fishing grounds, total yields for Guanacaste would have seen an initial drop that quickly leveled off, which is not the case.

While the catch statistics above are an important indicator of the overall state of marine resources in the Cuajiniquil vicinity, they do not tell us anything about the how individual fishers are experiencing declining fish stocks. Variables such as the number of fishers contributing to the total catch in Guanacaste, the composition of fish species caught, and the price of fish all play a role in how a given fisher is affected by the overall decrease in catch. Although fine-scale data about all these variables is not available in Costa Rica, the voices of Cuajiniquil fishers shed light on the meaning of resource decline for small-scale fishers.

When asked how the current fishing conditions compare to past years, most fishers are quick to contrast a rich past with a meager present to illustrate that “fishing today is not the same as it once was” (Interview, Mario) and that today “there is scarcity, much scarcity” (Interview, Gustavo). One fisher tells me that over the years “there has been enormous change. Before you could put in just one net and you’d get 100 kilos of snapper. Now you put in three or four nets and you might get 10 kilos”

(Interview, Danilo). Other such accounts of previously rich waters describe abundance to the point of excess: “We’d throw away fish sometimes—we once pulled up a shark and then just left it there” (Interview, Antony). The wife of a former fisher says that when her husband started fishing, “people just fished right near the shore and they found everything they looked for there: dorado, large lobsters, everything was close. Now you have to go farther and farther to find resources” (Interview, Irma). These accounts suggest that individual fishers are feeling the effects of the overall decline in resources shown in figure 10. Generally, fishers today travel farther distances, spend longer periods of time at sea, and use more fishing equipment than ten, twenty, or thirty years ago, and yet return home with fewer fish. Consequently, it has become increasingly difficult for fishers in Cuajiniquil to support their families.

A small number of fishers, however, are less concrete about the trajectory of marine resource availability in the area, explaining that “catch has always varied, it has always been that way” (Interview, Ricardo). On the one hand this is an acknowledgement of the complexities of marine ecosystems; one fisher explains: “This year there was no cold water and so the algae didn’t bloom and fish didn’t come up close to the shore—that’s what we wait for every year in December to April—the cold water. This year the fish didn’t come. But I say it’s a current thing—we had 5 years when fishing was worse than this” (Interview, Conan). Literature from other small-scale fisheries has found that fishers are often aware of fluctuating marine resources but are not always able to determine changes in short-term fish productivity from long-term trends in stock abundance (Hilborn 2007; Ludwig *et al.* 1993; Van Densen 2001).

On the other hand, statements about catch variability imply an unwillingness to confront the possible responsibility fishers that have for current population decline. One fisher tells me that: “fishing is not the same as it used to be,” but when I ask about the possibility that destructive practices have contributed to decline, he says: “It’s hard to fish out everything, because just one snapper or dorado has millions of eggs” (Interview, Mario). These fishers tend to blame increasing poverty in the region on the presence of the *sector marino*, explaining that before increased enforcement “there was enough space for everyone to work” (Interview, Sergio). As noted previously (Figure 10), catch in local waters began to plummet at roughly the same time that the ACG initiated stricter enforcement of the *sector marino* no-take policy, inconveniently linking lower catches with conservation. This sentiment is troubling to ACG conservation efforts in that it implicates the *sector marino* directly in current poverty. It is also troubling for broader fishery management efforts as it negates the need for regulating extraction by understanding declining yields as external to individual fishing practices (the importance of fishery management is discussed in Chapter 3.) While this represents only a small portion of fishers’ opinions, it is an important mindset for ACG to target, perhaps by sharing data such as that described in Figure 10 with the fishing community at large.

Regardless of what fishers attribute their decreased catch to, most are not hopeful for the future of fishing in Cuajiniquil. Danilo, one of the men with the longest history fishing in the area admits, “I think in 10 years there won’t be anything left.” Irma, the wife of an ex-fisher explains, “The way we’re going now, there will come day when there won’t be anything left. People here need to find another way to live” (Interview, Irma). Even Jorge, a relatively affluent local fish exporter who believes his business is

sufficiently stable to weather declining fish stocks during his lifetime, tells me that the fishing industry is a thing of the past and that he would never want his children to follow in his footsteps (Interview, Jorge). Such pessimism decreases the interest fishers might have in respecting the *sector marino* for future spill-over benefits, and encourages fishers to extract as much as they can before it's all gone.

The rise of fishing in Cuajiniquil

Descriptions of the current state and predicted future of marine resources in Cuajiniquil paint a grim picture for the many residents dependent on fishing. Decreasing fish stocks over the last decade have clearly resulted in increasing poverty among fishers. Why, then, does so much of Cuajiniquil continue to fish? They continue to do so because they have little or no alternative. An examination of the history of fishing in Cuajiniquil will provide information on the particular ways the town became dependent on marine resources. This will in turn illuminate the specific areas where Cuajiniquil needs support.

Fishing did not emerge as a common livelihood strategy in the Cuajiniquil area until the 1970s. This is significant both because it means that there are active fishers who have experienced essentially the entire trajectory of fishing in the region (and so have seen the complete change in resources and can speak to this change) and because it shows there is not a long cultural tradition of fishing in Cuajiniquil (Quesada Alpizar 2005). Many small-scale fishing communities have strong cultural ties to their livelihood; fishers in such communities often have established work structures and respected elders that can be tapped to shift extraction practices and work towards sustainable resource use. On the other hand, fishers with strong cultural ties may be more difficult to relocate into the

broader economy when the opportunity arises (Cinner *et al.* 2008). Almost every fisher in Cuajiniquil told me they would rather work in tourism or have a steady job on land than fish. They cite the risk of going out sea as well as the income insecurity associated with irregular catch as reasons that “families that live off fishing suffer more” (Interviews, Sergio, Irma). If the ACG ultimately wishes to decrease the number of fishers in the area, fishers’ willingness to leave the ocean will be to its advantage.

Pre-fishing Cuajiniquil was supported by the agricultural arm of Hacienda *Santa Rosa*. The *patrón*, the large-scale landowner, would hire agricultural, facility maintenance, cooking and cleaning laborers to run operations on the hacienda. In those days, virtually all of Cuajiniquil worked on the hacienda and received a bi-weekly or monthly wage in return. The shift from this steady income to the intermittent one earned from fishing will be important in upcoming sections in the context of alcohol abuse and the potential for community organization or self-designed management (Interview, Centeno).

Beginning in the late 1960s, a few fishers from coastal towns to the south began to arrive in the *Bahía de Cuajiniquil* to extract lobster via *buceo de pulmón*, free diving. A few trucks transported what was caught up the steep, winding road (constructed in the early 1950s) leading from the coast up to the Pan American Highway. However, passage was not always guaranteed during the rainy season due to deep mud or landslides. Furthermore, as the town still had no electricity and consequently no ice to preserve the catch, exportation was irregular. According to retired schoolteacher and long-term resident Miguel Centeno, around this time the first native Cuajiniquil fisher used only a rowboat and hand manipulated net. Slowly, more people began to try their luck in the

ocean, to get their own boats. Agriculture, however, was still the main source of local employment.

The last *patrón* of Hacienda Santa Rosa was the Nicaraguan dictator Anastasio Somoza Debayle. Somoza provided year-round employment for several hundred people in the Cuajiniquil area and seasonally imported Nicaraguan labor (Interview, Centeno). When the Sandinista National Liberation Front overthrew Somoza in 1979, the government of Costa Rica expropriated his land. A large portion of this land would later become part of the ACG. A smaller section of the remaining land was divided between a cow milk and meat producing cooperative and individual plots granted to the people of Cuajiniquil. This cooperative disintegrated after several years and many members sold their shares, a decision that has contributed to fishers' dependence on fishing today (Interviews Jaime, Centeno). As might be imagined, the end of Somoza's dictatorship marked a shift in employment/income structure for Cuajiniquil with the disappearance of the umbrella presence of the hacienda; very quickly, the Cuajiniquil economy transitioned from agriculture to fishing. Furthermore, the political and economic unrest triggered by Somoza's fall drove a large number of Nicaraguan immigrants across the border. As a town close to the border, Cuajiniquil experienced a great influx of Nicaraguans who entered into the fishing population (Interview, Miguel Centeno).

