

**NARRATIVES OF ENVIRONMENTAL CHANGE:
MANGROVES, SHRIMP FARMING, AND ARTISANAL FISHING
COMMUNITIES IN ECUADOR**

by

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ABSTRACT

In recent years, many developing nations have reaped an economic windfall from the growth of shrimp aquaculture. Increasing demand for specialty seafood in the industrialized world, as well as a drive to diversify export commodities, has led to extensive construction of shrimp ponds in tropical areas, largely at the expense of coastal mangrove forests. Since the 1980s, Ecuador has become one of the world's leading shrimp exporters, exacting a high toll on the environment and transforming the economic basis of many coastal communities.

Ecuadorian shrimp farmers dismiss their critics by asserting that the shrimp industry has generated dynamic economic growth and employment opportunities for thousands of people. However, this paper will argue that transformation of mangrove estuaries brought on by the development of the shrimp industry has had uneven socioeconomic consequences. Specifically, traditional fishing communities have borne the greatest hardship from this rapid transformation, but simultaneously have found few sources of alternate employment in shrimp aquaculture.

This study will focus on the estuaries of El Morro and Data de Posorja in southern Guayas province, which were dominated by small-scale economic activities such as artisanal fishing until the advent of shrimp farming. More than simply a conflict of social groups over a natural resource, this is also a story of clashing narratives. While many view the development of shrimp aquaculture as a story of progress and modernization, traditional fishermen see it as a story of betrayal and decline. The kind of story that prevails will have implications for future management of mangrove estuaries.

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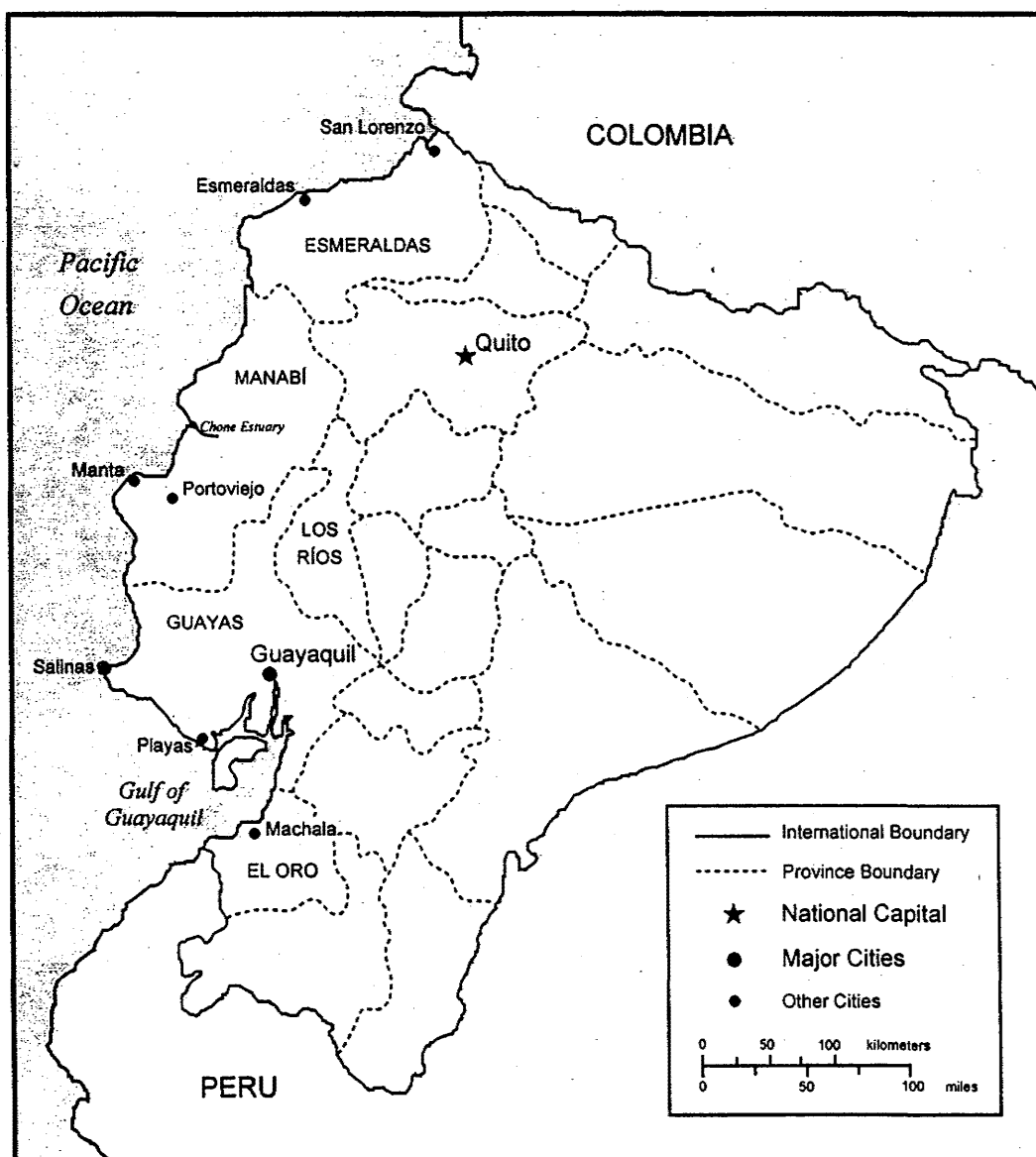
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CHAPTER I: INTRODUCTION