Divisions between *ticos* (Costa Ricans) and *nicas* (Nicaraguans) are still quite prominent in Cuajiniquil. Not only is there a perceived ideological difference but there is a clear physical divide in the community as well. Cuajiniquil is divided into *barrios* (neighborhoods) that are considered either 'Costa Rican' or 'Nicaraguan.' Divisions within *barrios* are illustrated by comments such as 'the family across the street are *nicas*;

they always throw their trash in the river,’ or ‘I would never buy bread from them because it wouldn’t be clean. They just have a different culture’ (Flor, paraphrased). One local fish exporter tells me he sent his children to school an hour and a half away from Cuajiniquil because they were picking up a strong Nicaraguan accent from their local peers (Interview, Jorge).⁵ The polarization of Nicaraguans and Costa Ricans in Cuajiniquil is not trivial; it poses a serious barrier to organization or cooperation within the community and discourages compliance with fishery management as will be discussed in more detail in Chapter 3.

In the early 1980s electricity arrived in Cuajiniquil, which allowed for the production of ice to store fish for later sale. In 1982 the government initiated the construction of the *muelle*, a large dock complete with a fish processing plant, which was intended to serve the people of Cuajiniquil (Interviews, Miguel Centeno, José Lara, Jaime Lara).⁶ In the early 1980s, there were only 12 fishing vessels in the *Bahía de Cuajiniquil*; within a few years that number had doubled and today has reached 180 (Interview, Jorge; fishing vessel statistics from INCOPECA). With the increase in extraction and exportation capability came the first outside businessmen interested in buying and transporting seafood from Cuajiniquil to larger ports or to the capital (Interview, Jorge). By the late 1980s and early 1990s, fishing was booming! Today, there are 812 fishing

⁵There is a long history of prejudice and discrimination against Nicaraguans in Costa Rica not dissimilar to the history of Mexicans in the United States. The political and economic instability in Nicaragua over the last several decades has resulted in a large influx of Nicaraguans into Costa Rica and hence Nicaraguans are often viewed as ‘job thieves’ and instigators of crime.

⁶Despite its small size and remote location, Cuajiniquil was on the national radar in the 1940s and 1950s because of its proximity to Nicaragua. It served as a passage point for Nicaraguan laborers entering Costa Rica to work on banana plantations and played a role in the internal political conflicts of the time. In part, this recognition (coupled with the extra rich bordering waters) resulted in the construction of the *muelle*, which supported Cuajiniquil in becoming one of the five main landing sites in the Pacific (Interview, Miguel Centeno; FAO 2004).

licenses for the 2,235 residents in fishing towns situated around the *Bahía de Cuajiniquil* waters (population statistics from the health clinic in *La Cruz*, fish license statistics from INCOPECA, see appendix 3).⁷ Given that all fishers in this area are men, a better estimate of fishing prevalence looks at the number of men between the ages of 10 and 75: 1 in every 1.1 individuals of eligible fishing status has a fishing license.⁸ As this ratio makes clear, fishing is a source of income for the vast majority of families in the area. Even families that do not fish have livelihoods tied to the ocean and are impacted by the state of fish stocks in the area; the owner of a small restaurant explained to me that when the fishing is bad his business suffers because the economy of the town suffers (Interview, Larry).

Lots of fish fast: how Cuajiniquil tied its future to the ocean

The rapid rise of fishing in *Bahía de Cuajiniquil* waters, where resources were previously untapped, meant that many Cuajiniquil residents went from making a small, regular wage working on the hacienda to making much more at irregular intervals from fishing. This transition has shaped the Cuajiniquil community in complex ways, the most straightforward of which has been creating dependency on a now-dwindling resource. Fishers had little incentive to attend school because they could make more from the ocean than from most professional fields: “People thought that all their lives fishing would be the same and that their children would make even more because they

⁷ Cuajiniquil, with 1,527 residents is the largest of the three fishing towns dependent on the *Bahía de Cuajiniquil* waters. The population figure for Cuajiniquil includes neighborhood *barrios* ‘El Cangrejal’ and ‘Las Vegas.’ The other two towns are El Jobo and Puerto Soley (statistics from the *La Cruz* health clinic).

⁸ A few of the 812 active licenses for 2011 belong to men from nearby cities who fish primarily for sport but these numbers are too small to affect by analysis (Interview, Luis Picado).

would have better extraction gear and fish prices would be higher!” (Interview, Centeno). Furthermore, most fishers sold any agricultural land they owned because they no longer needed it and it was more convenient to buy small plots closer to the ocean and the *muelle*.⁹ Consequently, residents tied their futures securely to marine resources and severed connections with alternative livelihood strategies.

One of the local fish exporters in Cuajiniquil describes that in the 1980s and early 1990s: “There was lots of money everywhere; fishers had money and middlemen in San José became millionaires” (Interview, Jorge). It was lucrative for young boys to join their fathers fishing from an early age, and so “no one sent their kids to school because they could just fish” (Interview, Centeno). Miguel, a university educated teacher, describes returning to Cuajiniquil on weekends and hearing fishers boast: “What someone who studied makes in a month I can make in two days fishing!” (Interview, Miguel Centeno). Similarly, Simón describes how hard it was to switch from a fisher’s income to the meager salary paid by the ACG to section rangers in 1994. In this way the burst in income from fishing disincentivized education, closing opportunities for future employment once marine resources began to decline.¹⁰

One fisher describes his recent attempts to find alternate employment in the face of declining marine resources: “I went to San José to work for two months and it’s

⁹ Not only has the selling of agricultural land contributed to current poverty and lack of income opportunity for fishers, but it has also reduced community possibilities for development (land for a new school, land for hotels). A Canadian man now owns a great deal of the land surrounding the immediate town of Cuajiniquil and so much of the future possibilities for tourism development lie in his hands.

¹⁰ In the 1950s, a small primary school was founded in Cuajiniquil. Cuajiniquil only received a secondary school within the last decade, however (received is a generous term—the community hall has temporary partitions set up to divide one the large room into non-soundproof classrooms). Previously, if parents wished their kids to progress past primary school, they would have to send them to La Cruz and find a way to pay the bus fare. Cuajiniquil is currently working to buy land and raise funds for a real secondary school.

impossible to make anything because I only went through 6th grade and only have experience fishing” (Interview, Sergio). Most fishers in Cuajiniquil have a 3rd or 4th grade education. One young man I interviewed had finished 9th grade, but no other interviewees attended secondary school. In comparison, as of 2004, 96% of primary-age children in Costa Rica successfully completed 5th grade and 94% transitioned from primary to secondary school. As of 1999, 46% of adolescents were enrolled in secondary school (UNESCO Institute for Statistics). The lack of education within the fishing population limits potential for shifting employment strategies and makes Cuajiniquil especially dependent on marine resource extraction.

Another important result of the rapid transition from agriculture to fishing in Cuajiniquil was the development of a two-tiered fishing hierarchy. Essentially, a few fishermen/businessmen from larger, more established ports came to Cuajiniquil, bought local catch, and exported it to larger cities. These businessmen became known as *recibidores*, ‘receivers’ of catch, and continue to be the established middlemen for fishers in Cuajiniquil and fish markets outside the town. On the one hand, the receiver system provided Cuajiniquil fishers with export capacity they were not capable of during the early years. *Recibidores* also acted as sources of capital for fishers purchasing *pangas*, new motors, or expensive fishing equipment. On the other hand, the receiver system supported a pattern of fisher dependence on the *recibidores* and consolidated export profits among just a few members of the community.¹¹

¹¹ One Cuajiniquil resident proposed that the fisher-*recibidor* relationship parallels the farmer-*patrón* relationship from the hacienda days (Interview, Centeno). The evolution of dependency and the role of paternalistic authority in Cuajiniquil would be an interesting topic to pursue, and likely has broader implications for fishers’ relationships with government agencies such as the ACG and the national fishery management institute (INCOPECSA).

The receiver system, coupled with the arrhythmic lifestyle created by the shift from of farming to fishing, has also contributed to alcohol and drug abuse in Cuajiniquil. “People could make too much money all at once,” Miguel Centeno described, “and then they’d spend the rest of the days doing nothing, spending all their money (Interview, Centeno).” The *recibidores* provided a ‘safety net’ for fishers who spent all their income before returning to sea to fish. One *recibidor* described that people would make a killing during a single fishing trip but would spend it all drinking. When nothing was left, fishers would come to him and he would lend them money for gas and food supplies and deduct the loan from their next catch (Interview, Jorge). Ricardo, who has been fishing in Cuajiniquil since fishing started, recounted that “even if fishers came home Saturday with one million colones (~\$2,000), by Monday they’d be looking for someone to lend them money. People used to fish for lobsters and a bad fisher could get 800 in a day while a good one could get 1,500. They’d take whatever they made to the one bar we had in town, buy all the beer there was. It’s been like that all my life—whatever you earn you drink” (Interview, Ricardo).

Today, it is quite common on any given morning to see a group of men loitering around the porch of the local supermarket in Cuajiniquil, clear bottles of liquor in hand. A previous employee at the supermarket in town described watching fishermen come in to grocery shop with their wives and carefully monitoring food purchases to ensure money was left over for liquor (Interview, Kailor).¹² Alcohol abuse is clearly affecting the immediate welfare of many families in Cuajiniquil and poses a challenge to

¹² Alcohol and drug abuse is a common pattern in small fishing towns around the world (Goodwin 2001). In response to my queries about alcohol abuse in Cuajiniquil, one fisher reminds me: “Lets not just criticize this town, this happens everywhere, at the global level” (Interview, Gustavo).

successful conservation because it creates an insatiable motivation for income. In a sense, Cuajiniquil is drinking away its fish stocks. ACG biologist Maria Marta is of the opinion that Cuajiniquil must work aggressively with IAFA (the Institute for Alcoholism and Drug-Dependence) to confront the deep problems of alcoholism and drug abuse before the ACG can have any marked success with their conservation outreach (Interview, Chavarría).

Although there has been very little state intervention in Cuajiniquil on the substance abuse front, the Costa Rican Training Institute (INA) has attempted to confront growing poverty by providing training programs for adults, intended to broaden income opportunities. Several times a year, INA hosts daylong, weeklong, or even monthlong technical workshops in areas such as hotel management, guiding, crafts, etc. (Figure 11). These workshops are generally poorly attended, however, because there are limited outlets for the skills they offer, and residents are frustrated that there continue to be no real options. Costa Rica, as a booming tourist economy, tends to funnel tourism-related training into rural economies in need of development (Giro 1993), but Cuajiniquil receives minimal tourism. Fishers often feel that they are wasting their time at INA trainings, and therefore would rather spend their time at sea (Interview, Esteban). It is in the interest of the ACG to support tourism as an alternative to fishing. There needs to be an active effort to bring tourists to Cuajiniquil; INA's educational programs will only take hold when tourists actually visit the community and the benefits of training are clear and direct.



FIGURE 11: Sign taped to one of the buildings at the *muelle* in January 2011. “FRIENDS OF CUAJINIQUIL: We invite you to the community hall at 4 in the afternoon on the 22nd of June so that we can introduce the INA [the National Training Institute] course and program offerings in town.”

Resource dependency and the willingness to conserve

The reality of poverty and resource dependency as barriers to conservation in the *sector marino* is perhaps most clear when one looks at the Cuajiniquil residents who *are* supportive of the ACG’s presence. As articulated previously, the majority of Cuajiniquil fishers are resentful of the *sector marino* because their income has substantially diminished in recent years due to declining fish stocks and supporting their families has become more and more difficult. Many of these fishers express the importance of conservation in the abstract, but believe the ACG kicked them out without providing alternatives. Only a very few Cuajiniquil residents were firmly in favor of the no-take policy in the ACG *sector marino*. The well-off *recibidores* I talked with stated that they are fully supportive of the marine conservation efforts and see the *sector marino* as

crucial to the future of fishing in Cuajiniquil. Both are invested in marine resources *and* have the income stability allowing them to afford to support longer-term goals. Other firm supporters of marine conservation derived some or all of their income from an alternative source such as marine-activity based tourism or a small local business (restaurant, hotel, grocery store, etc.) and thus were less dependent on marine resources. This is consistent with research in the Red Sea showing that fishers with multiple sources of income or higher earnings were more willing to support conservation measures than their poorer, more dependent counterparts (Marshall *et al.* 2010).

Interestingly, the final demographic that expressly supported the *sector marino* was old-time fishers who were not necessarily wealthier than their younger peers (Interviews, Ricardo, Danilo). Don Ricardo, who was a farmer during the 1950s and 1960s and then became one of the first fishers in the area, explained wisely that conservation is crucial to the future of fishing because “the ocean is like a farm: if we don’t take care of it, it won’t produce. If I have a farm and I have livestock and I don’t take care of the pastures, the grasses, the water, my livestock won’t be able to live there” (Interview, Ricardo). While not all old-timers were in favor of conservation, it is important to note that no fisher I spoke with under the age of forty was unequivocally in favor of the ACG *sector marino*. Even the one young fisher I spoke to who had participated in Maria Marta’s ‘biosensitization’ program as a boy and recalled dreaming about being a biologist or a tour guide, now talks freely about entering the *sector marino* to fish (Interview, Dennis). While it is of great concern to the ACG that younger fishers do not support the *sector marino*, the fact that *recibidores* (who hold authority and power in Cuajiniquil) and some older fishers see conservation as a critical part of salvaging

declining fish stocks and thus reducing poverty in Cuajiniquil is very important. As Chapter 3 will address, community supported fishery management (both inside and outside the *sector marino*) is critical to the sustainable future of fishing.

Providing alternatives to fishing is not enough

Poverty and the dependence on marine resources among Cuajiniquil fishers are clearly inhibiting effective conservation in the ACG's *sector marino*. Addressing these barriers by creating real alternatives to fishing is an important step towards achieving the ACG's goal to protect the *sector marino*. Declining fish stocks have resulted in increasing poverty because fishers have little to no employment alternatives.

Consequently, fishers view the *sector marino*'s no-take policy as a serious intrusion on their ability to provide for their families and are resentful and non-compliant. The ACG should actively support alternatives to fishing and work closely with organizations like INA so that community members have the training they need to succeed outside of the fishery. Tourism is a likely alternative candidate because Costa Rica is a hot spot for visitors and Cuajiniquil is opportunely (for tourist purposes) positioned in between marine and terrestrial conservation areas.

However, neither Cuajiniquil nor the ACG can look to tourism (or any other one area) to fully solve its respective problems. Finding employment for 800 fishers from a single, new industry is an impossible task and would simply transfer Cuajiniquil's resource dependency on fishing to an equally seasonal (arrhythmic) tourism. Fishing will, and should, remain an integral part of Cuajiniquil's economy. Adding tourism to fishing (rather than replacing fishing with tourism) would diversify the economy and

reduce Cuajiniquil's dependence on one particular source of income. In order for income diversification to work both in terms of alleviating poverty for fishers and decreasing pressure on the *sector marino* (which of course are inextricably linked), however, fishing in Cuajiniquil cannot continue on its current path. Marine resources around the *Bahía de Cuajiniquil* have diminished substantially over the past several decades and will continue to decline if fishing practices are not regulated. Regulation (or management) involves limiting fish extraction to prevent unprofitable and unsustainable use of marine resources (Hardin 1968). As the following chapter will explain, the institution responsible for managing fisheries in Costa Rica (INCOPECA) is not effectively regulating resource extraction in Cuajiniquil and fishers themselves have not created systems of internal management, hence the declining fish stocks over the last ten years. Imagining strategies for successful fishery management in the *Bahía de Cuajiniquil* is crucial for the future of fishers in Cuajiniquil *and* for the *sector marino*.