In recent years, many nations throughout tropical regions of Latin America and Asia have reaped an economic windfall from the growth of shrimp aquaculture, the cultivation of shrimp in ponds. Increasing demand for specialty seafood in industrialized nations and a drive to diversify export commodities in developing countries have led to extensive construction of large shrimp ponds in many tropical coastal areas. The development of shrimp farming has come at a high environmental and social price: deforestation of mangroves, decline in wild fisheries, salinization of agricultural land, pollution of coastal estuaries, introduction of exotic shrimp species and diseases, dislocation of small-scale fishing communities, privatization of communal resources, and spread of violent conflicts between resource users (Primavera 1997). This thesis examines the consequences of the rise of shrimp farming in the South American country of Ecuador (**Figure 1**).

Since the early 1980s, Ecuador has become one of the world's leading shrimp exporters, and in the process aquaculture has exacted a high toll on the environment and transformed the economic basis of many coastal communities. Ecuadorian shrimp farmers dismiss their detractors by asserting that the shrimp industry has generated dynamic economic growth, foreign exchange, and employment opportunities for thousands of people. They further argue that shrimp aquaculture turns previously unproductive coastal wetlands into a site for sustainable industry based on renewable resources. However, my thesis contends that the transformation of mangrove estuaries engendered by the development of the shrimp industry has had socioeconomic and ecological consequences borne unevenly by different social groups. These groups also have distinct *perceptions* of these changes, articulated in

Figure 1. Map of Ecuador, with coastal provinces indicated.



divergent narratives of socio-environmental change. In particular, traditional fishing communities along the coast of southern Ecuador have suffered the consequences of this rapid socio-environmental transformation more than any other social group in the region, but have attained very little alternate employment in the aquaculture sector. Conversely, those social groups that have realized the greatest economic benefits from the growth of the industry, such as shrimp farmers and exporters, have sustained few direct ecological impacts.

This study will focus on the estuaries of El Morro and Data de Posorja in southern Guayas province, which were dominated by small-scale economic activities, especially artisanal fishing, until the advent of shrimp farming. Using a political ecology approach, I argue that environmental degradation and social dislocation are related processes, located in a complex web of causes, including poor administration of state-owned resources, the breakdown of communal property management, and structural inequalities that are only exacerbated by this new industry. Furthermore, this is an analysis of not just material conflict among social groups or economic sectors over control of natural resources, but also a discursive conflict articulated by clashing narratives of socioenvironmental change. While many Ecuadorians view the development of shrimp aquaculture as a tale of progress and modernization, traditional fishermen voice a story of betrayal and decline. The kind of story that prevails has implications for future management of coastal resources, especially mangrove estuaries, and the prospects for social change.