Chapter 3

Overfishing in Cuajiniquil: The Void in Marine Resource Management

During my last week in Cuajiniquil, I finally had the chance to talk with Luis Picado, director of INCOPECA's regional office in La Cruz. Luis (or 'Picadito' as fishers call him) has more frequent contact with Cuajiniquil than any other INCOPECA employee and has worked in fishery management there for 33 years. We met down at the *muelle*, the docks where boats have been mooring for increasing spans of time recently due to declining fish stocks. After a friendly introduction, I asked Luis how he thought marine resource abundance in the *Bahía de Cuajiniquil* had changed since he first arrived in the area. As many other fishers described, Luis told me: "Twenty five years ago fishing here was a whole different story. Before if you went out to sea, you'd have a full boat in two or three days. Now people can go out for eight to fifteen days and come back with so little they can't even pay for the gas and food they brought with them" (Interview, Luis Picado). When I asked how INCOPECA has responded to this obvious decline, Luis admits, "To be honest, there has been poor management and no enforcement of our laws. INCOPECA was created with the interests of Puntarenas and the Gulf of Nicoya (larger ports to the south of Cuajiniquil) in mind and has neglected Cuajiniquil" (Interview, Luis Picado).

INCOPECA was founded in 1994 as an extension of the Ministry of Agriculture to manage aquatic resources for all of Costa Rica. As described in Article 1 of INCOPECA's governing laws, its objectives are to:

[Regulate] fishing activity and aquaculture, which includes capture, extraction, processing, transport, commerce and sustainable usage of aquatic species. [Conserve], [protect], and [guarantee] sustainable development of hydrobiological resources via adequate and appropriate methods to assure their permanence for the use of present and future generations (Ley de Pesca y Acuicultura).

Given the current state of fishing in Cuajiniquil, it is clear that INCOPECA has fallen short of its management goals, just as Luis describes.

Theory and practice suggest that fisheries require some form of externally dictated (top-down) or internally agreed upon (bottom-up) regulation on extraction practices to prevent precipitous declines in fish stocks (Hardin 1968; Ostrom 1990). In Cuajiniquil, largely unrestrained fishing practices have resulted in declining fish yields and contributed to increasing poverty among fishers. As long fishers continue to fish without limits in the *Bahía de Cuajiniquil*, they will inevitably keep putting pressure on the ACG *sector marino* to compensate for declining resources in legal waters. The lack of adequate fishery management in the waters adjacent to the ACG must therefore be addressed in conjunction with poverty and resource dependency in order for the ACG to make real strides towards successfully conserving *sector marino* ecosystems.

Managing marine resources is a complicated task in any fishery, especially when the fishing community is a poor, single-livelihood centered town like Cuajiniquil in a developing country like Costa Rica (Wright and Richards 1985; McClanahan *et al.* 1997; McClanahan and Mangi 2001). Top-down management is generally expensive and difficult to enforce (McClanahan 2004) while bottom-up management requires strong community cohesion and the support of larger fishery management structures (Ostrom 1990; Cudney Bueno and Basurto 2005). To understand the particular challenges to fishery management in Cuajiniquil and envision solutions to current fish declines, we

must look at INCOPECSA's (failing) management strategies and the barriers to fisher-derived management. In order for these challenges to be overcome, INCOPECSA, the ACG, and fishers will have to work together to develop and enforce fishery management in Cuajiniquil.

Overfishing: common property resources and the importance of management

Before launching into an examination of fishery management (or lack thereof) in Cuajiniquil, it is useful to briefly explain why overfishing occurs and how management plays a role in mitigating resource decline. A 1997 report by the United Nations Food and Agriculture Organization estimated that 35% of fish stocks worldwide are overfished (Iudicello 1999). Why is this? Garret Hardin's landmark article describing the 'Tragedy of the Commons' outlined the inevitably grim fate of (unmanaged) common property resources, resources that are owned by no one but are available for public use, resources like the ocean (Hardin 1968). Hardin asserted that the rational choices of individuals acting independently of one another collectively result in the decreased wellbeing of everyone involved. According to Hardinesque logic, fishers are motivated to extract as much as possible as quickly as possible because: "When a fishery is open to anyone, there is no assurance that a fish not caught today will be around tomorrow. In fact, it will probably be caught by someone else. So why not catch it yourself?" (Iudicello 1999).

For any given fisher, the above logic motivates him/her to catch fish when they're young, rather than waiting for them to mature or to catch spawning fish rather than waiting for them to lay their eggs. The large-scale impacts of unregulated fishing on individual income and the overall health of a fishery are elegantly illustrated in Figure 12 below. Fishing effort, which can be thought of as the time, energy, and money put into

fishing is shown on the x-axis and fishing yield is shown on the y-axis. What is important to take from this graph is that in an unregulated (open) fishery, total revenue for a given fisher doesn't drop below total costs until well past the level of effort that provides the greatest fish yield (labeled as maximum yield). Therefore, fishers tend to increase their extraction efforts until they are no longer making a profit and are driving fish populations towards collapse. The solution to this 'tragic' fate of fishers and fish stocks as Figure 12 shows, is to regulate fishing activity so that fishing effort is decreased, which in turn increases profits while decreasing total catch.¹³

¹³ It is useful to briefly recall from Chapter 1 that ACG outreach efforts have been much more successful in inland communities than in coastal ones. Inland communities that depend on farming/cattle ranching have an inherently different relationship with the resource they depend on (their land) than fishers do (the ocean) because their farmland is not a common property resource. Therefore, they have inherently different relationships with the terrestrial and marine portions of the ACG.

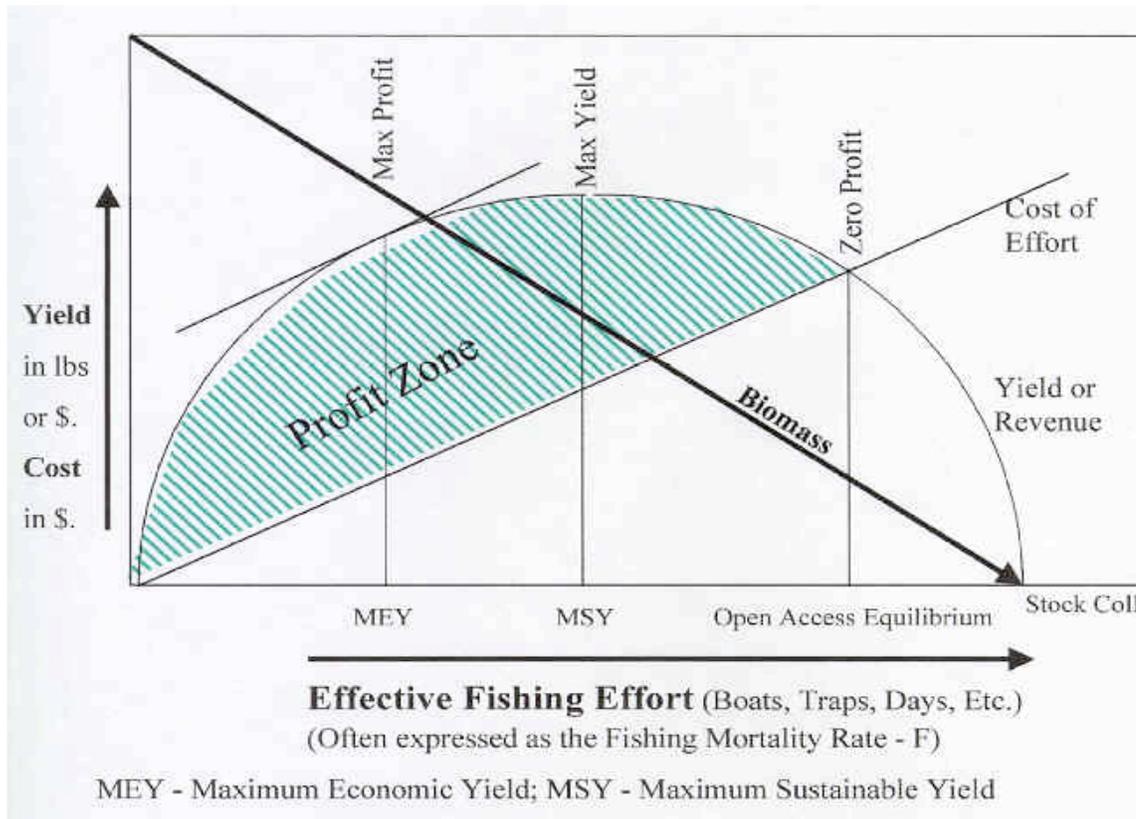


FIGURE 12: The Gordon-Schaeffer Fishery Production Function. In an open-access fishery, fishers will increase their effort (by increasing their fleet size, adding equipment, spending longer at sea, etc.) until their net profits are zero. At this point, effort has exceeded the maximum sustainable yield for a given fishery, and thus fish stocks are driven towards collapse. Maximum profits occur at much lower effort levels.