In the remainder of this introductory chapter, I will review literature relevant to my research, discuss research methods, and offer a profile of the study site and a brief history of shrimp farming in Ecuador. In the second chapter, I will detail the impacts of shrimp farming on artisanal fishing communities in southern Guayas province. In the third chapter, I depart

from a conventional, materialist analysis of the conflicts engendered by the expansion of shrimp farming to examine the clashing perceptions of different social groups implicated in these resource conflicts. In the conclusion, I will briefly summarize the successes and failures of conservation and management programs in this zone, and suggest future avenues of research for this contentious and ongoing environmental conflict.

Literature Review

This thesis will integrate a broad literature from across many fields in the humanities and social and natural sciences in order to better appreciate the dynamics of environmental and social change brought on by the rapid growth of shrimp aquaculture in Ecuador. I utilize both applied studies and theoretical works. For the purposes of this review, I have divided the relevant literature into four broad categories: (1) political ecology; (2) perceptions of environmental change and conservation; (3) environmental history; and (4) social and environmental impacts of shrimp farming.

Political Ecology

As a growing field, political ecology perhaps has not yet developed into a coherent body of theory, but it is unified by some common themes. First and foremost, political ecology recognizes a dynamic, dialectic relationship between political economy and ecology. Political economy influences environmental change at regional, national, and international levels. Conservation or development programs, whether sponsored by states or non-governmental organizations (NGOs), result from a struggle of competing groups of actors in the decision-making process, so that what is "best for the environment" is never self-evident.

Different groups of actors have varied perceptions of the causes and extent of ecological degradation, as well as different ways of valuing the environment.

Blaikie (1994) neatly outlines several themes central to political ecology, several of which I utilize as strategies for elucidating the complexities of social and environmental change produced by the shrimp aquaculture industry in Ecuador. First, Blaikie stresses the increased importance to political ecology of understanding the local historical context of such change. Although the historical arc of this thesis extends back no further than the 1960s, conceptions of the past constructed by distinct social groups continue to resonate in political struggles and resource management decisions today. Second, social-environmental interactions must be addressed at different spatial scales. Despite the potential for confusion in engaging ever-escalating levels of complexity, the story of changes generated by shrimp farming must be understood in terms of international markets, national policies, local practices, and individual actions and perceptions.

Third, as Blaikie says, "the state must be central to political ecology" (1994: 9). This is pertinent in the case presented here because the Ecuadorian state is deeply implicated in the development and control of the shrimp industry. However, it is also crucial to recognize the heterogeneous nature of the state, dissonance between policy formation and implementation, and the presence of non-governmental or parastatal institutions that may take on state-like roles, especially in the area of conservation policy (Black 1990; Bryant 1992; Sundberg 1998; Zimmerer 1993). At times, the Ecuadorian government has offered economic incentives to development; in other instances, some state agencies have tried to put the brakes on rampant growth. Many institutions within and outside the government have played a crucial role in attempts to conserve mangrove forests. Above all, regardless of adjustments in official policy,

the state has been consistently ineffective, viewed with deep suspicion by almost all parties involved, and has generally failed in its primary role of balancing the claims of conflicting social groups in a just and transparent manner.

Finally, “contestation and conflict over the environment is another central element of political ecology” (Blaikie 1994: 9). In exploring conflicts over access to land or other resources, works of political ecology are often partial to socially disadvantaged groups struggling to protect their livelihoods (Bryant 1992). These conflicts are not only material in nature but also ideological. Shrimp farmers, traditional fishermen, the state, conservationists, and other stakeholders are presently locked in conflict over the best use of coastal estuaries in Ecuador, and each group has particular and sometimes irreconcilable perspectives on the natural environment and the other social actors involved. These distinctions are interesting in their own right, but even more crucial are the processes that turn perception into decision and action.

The theoretical framework for this paper is informed by other important conceptual work in political ecology. Blaikie and Brookfield’s *Land Degradation and Society* (1987) laid the groundwork for political ecology, and its concerns are still relevant. Later works, such as Bryant (1992) and Peet and Watts (1996), while identifying *Land Degradation and Society* as a “key text,” highlight some drawbacks of the approach and suggest new paths of inquiry. Bryant points out political ecology’s tendency towards economic reductionism and its theoretical fuzziness (Bryant 1992). Peet and Watts take political ecology to task for its avoidance of politics and a plurality of causal explanations that comes “perilously close to voluntarism” (Peet & Watts 1996: 8). Political ecology, in their view, generally fails to identify “strategic factors which have causal power,” offering instead an overly-inclusive “chain of

explanation" (Peet & Watts 1996: 8). Even overtly politicized works occasionally challenge commonly held chains of cause and effect by proposing complex "webs of causality" and discursive and non-discursive "nexus of production relations" (Blaikie 1994; Vandermeer & Perfecto 1995; Yapa 1996).

The all-encompassing nature of political ecology is a kind of double-edged sword. The approach links together many causal factors to create a more rounded picture of the causes of and responses to environmental degradation, but often fails to identify the most crucial factors that may provide a basis for action. In addressing the case of Ecuadorian shrimp farming, I will give different causal factors their due and explore a diversity of points of view of actors involved. Yet I will single out particular groups of people that are most responsible for the social and environmental transformations on the coast of Ecuador and have the most power to effect change.

Some empirical works of political ecology serve as models for my study. Zimmerer's (1996) work in Andean peasant communities links a Western appreciation of biodiversity to the importance of plant varieties in the lifestyle of the small-scale farmer. Stonich's (1993) work on poverty and environmental degradation in southern Honduras traces the historical development of these problems while taking a strong political stance, highlighting peasant awareness of environmental degradation and "strategies of survival" that incorporate this knowledge. This book is especially relevant because it explores the influence of Honduran shrimp farming on the mangrove ecosystem and subsistence livelihoods that depend on it. Sebastiani, et al. (1994), although not a self-declared work of political ecology, nonetheless acts as an important model for this project. Their study explores the highly contested nature of a conflict over mangrove resource use in Venezuela involving diverse groups of actors

(subsistence fisherfolk, shrimp farmers, conservationists, and state officials). The study finds that even economically marginal groups are able to influence policy through coalition-building and engagement with a relatively open and participatory decision-making process (Sebastiani, et al. 1994).

Environmental perception and local attitudes towards conservation

Although it may be considered a subset of political ecology, a burgeoning literature on environmental perception and local attitudes towards conservation is treated separately here because of its relevance to this project. Study of environmental perception has a long tradition in human geography, but these works are often highly speculative and focused principally upon the individual (Saarinen, Seamon, & Sell 1984; Tuan 1974). On the other hand, political ecology typically portrays decision-making by individuals, usually "land managers," as rational but constrained by structural economic and political inequities. A growing school of thought, exemplified by Zimmerer (1993), Schmink and Wood (1987), Sundberg (1998), and Arizpe, Paz, and Velázquez (1996), attempts to analyze the discourses of environmental change and individual perceptions at the local level. Zimmerer (1993) explores contrasting perceptions of soil erosion in Bolivia. In this analysis, "Discourses on the causes of erosion are seen here not as mere reflections of experience, culture, and development history in the region, but instead are recognized as constitutive of past and present power relations" (315). One possible dilemma of research in perceptions is that ideas are as diverse as people, but Zimmerer overcomes this to a large extent by finding characteristic themes in the ideologies of particular social groups. He also discovers variation within groups (such as

older versus younger peasants), and a borrowing of views and accommodation of differences among groups (Zimmerer 1993).

Arizpe, Paz, and Velázquez (1996) explore the “human dimensions of global change” at its most elemental level, in the voices of persons implicated in the deforestation of the Lacandona Rain Forest in Mexico, such as peasant farmers, cattle ranchers, and government officials. Individual perceptions are shaped by interactions with other members of particular social groups and informed by larger discourses on socioeconomic conditions that predate the deforestation problem. “Previously defined semantic boundaries” between social groups define perceptions of deforestation (Arizpe, Paz, & Velázquez 1996, 93). Sundberg (1998), working in the nearby Maya Biosphere Reserve in Guatemala, argues that the perceptions of local people are not merely shaped by larger discourses or separated by all-encompassing semantic boundaries; rather, locals may employ terminology that borrows freely from dominant or privileged discourses, especially the rhetoric of scientific conservation espoused by NGOs in the area, in order to further their interests or disarm the authority of groups perceived as outsiders (Sundberg 1998).