There have been countless national and international efforts to regulate fisheries in response to declining marine resources in the world's oceans. For the most part, fisheries worldwide are now managed in some capacity, whether by regulating open access (Wilén and Homans 1997) or by controlling access (Sissenwine 1998). On the broadest level, international law now recognizes the rights of coastal countries to control fishing (and other marine-based activity) within 12 miles of their shores. This limits competition between international fishing fleets and in theory, allows for nationally regulated fishing practices. Between the 1960s and 1980s, most countries extended their offshore jurisdiction to 200 miles and in 1982 the United Nations Convention on the Law

of the Sea (UNCLOS) recognized this 200-mile limit as an Exclusive Economic Zone (EEZ) where states can dictate the access of foreign fleets with respect to natural resources, marine science research, and environmental protection (Iudicello 1999).¹⁴ Exclusive Economic Zones are a first step towards limiting fishing access to the world's oceans. However, fisheries within national waters still need to develop strategies to regulate fishing in order to prevent unsustainable and unprofitable extraction. There are myriad approaches fishery management can use to prevent resource decline and a brief overview of these approaches will be useful for contextualizing management approaches in the Cuajiniquil fishery. Management tools can be broken into two distinct categories: (1) *Input controls* limit what can be brought into a fishery and include: limiting the amount or type of fishing gear permitted, restricting technological innovations, limiting the number of fishers by requiring anyone fishing to possess a license (licenses may be renewable, transferable, issued to the vessel, the operator, the crew), or limiting the duration of the fishing season, and (2) *Output controls* limit what can be taken out of a fishery, and include strategies such as imposing landing quotas (quotas on the quantity of fish that can be received at a given dock), catch limits per fishing vessel, restrictions on

¹⁴ Costa Rica has a particularly large EEZ because of their distant *Isla del Coco* (FAO 2004), thus rendering the task of managing national waters more difficult still (Quesada Alpízar 2005).

the size or sex of fish landed, or technical restriction on times and areas fish can be caught.¹⁵

Managing the Cuajiniquil fishery: How INCOPECA is failing

INCOPECA management strategies in Cuajiniquil theoretically include both input and output controls. Fishers are required to buy a license every year, to register their *pangas*, and are prohibited from using gill nets with mesh 3.5 centimeters or smaller (Figure 13). *Recibidores* must have their facilities inspected intermittently (although what for, no one could precisely say), and there are caps on the extraction of aquarium fish species. For the most part, however, these ‘controls’ do not limit fishing in a meaningful way, or do not limit fishing at all. Although fishers pay for a license every year, INCOPECA has not restricted the total number of licenses it sells, and so new fishers continue to enter the *Bahía de Cuajiniquil*, increasing the competition for dwindling resources (Interviews, Picado, Gustavo). One fisher notes that he has seen aquarium fishers bribe INCOPECA authorities to be able to exceed catch limits (Interview, José).

¹⁵ The most celebrated management strategy on a global scale has been the Individual Transfer Quota (ITQ) system. Essentially, the ITQ system grants catch quotas to individual fishers based on an pre-determined annual overall catch limit for the entire fishery and opens up a market where individual quotas can be bought and sold: the quota represents a right to fish and has value so that less successful fishers become sellers and more successful fishers become buyers. Under ITQs, there are generally few fishers who are making more money and so they make be more interested in the future of the fishery and be more interested in proper management (Branch 2009; Iudicello 1999). Under ITQ systems, there are generally fewer fishers who are making more money and so they make be more interested in the future of the fishery and be more interested in proper management (Branch 2009). However, ITQ systems are usually not possible or effective in small-scale fisheries in developing countries (like Cujainiquil) because they require a large amount of input information in terms of knowledge about the fishery and strong top-down management to initially allocate quotas and ensure fishers without permits are not poaching. Furthermore, ITQs are designed to limit extraction of one or several target species, and nearly all small-scale fisheries depend on many species, which disrupts management plans and results in unpredictable ecosystem responses (Copes 1986; Squires *et al.* 1998).

Finally, ACG biologist Maria Marta explains that the mesh size law, which is intended to protect immature fish and ensure only the adults are caught, has actually resulted in the targeting of larger, egg-bearing individuals. “The rules are backwards!” she explains. “INCOPECSA is a tangle of bad laws, too little information, and bad management. It’s sad to see the ignorance of INCOPECSA authorities. I can look up all the information I want in scientific journals and can talk to my colleagues about marine biology, but there needs to be someone who transmits good information to the institutional level. There’s a chasm between science and reality!” (Interview, Chavarría). In the future, the ACG could play an important role in bridging this chasm.



FIGURE 13: Sign posted at the *muelle* advertising INCOPECSA’s rules and prices for obtaining fishing vessel inspection and fishing licenses. The details of business hours and expenses are not important to my analysis; I include this picture because it exemplifies the haphazard/neglected communication between INCOPECSA and Cuajiniquil fishers.

The result of INCOPECSA’s ineffective but persistent presence in Cuajiniquil is that fishers experience all of the negative aspects of management (such as paying for a

license) without receiving the benefits of increased profit or the guarantee of a sustainable resource supply. One fisher explains that: “INCOPECA was made to help fishers, but they’ve actually been a knife in the neck” (Interview, José). This fact, coupled with perceptions that INCOPECA officials are corrupt and do not care about marine resource stability in Cuajiniquil, has led to increasing distrust of management by fishers. This, in turn, decreases the likelihood that fishers might willingly follow management decisions.

Several times a year, INCOPECA sends representatives down to Cuajiniquil for scheduled meetings with the fishing community. Meetings are designed to share information about policies and discuss the future of fishing in the area. They are supposed to be a place for fishers to voice their concerns about management, decreased fish stocks, etc., but real dialogue or negotiation between INCOPECA and fishers is limited. Few fishers regularly attend INCOPECA meetings, and of those only a handful voice requests or offer opinions. From INCOPECA’s perspective, this indicates disinterest and disorganization on the part of fishers and makes it difficult to determine what Cuajiniquil needs/wants: “Everyone has something different to say, and they do not come up with a plan together that we could listen to” (Interview, Picado). Fishers explained to me, however, that they did not attend meetings or offer opinions because INCOPECA is all talk when it comes to implementing real ways to address declining fish stocks. Every meeting, they said, ends in empty promises for a better fishing future. For example, following the recent upswing in aquaculture projects around Costa Rica, INCOPECA proposed the introduction of a tilapia-farming project in Cuajiniquil

(Interviews, Picado, Gustavo). More than a year later, there are still no tilapia (Interviews, Sergio, Esteban).

The fact that fishers view INCOPESCA as ineffective and disinterested in Cuajiniquil's future is detrimental to ACG conservation efforts, not only because it poses a barrier to successful management, but also because many fishers link INCOPESCA with the ACG. Fishers view both organizations as no more than a patrolling presence that fails to give back to the fishing community. The fact that the ACG uses INCOPESCA's parameters to enforce the *sector marino* no-take policy (by confiscating fishing licenses, for example) only adds to the blurring of these lines.

Community derived ideas for preventing resource decline

Although fishers were highly critical of INCOPESCA's management presence in the *Bahía de Cuajiniquil*, most agreed that management of some kind was needed in order to guarantee the viability of fishing in the future. When I asked fishers how to prevent a permanent collapse of fishing in the area, I was met with a brainstorm of ideas for improved management and community involvement. Generally, these ideas can be broken down into three categories:

(1) Impose a *veda* (a seasonal or regional fishing ban), so that a section of the ocean is closed to fishers for part of the year in order to allow fish stocks to replenish. As one fisher points out: "We fish 365 days a year here. All the dorado come here come to lay eggs, and we capture them, we lose all those eggs because they don't have time to reproduce. It's the same with snapper; when we gut them, we see they're full of eggs" (Interview, Sergio). Fishers also suggest that biological data on fish reproduction times

could be used to inform these seasonal bans: “There are species we could maintain by doing biological studies. Biologists know when the fish are reproducing and we could protect certain areas or fish during those times—that’s what marine biologists are for!” (Interview, Gustavo).

(2) *Regulate fishing gear.* Almost every fisher I talked to had an opinion about which fishing practices or combinations of practices were most destructive to marine ecosystems and the future of fish populations. Some think that gill nets have caused the most harm, because not only do they catch anything and everything swimming by, they also tear on rocks and continue to kill fish for years, a phenomenon known as ‘ghost fishing’ (Arnason 1994). Others say that compression diving is the main culprit, as it allows fishers to hunt octopus, lobster, and fish of all sizes.¹⁶ Fishers propose regulating gear on a seasonal or regional basis determined by when and where fish breed and how currents or wind patterns affect gear use. For example, between November and March, fishers report that the winds are too strong to be able to fish with hook and line, and so they rely on gillnets during these months.

(3) *Limit the number of fishers in the area.* Many, many fishers in Cuajiniquil attribute the trend in declining catch to the increased number of fishers in the area. Rolando, who began fishing in the late 1960s at age 12 with his father, notes that in the early days “There were very few vessels and the fishing was too good: it was fabulous. As the fleet grew, the fish decreased. Every year there are more boats and fewer fish” (Interview, Rolando). Fishers suggest that INCOPECA limit the number of fishing

¹⁶ Compression diving uses an air compressor kept in the boat to pump air down long tubes to fishers. Many fishers suffer permanent injury from compression diving: oxygen deprivation or nitrogen buildup results in cognitive/motor disabilities and the inadvertent pumping of exhaust down the tubes can cause lung damage.

licenses it sells in the area or ban fishers from outside the *Bahía de Cuajiniquil* to reduce pressure on fish stocks.

Bottom-up fishery management and the barriers to organization in Cuajiniquil

If Cuajiniquil fishers believe that management is necessary for their future and have so many ideas about ways to more effectively manage marine resources, why have they not come together to internally regulate fishing? There is a great deal of literature suggesting that bottom-up management systems, where resource users themselves develop strategies to regulate their own resource use, can be highly effective in combating unsustainable exploitation of common property resources (Ostrom, 1990). Bottom-up management has been shown to be especially important in small fisheries in developing nations where governments do not have the means to effectively regulate resource extraction—fisheries like Cuajiniquil (McClanahan *et al.* 1997). Political Scientist Elinor Ostrom offers a useful picture of how bottom-up management can work in the small fishing town of Alanya, Turkey.

There are about 100 fishers in Alanya who operate small boats and use various types of nets to fish. The 1970s were the ‘dark ages’ for Alanya: fish stocks were threatened by unrestrained fishing and competition between fishers for diminishing resources was leading to internal hostility and violence. Seeing that fishers were quickly driving their own future into the ground, members of a local cooperative began experimenting with a system that allocated fishing sites among fishers. After nearly a decade of trial and error, the cooperative perfected a system that worked as follows: all usable fishing locations in the vicinity were named and listed (taking into account how

nets might block fish availability in adjacent sites), and every year a list was compiled with of all licensed fishers in the area. Fishers were assigned fishing sites by lottery, and each day fishers rotated to a new location. As a result, all fishers were granted equal access to the best fishing sites and did not have to waste resources searching for, or fighting over, fishing ground. Enforcement of this system (e.g. preventing ‘cheating’ of fishers entering the best sites out of turn) was performed by fishers themselves as a by-product of the incentive created by rotating access to sites. Fish stocks appeared to stabilize subsequent to the implementation of this system of rotation, thus ensuring the future of fishing in Alanya.

If Alanya could do it, why can’t Cuajiniquil? As I probed into the history of fisher-directed regulation of marine resources in Cuajiniquil, I was told over and over by fishers and non-fishers alike that fishers are very individualistic and therefore have been unable to form successful organizations within the community (Interviews, Sergio, Freddy, Gustavo, Alán). Many fishers cite the flexible/unstable job and pay schedule as posing practical barriers to successful organization. One Cuajiniquil resident described this phenomenon clearly: “The fishers’ work style has resulted in independence. A group of farmers can say: ‘we’ll meet Friday at 5:00 pm’ and at 4:30 drop their tools and go to the meeting. Fishers, on the other hand, may agree on Tuesday to meet on Friday at 5:00 pm, but then they couldn’t go out to sea for the rest of the week because people go to sea for five or six days at a time” (Interview, Alán). Furthermore, because out at sea “each person depends on their own skill, intelligence and astuteness; fishers are independent by nature” (Interview, Alán).

As Alanya's success is tribute to, the barriers to community organization and internal management in Cuajiniquil stem from more complicated roots than the 'individualistic' lifestyle of fishers. The receiver system, for example, plays a role in preventing organization because it supports fisher dependence on one businessman and does not require that fishers work together. Jorge, a *recibidor* himself, explained that although it would do him no good, fishers in Cuajiniquil could make more money if they sold their catch directly to restaurants and took responsibility for their own finances. This would require that fishers combine efforts and invest in exportation themselves. Conan, an entrepreneurial fisherman who is constantly looking for ways to improve the lot of Cuajiniquil fishers, expressed his frustration at the unwillingness of his peers to do just that. "I've told people and over and over," he explains, "that we should buy a truck together and take turns driving our own catch to San José [the capital] instead of selling to the *recibidores*" (Interview, Conan).

The division between fishers of Costa Rican and Nicaraguan descent (described in Chapter 2) poses another barrier to internal management. "For every one *tico* (Costa Rican) here there are five *nicas* (Nicaraguans)," Antony told me, "and that's what killed everything here. We [ticos] used to only kill the big fish. But the nicas take even the smallest of everything! They turn over every stone to get lobster, they even use ropes tied to motors to move rocks; there are no more lobster now" (Interview, Antony). The ACG section ranger, Simón, extends the criticism of Nicaraguans to include illegal entry into the *sector marino*: "native people from this town [Cuajiniquil] are those who disturb the park the least. The problem is with the Nicaraguans living in Cuajiniquil; those people are a problem. They come fish here [in the *sector marino*] any way they can" (Interview,

Simón). If fishers are convinced their coworkers are cheating the system and entering the *sector marino* boundaries, they will cheat the system as well, or risk losing out.

Therefore the lack of trust and the cultural division in Cuajiniquil is posing a barrier to top-down management as well as preventing internal management (Wright and Richards 1985; McClanahan *et al.* 1997; McClanahan and Mangi 2001; Ostrom 1990).

The preceding overview of the barriers to fisher organization is useful in that it outlines the internal hurdles Cuajiniquil must overcome as a community. I want to focus now, however, on a fisher organization from the 1990s that has been all but forgotten by Cuajiniquil to offer a slightly different perspective on the challenges faced by locals attempting to unite.

ASOPESCA: state-imposed barriers to a local fishing association

The Association of Fishers, or ASOPESCA, was created in the mid 1990s by residents from Cuajiniquil and the neighboring coastal towns El Jobo and Puerto Soley. The purpose of ASOPESCA was to form a group of fishers who could collectively run the *muelle*, the docks built by the government in the 1980s for the people of Cuajiniquil. Essentially, running the *muelle* would involve cooperatively overseeing the operations of the fish processing plant, which would in turn give fishers a much more prominent role in their own fishery because it bypassed the receiver system.¹⁷ As described by two of its

¹⁷ When the *muelle* was originally built, it was entrusted to the National Institute of Pacific Ports (INCOP). For some years, INCOP allowed the shrimp company TALMANA to run its operations through the processing plant at the *muelle*. Eventually INCOP offered to turn over the facilities to the Association for Development in Cuajiniquil. Feeling that they were unprepared to run the *muelle*, the Development Association turned down the offer and the *muelle* was subsequently turned over to the local municipality of *La Cruz*. Upon vacating the *muelle*, TALMANA illegally removed a great deal of equipment, leaving the processing plant sorely lacking in infrastructure (Interviews, Jaime Lara, José Lara, Marco Lara).

founding members, ASOPESCA was met with obstacles every step of the way (Interviews, Jaime Lara, José Lara,). Initially, the municipality of La Cruz, who had jurisdiction over the *muelle* at the time, told ASOPESCA that it would have to compete with three other outside organizations interested in the fish processing plant. José Lara, a founding member, told me with frustration: “We were the ones from the zone, we had letters of support from all the surrounding towns!” (Interview, José Lara). The mayor at that time was reluctant to sign off on ASOPESCA’s proposal to take control of the *muelle* and tried to thwart their plans by announcing late one evening that his signature must be acquired by 7:00 the next morning in order to secure the *muelle*. “We woke up and drove up to La Cruz at 2:00 a.m. when we heard we needed the signature right away. But we finally got it!” (Interview, José Lara).