This thesis will draw elements from all of these studies. First of all, while I emphasize the ways that *individuals* in the study area perceive themselves, other actors, and the local environment, I also identify distinctions between *social groups* in the manner that characteristic narratives of socioenvironmental change are generated. Second, I try to conceptualize a recursive mechanism to explain the relationship between individual and group narratives, and how this perceptual framework influences environmental decision-making. Finally, I will explore the ways different groups employ ideas borrowed from larger, “privileged” discourses to justify their behavior.

Environmental history

My thesis also utilizes concepts developed in the field of environmental history. The growing fields of political ecology and environmental history share few institutional or disciplinary roots. The former has its origins in a diverse set of works across a variety of disciplines, including geography, cultural ecology, anthropology, and ecology. The latter is more clearly identified with the humanities tradition in history. However, like political ecology, environmental history embraces the complexity of natural and social forces and the recursive relationship between those forces, recognizes the political and economic forces of environmental change; and seeks to recover lost voices, shrouded either by the passage of time or oppressive social structures. Donald Worster (1988) identifies three major areas of concern to the environmental historian: first, understanding natural processes over time; second, the interaction of social, economic, and cultural forces with nature; and third, differing perceptions and interpretations of the natural environment. My thesis will draw primarily on work from the latter category, especially as relates to the use of *narratives* in environmental history.

The importance of narratives in shaping environmental history has been explored most thoroughly by William Cronon (1994). In his analysis, narratives are not mere interpretations of the past, but actually construct past “reality.” Narratives have special appeal to people because we tend to live our lives as if we were living out a story. Moreover, narratives are not aimless chronicles but *directed*, usually in either a “progressive” or “declensionist” trajectory (Cronon 1994). Similarly, Merchant (1996) calls the history of Western civilization a meta-narrative of “recovery” (from the Fall), identifying within it both

progressive and declensionist elements. Furthermore, social power is achieved by controlling these kinds of metanarratives:

We internalize narrative as ideology. Ideology is a story told by people in power. Once we identify ideology as a story—powerful and compelling, but still only a story—we realize that by rewriting the story, we can begin to challenge the structures of power. (Merchant 1996: 157)

Although my thesis does not take the long historical view that Cronon, Merchant, and most other environmental historians do, I will explore the way that diverse social groups construct narratives of social and environmental change, and the recursive relationship between social power and dominant narratives. These concepts will be further developed in Chapter III.

Social and environmental impacts of shrimp farming

There is a diverse literature, mostly from Asia and Latin America, on the damaging effects of shrimp aquaculture on coastal ecosystems and human communities. The environmental impacts can be divided into three main types: mangrove deforestation, degradation of estuarine water quality, and decline of wild stocks of aquatic species. The impacts of mangrove deforestation in order to construct shrimp ponds are probably the most well-documented. Around the world, shrimp aquaculture operations have tended to locate in mangrove zones. Mangroves are known to provide a number of “ecosystem services,” such as maintenance of coastal water quality, flood control, high primary productivity that serves as the basis of benthic and nearshore food chains, and as habitats, feeding grounds, and nurseries for fish, crustaceans, and mollusks. Depletion of mangrove coverage to create space for shrimp farms has had a negative impact on all of these ecosystem functions (DeWalt, Vergne, & Hardin 1996; Flaherty & Karnjanakesorn 1995; Guija & Finger-Stich 1996; Southgate 1992; Southgate & Whitaker 1992; Webb-Vidal 1992).

Effluents from shrimp ponds may be responsible for declines in estuarine water quality. Intensive or semi-intensive aquaculture systems create higher concentrations of nutrients in estuarine and coastal waters, especially ammonia, chlorophyll *a* and bacterial cells (Robertson & Phillips 1995). Under certain circumstances, this release of nutrients may lead to hypernitrification and eutrophication in estuaries (Robertson & Phillips 1995; Pillay 1992; Smith 1996). Robertson and Phillips (1995) estimate that depending on management techniques, between 2 and 22 hectares of mangrove forest are required to effectively filter the nitrogen and phosphorous from one hectare of shrimp pond. Ponds built over acid sulfate soils in mangrove zones release acidic effluent into estuaries, which potentially "destroys food resources, displaces biota, releases toxic levels of aluminum, and precipitates iron that smothers vegetation and microhabitats and alters the physical and chemical properties of the water" (Stevenson 1997: 429). Aquaculture makes use of chemicals for parasiticides, fungicides, bactericides, disinfectants, pond sterilants, oxidizers, algicides, herbicides, and antifoulants (Pillay 1992).

Other studies find that shrimp aquaculture leads to a decline in wild fisheries. As mentioned above, decline in mangrove forest corresponds with a decline in habitat for fish, crustaceans, and mollusks. Capture of shrimp postlarvae to stock ponds and gravid females to use as breedstock to produce larva artificially may lead to a long-term decline in populations of wild shrimp and other species through incidental capture, or bycatch (Gaibor 1997; Coello & Olsen 1995). Intensive shrimp farming uses feed that contains fishmeal and fish oil, meaning that shrimp cultivated by these methods actually requires two to four times its weight in fish inputs, derived primarily from wild stocks (Naylor, et al. 1998). By one estimate, shrimp aquaculture is one of the most wasteful and unsustainable food production systems in

the world, typically requiring 300 joules of "ecological work" for every joule of edible shrimp protein produced (Larsson, Folke, & Kautsky 1994).

While there is ample evidence that shrimp farming has been a cause of environmental degradation in coastal areas around the world, weighing its socioeconomic impacts is a more difficult task. On the one hand, shrimp farming has been an economic bonanza for many developing nations, by generating foreign exchange and employment opportunities (Guija & Finger-Stich 1996; Primavera 1997; Webb-Vidal 1992). At the same time, however, shrimp aquaculture has had a variety of negative social impacts on coastal communities throughout the world. These fall into three major categories: first, occupational displacement through degradation of other productive uses of coastal ecosystems; second, uneven distribution of economic benefits generated by shrimp farming; and third, the creation of sometimes violent conflicts between user groups.

By degrading natural resources in coastal areas, especially in mangrove ecosystems, shrimp farming has led to the displacement of many traditional users of these resources. Throughout the tropics, fishing communities have probably felt the greatest impact from shrimp farming. Loss of mangrove forest and degradation of water quality near shrimp ponds have degraded small-scale fisheries in Asia and Latin America (DeWalt, Vergne, & Hardin 1996; Guija & Finger-Stich 1996; Primavera 1997; Stonich 1993). Artisanal fishermen and other members of coastal communities are witnessing the rapid disappearance of other uses of the mangrove ecosystem, such as salt production, tannin production, and the collection of fuelwood (DeWalt, Vergne, & Hardin 1996; Primavera 1997; Stonich 1993). Salinization of rice fields in the vicinity of shrimp ponds in Thailand, Bangladesh, and other Asian countries has led to diminished rice production and abandonment of farms, thus increasing food

insecurity in some areas (Barraclough & Finger-Stich 1996; Guija & Finger-Stich 1996; Flaherty & Karnjanakesorn 1995; Primavera 1997). Ironically, many artisanal fishermen in Honduras threatened by shrimp farming were originally forced to relocate to coastal areas after losing farms during the cattle and cotton booms of the 1950s and 1960s (Stonich 1993).

Perhaps the economic gains generated by shrimp aquaculture could compensate for these losses, but in actuality these benefits are not distributed evenly. By and large, the major beneficiaries of shrimp farming in Asia and Latin America have been people who are already rather well-off. In Thailand, for example, the high start-up capital necessary for purchasing concessions and constructing shrimp ponds have precluded most traditional coastal resource users from participating in the industry; meanwhile, the promise of high profits has attracted large corporations and urban elites (Flaherty & Karnjanakesorn 1995). Similarly, shrimp farm ownership in Honduras has been dominated by military and government officials and affluent urban investors (Stonich 1993). Meanwhile, the labor required by the shrimp industry is usually unskilled and poorly paid (Primavera 1997; Stonich 1993). Moreover, in shrimp aquaculture labor requirements are quite low; Stonich (1993) estimates that less than one job per hectare of shrimp farm is produced by aquaculture in a region (Gulf of Fonseca, Honduras) with an unemployment rate of nearly 60 percent. A rice farm may use as much as 10 times the labor required on a shrimp farm of comparable size (Primavera 1997).