After securing control of the *muelle*, ASOPESCA drew up a plan for developing and running the plant with help from a rural development program in Liberia, a small city 100 km north of Cuajiniquil (Interviews, Jaime Lara, José Lara). “It was all official and everything,” José told me, “but we didn’t have any money. We went to institutions asking for support, and while everyone congratulated us on the project, no one gave us any funds. So we raised money by raffles and events in town, and we even wanted to send Jaime [another member] to the U.S. to look for funding” (Interview, José Lara). Serendipitously, around this time an ex-administrator from the shrimp company previously in charge of the *muelle* saw that ASOPESCA was ready for business and said he’d help find funds. “We got lots of new equipment and all the licenses,” José told me. “It was beautiful, a model for the rest of Central America. We had everything ready for processing right here, fish didn’t have to be sent to the capital. We even had a few

exportations and it was very successful” (Interview, José Lara). In 1996, ASOPESCA made the first step towards community-based regulation, proposing to create annually rotating exclusion zones and to eliminate gill nets and diving with compressors (Interview, José Lara).

ASOPESCA’s success, however, was short lived. The fish exportation company they had been partnering with (*Todo Mar*) tried to take over the *muelle*, resulting in a two-year halt on operations. Unable to work off their loans for the initial investment in equipment, ASOPESCA found itself in increasing debt. To make financial matters worse, an external administrator brought in specifically to provide support in accounting allegedly funneled money out of the association (Interview, Chavarría). Eventually, the municipality of La Cruz repossessed the *muelle*: “Instead of helping us,” José explained, “the municipality kicked us out” (Interview, José Lara). The processing plant was subsequently granted to one of the receivers who began charging *lanchas* for docking. Gradually the facility deteriorated and just last year the municipality sent workers to strip the remaining equipment within (Figures 14, 15, 16, 17).¹⁸ “This happens to all of the goods of the state,” José told me resignedly, “the mayors here aren’t interested in fishers because we’re poor. They’re interested in people with money” (Interview, José Lara).

¹⁸ When I visited the municipal offices in search of official documentation of changes in jurisdiction over the *muelle* since its completion in 1982, I was met with a void of information. The lawyer who I was told could help was out for the day, and various e-mails to municipality employees since have yielded no results. I can only conclude that there is very little (readily available) documentation of Cuajiniquil-related politics or that the municipality is hesitant to provide this documentation.



FIGURE 14: “Fishing Prohibited” painted on the gate to the *muelle* in Cuajiniquil, a dock that was intended to serve the local fishing community.



FIGURE 15: External view of the *muelle* infrastructure, January 2011. The *muelle* was once a working fish processing plant, but now is essentially an empty shell unused by the fishing community.



FIGURE 16: Internal view of the *muelle* infrastructure, January 2011. All useful equipment has been removed, leaving a tangle of scraps that once comprised the fish processing plant.



FIGURE 17: Internal view of the *muelle* infrastructure, January 2011. Notice the outlines for tools long gone on the walls, the disconnected pipes, and the rubble on the floor.

Building cooperative management

Currently, the waters outside of the ACG *sector marino* are not properly managed by INCOPECA from the top nor by the community from the bottom. INCOPECA requires that fishers purchase licenses and imposes other (largely meaningless) restrictions on fishing gear, but has not successfully stabilized resource decline in order to ensure sustainable fish stocks in the future. As a result, Cuajiniquil fishers experience the negative aspects of management without any of the promised benefits and are skeptical of INCOPECA's motives. Furthermore, fishers think there is no hope for internal

organization or management because fishers are individualistic and divided. There are indeed many, many barriers to a cohesive community in Cuajiniquil, however, ASOPESCA shows that there was a point when a fishing association did work in Cuajiniquil. The demise of ASEOPESCA was largely related to external obstacles, rather than internal disorder.

The way to address the failure of both top-down and bottom-up management in Cuajiniquil is to incorporate both strategies, to co-manage the fishery with the support and input of the ACG (Ban *et al.* 2009; Guidetti and Claudet 2009). Co-management brings together local and ‘scientific’ knowledge and is both self-enforcing and externally enforceable. In the long-run, cooperation between fishers, INCOPESCA management, and ACG scientists is more likely to result in sustainable resource use than the efforts of any one group alone (Cudney-Bueno and Basurto 2009; Gutiérrez 2011). Given fishers’ current skepticism of INCOPESCA, the ACG, and their own ability to organize, the co-management initiative in Cuajiniquil must be catalyzed by INCOPESCA and the ACG. Together, these institutions can begin to determine an improved scientific basis for management (what gear should be used, how many licenses can be given out etc.). As INCOPESCA and the ACG work to improve the theoretical success of regulatory measures, they must actively seek out and encourage fisher input. Furthermore, as any fishing regulations put in place in Cuajiniquil will only work if fishers *collectively* buy into the importance of these regulations, INCOPESCA and the ACG must support fishers in overcoming the internal divisions that have inhibited collective action in the past.

Conclusion

In 1987, a conservation area was born in northwestern Costa Rica that reimagined the police-enforcement tactics and isolationist mentality of the traditional national park system (Janzen, 2010). The ACG recognized that conservation cannot operate in isolation from adjacent communities (Ban *et al.* 2009; Charles and Wilson 2009) and so they went about developing education outreach programs for their neighbors and employing locals as park rangers, secretaries, parataxonomists, etc. By involving local towns in the conservation process, the ACG hoped to achieve its goals of ecosystem protection by fostering compliance and support. One of those towns was Cuajiniquil, a fishing community of 1,500 that lies just north of the marine portion of the ACG. From the beginning, the ACG hired Cuajiniquil residents to work as park rangers in the *sector marino* and brought in biologists to educate fishers and their children about the myriad benefits of conserving marine ecosystems. More than twenty years after the ACG's creation, however, the Cuajiniquil community remains resentful of, and resistant to, the no-take policy of the *sector marino*.

Interview by interview, voice by voice, this thesis has worked to bring together the many facets of Cuajiniquil's history in order to explain why the ACG's outreach efforts are not enough to protect the *sector marino*. Fishers are poor, and growing poorer every day as marine resources dwindle in the *Bahía de Cuajiniquil*. The rapid transition from an hacienda economy to fishing has left Cuajiniquil with few employment alternatives. Poverty and resource dependency among fishers mean that the long-term economic incentives of spillover (understood by most fishers thanks to ACG education programs) are not enough to change present fishing behavior. Fishers need preparation

for, and access to, employment alternatives outside the fishery if pressure on *sector marino* resources is to be lessened (Marshall *et al.* 2010; Newton *et al.* 2007). It is crucial that while creating alternatives to fishing, the future of the Cuajiniquil fishery is not neglected. Fishing can continue to play a vital role in the Cuajiniquil economy, and fishing resources must be successfully managed if current trends in fish stock decline are to be reversed. Managing the fishery outside the *sector marino* is central to the success of conservation efforts in the long run because unregulated waters will inevitably result in unsustainable extraction practices (Hardin 1968; Iudicillo 1999), which will in turn draw fishers into protected waters.

The ACG cannot tackle the barriers to successful marine conservation alone. From a budgetary perspective, the ACG is already stretched thin and is constantly struggling to raise the money to support biological education programs and maintain hiring practices that are not funded by the state. Expanding ACG programs directly would dilute quality and reduce impact. As ACG biologist Maria Marta told me: “If a farmer has a lot of pigs, they will always be skinny” (Interview, Chavarría). From a leadership perspective, the ACG does not have the infrastructure or jurisdiction to single-handedly take on the poverty, income diversification, and fishery management angles of non-compliance in the *sector marino*.