The expansion of shrimp aquaculture has also heightened resource conflicts in coastal areas, often to the point of violence. These disputes stem primarily from questions of access to and proprietorship of fishery resources in estuaries and other waterways that are sites of aquaculture activities. Often, shrimp farmers "tend to view as private property what have been seen as commonly held resources" (Guija & Finger-Stich 1996). This applies not only to

mangrove forests and other areas actually converted to *de facto* private property for the construction of shrimp ponds, but also to adjacent zones that fishermen continue to utilize (DeWalt, Vergne & Hardin 1996). Shrimp farmers may bar passage through farms and nearby waterways by erecting physical barriers or through threats of violence (DeWalt, Vergne & Hardin 1996; Guija & Finger-Stich 1996; Primavera 1997; Stonich 1993). Such tactics may produce protests and heated confrontations between shrimp farmers and other user groups (Sebastiani, et al. 1994). Frequently, these confrontations turn violent. In Bangladesh and Vietnam, local people who oppose shrimp farmers have been murdered, bombed, burned out of their homes, and intimidated into silence or relocation (Primavera 1997).

As we have seen, the socioenvironmental impacts of shrimp farming are quite well documented. However, only a few studies have focused on these impacts at the level of specific coastal communities (DeWalt, Vergne & Hardin 1996; Sebastiani et al. 1994). With my thesis, I will add a valuable new case study to this body of literature and contribute to an understanding of the way the costs and benefits of shrimp farming are *perceived* at a local scale.

Research methodology

My study follows a qualitative research design that combines ethnography and phenomenology to elicit perceptions and reconstruct narratives of environmental change over a time span of 15-20 years. The rationale behind this approach is to identify the cultural processes that underlay the economic structure of the shrimp industry and to explain the meanings of such rapid ecological and economic shifts to distinct groups. Using the *etic*, or outsider's, perspective associated with ethnography, I seek to understand the social structure

and economic constraints of the residents of my study area, and how their livelihood has materially changed since the advent of the shrimp industry (Fetterman 1998).

Simultaneously, utilizing the emic approach, I attempt to elicit the different ways that local people *perceive* these transformations. This is a “phenomenologically oriented research approach” which “compels the recognition and acceptance of multiple realities” (Fetterman 1998: 20). Specifically, through loosely structured interviews with informants, I sought to bring out perceptions of social and environmental change in the form of *narratives*. Individual perspectives vary among individuals, but by focussing on similarities in key phrases and narrative trajectories, I assert that narratives can be identified with distinct aggregations of individuals, or social groups.

By utilizing this multifaceted research approach I demonstrate that costs and benefits of the shrimp industry are perceived to be unequally distributed across Ecuadorian society. Three major social groups were identified:

- *Shrimp aquaculture sector*: shrimp farmers, members of the aquaculture trade unions, shrimp packing plant workers.
- *Artisanal fishing sector*: fishermen, clam collectors, crabbers, shrimp fry catchers.
- *Conservationist sector*: biologists, technicians, managers affiliated with private conservation organizations or government agencies.

It should be noted that these groups are not always discrete, as some individuals may be affiliated with two or more sectors. I use professional association as the main criteria for categorization.

A major source of information for my thesis is a series of interviews I conducted with persons I identified as belonging to one or another of these three sectors. The interviews

were conducted over a period of seven weeks from May to July, 1998. In all, I interviewed 28 people using a recorder, either individually or in small groups of 2-3 people. On average, each interview lasted between 30 and 45 minutes. The format of these interviews was open-ended and loosely structured, in order to generate spontaneous responses from the informant. The interviews focused primarily on three themes: shrimp aquaculture's social and ecological impacts; the recent history of localized environmental change; and the efficacy of government-led and private conservation and development measures. In addition, I assisted the National Fisheries Institute in conducting a census of shrimp postlarvae catchers on the beaches near the town of Data de Posorja. Using structured questionnaires, over 100 people were interviewed over a span of three days (June 7-9, 1998). The results of this survey provide excellent socioeconomic data on local artisanal fishing communities (Zambrano 1998).

During this seven week research period, I surveyed shrimp aquaculture operations, accompanied fishermen at work, and attended community meetings. I acquired relevant documents in the libraries of government agencies such as the National Fisheries Institute and Coastal Resources Management Program in Guayaquil, and the Ministry of Agriculture and Livestock in Quito and Guayaquil. I was also able to review documents from private conservation organizations such as Fundación Natura and EcoCiencia in Quito and a shrimp industry association, the National Aquaculture Council, in Guayaquil. It bears mentioning that only about two weeks were spent in the main study area in Southern Guayas province, with the remainder spent in Quito, Guayaquil, and Manabí province.