Instead, the ACG must collaborate with the other institutions already working in Cuajiniquil to promote development and manage the marine resources outside the *sector marino*. Co-management of the Cuajiniquil fishery (by INCOPESCA, the ACG, and Cuajiniquil fishers) is a critical piece of the broad reaching partnerships needed to address societal and environmental barriers to ACG conservation efforts. By working

together, INCOPECA, the ACG, and fishers can create effective and enforceable extraction regulations that will stabilize declining fish stocks and ensure the future of fishing in Cuajiniquil. This, in turn, will decrease fishing pressure on the *sector marino* and allow the ACG's educational programs to have real impacts on behavior.

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A particularly amazing part of the interview process was seeing how my questions about fishing and conservation in Cuajiniquil sparked real conversations between community members. Groups of men and women formed around the small voice recorder I held while I conducted interviews. Fishers discussed amongst themselves the effectiveness of INCOPECA, debated how long it would take fish protected in the *sector marino* to spill out into legal fishing grounds, and weighed in on how gear should or should not be limited to protect fish stocks. These are the conversations that are needed if the Cuajiniquil community is to develop a collective voice that will allow for the much needed negotiations between fishers, the ACG, and INCOPECA.

I hope my thesis, both as a process that began to stimulate thought and discussion and as a final product, will contribute to imagining successful conservation in a beautiful corner of the ocean and a more sustainable future for Cuajiniquil fishers. However, I know that the stories I have recorded and the knowledge I have compiled belong to the people of Cuajiniquil. They are the ones who must carry on the dialogue.

¡Ya está bien grabado!
(Ántony, 11 January 2011)

Appendix 1: Standard questions asked during my interviews with Cuajiniquil fishers.

- How long have you lived in Cuajiniquil?
- Do you or your family members fish? When did you start fishing?
- Do you have any other sources of income?
- Do you have your own *panga* or *lancha*?
- What species of fish do you usually catch? What gear do you use (gillnets, hook and line, spear guns)?
- How have you seen fishing change over the years? Has your income diminished as result of these changes?
- Why do you think your catch has changed?
- Do you think you'll be able to fish here for the rest of your life?
- Is there a way to manage marine resources to ensure that there will be a future for fishing in Cuajiniquil?
- How would you manage marine resources if you could?
- What alternative employment do you think is possible for Cuajiniquil?
- How has the ACG *sector marino* impacted your fishing practices and extraction capability?
- Why do you think the *sector marino* was created?
- Do you think it's important to protect marine resources? Why or why not? (How might protection benefit fishermen?)
- What attempts have been made by the ACG, INCOPECA, or INA to provide employment alternatives for Cuajiniquil?
- Have you been a member of any community/fisher organization?
- What do you think about the effectiveness of organizations in Cuajiniquil?
- Have you or your fellow fishers communicated directly with the ACG or INCOPECA about fishing?

**Appendix 2: Common species contributing to fishers' catch in
Cuajiniquil separated by gear type**

Common name	Scientific name	Common Capture Gear Common capture gear
Pacific Red Snapper	<i>Lutjanus peru</i>	Hook and line, gill-net
Spotted Rose Snapper	<i>Lutjanus guttatus</i>	Hook and line, gill-net
Pacific chub mackerel	<i>Epinephelus labriformis</i>	hook and line, gill net
Flag Cabrilla	<i>Epinephelus acanthistius</i>	gill net
Red Cabrilla	<i>Scarus rubroviolaceus</i>	gill-net
Cortez Rainbow Wrasse	<i>Thalassoma lucasanum</i>	hand-net
King Angelfish	<i>Holacanthus passer</i>	hand-net
Cortez Angel fish	<i>Pomacanthus zonipectus</i>	hand-net
Guineafowl pufferfish	<i>Arathron meliagrus</i>	hand-net
Longnose hawkfish	<i>Oxycirrhites typus</i>	hand-net
Bicolor parrotfish	<i>Cetoscarus</i>	speargun
Octopus	<i>Octopus</i> sp.	<i>bichero</i> (hooked pole)
Pacific Spiny Lobster	<i>Panulirus</i> sp.	<i>bichero</i> (hooked pole)

Appendix 3: Registered license statistics for the town of Cuajiniquil

(The letter I received from Luis Picado, director of the La Cruz branch of INCOPESCA, after my request for records of licenses granted to fishers in Cuajiniquil over the last ten years. I include this because it epitomizes the clear disorganization of INCOPESCA's data: there are numerous words with omitted letters and the total fishing licenses for Cuajiniquil is added incorrectly. Furthermore, it is unclear what the year-by-year license data actually represents (new number of licenses or total number of licenses.)



Dirección Regional Guanacaste
Oficina Subregional La Cruz

La Cruz, 17 Febrero 2011.
OAC-02-020-11.

Señorita:
Clara Rowe

Estimada señorita:

Por este medio me permito informarle respecto a los Carnet de pescador Comercial y Turísticos por año en la zona de La Cruz:

INCREMENTO DE CARNE COMERCIALES POR AÑO:

AÑO	No. CARNE COMERCIAL	AÑO	No. CARNE COMERCIAL	AÑO	CARNE TURISTICO
2000	38	200	158	2008	8
2001	19	2011	397	2009	2
	12	TOTAL	8012	2010	7
2002				2011	7
2003	6			TOTAL	24
2004	7				
2005	11				
2006	56	Total de embarcaciones	Pesca Comercial	Pesca turística/ Deportiva	
2007	20		180 (2011)	4 (2011)	
2008	36				
2009	52				

De usted, atentamente,

Luis Ángel Picado Vega
Jefe, Oficina Subregional La Cruz
INCOPESCA.

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- Clínica de la Cruz: unofficial compilation of 2010 population statistics for La Cruz.
- INCOPESCA, statistics on fish licenses and registered vessels in Cuajiniquil sent to me via e-mail (see Appendix 3).
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Personal Interviews

*Interviewees who wished to remain anonymous are listed by pseudonym

**Interviewees used in my analysis but not directly quoted (listed by pseudonym)

Alán, Manuel, 4 January 2011—former *recibidor* & current hotel owner

Ántony,* 11 January 2011— former fisher and current employee for a small fisher farming project

Bella,**10 January 2011—farmer &small business owner

Benjamín,* multiple interview dates—takes sport fishers out in his *panga*

Beto,** 11 January 2011—fisher

Carla,* 20 July 2010—wife of fisher

Centeno, Miguel, 7 January 2011—retired school teacher

Chavarría, Maria Marta, 26 July 2010 & 10 January 2011—ACG biologist & bio-educator

Conan,* 26 July 2010 & 7 January 2011—fisher

Danilo,* 6 January 2011—fisher

Dennis,* 10 January 2011—fisher

Federico,** 3 January 2011—fisher

Fernando,* 21 July 2010—former fisher and current employee for a small fisher farming project

Gustavo,* 3 January 2011—fisher & farmer

Hugo,** 20 July 2010—ACG park ranger (terrestrial sector)

Irma,* 4 January 2011*—wife of former fisher and current administrator of a cattle ranch

Jenny,** 3 January 2011—sister of fishers

Jarol,* 12 January 2011—fisher

Janzen, Danilo, 8 January 2011—ACG biologist and conservationist

José,*11 January 2011—fisher & occasional guide for marine-based tourism

Josefina*, 4 January 2011—mother of fishers

Natanel,** 5 January 2011—retired fisher

Larry,* 5 January 2011—restaurant owner

Picado, Luis, 7 January 2011—director of INCOPESCA for the La Cruz region

Ricardo,* 25 July 2010—fisher

Marco,* 27 July 2011—operates a SCUBA diving/snorkeling business

Jorge,* 6 January 2011—*recibidor*

Esteban,* 6 January 2011—fisher

Mario,** 21 July 2010—ACG park ranger (terrestrial sector)

Oscar,** 5 January 2011— administrator for the Asociación de Desarrollo

Paúl,** 5 January 2011—fisher & farmer

Rolando,** 5 January 2011—former fisher and current farmer

Simón,* 24 July 2010—former fisher and current ACG park ranger (marine sector)

Santiago*, 13 January 2011—fisher

Sergio,* 6 January 2011—fisher