Profile of the Study Site

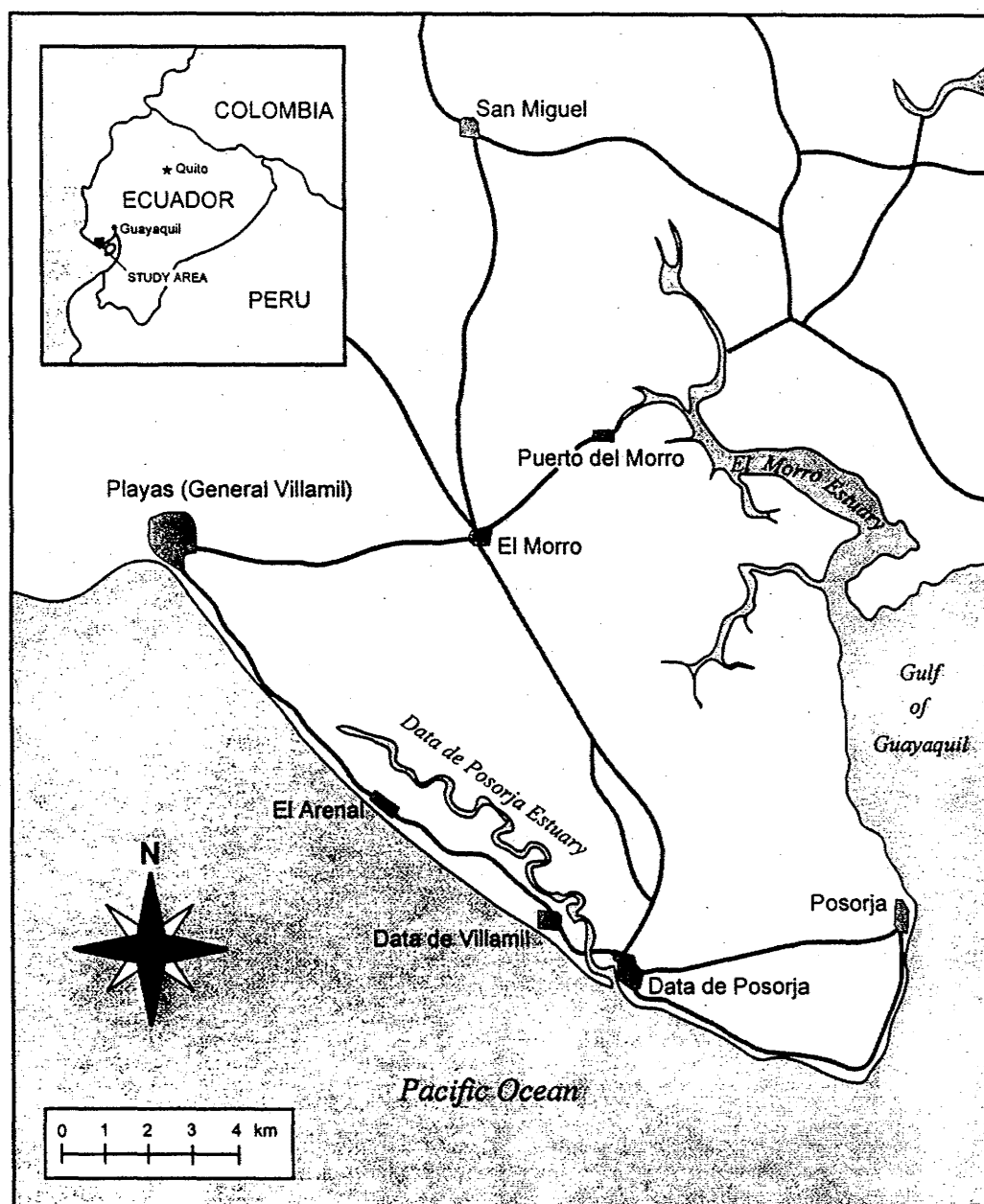
My thesis focuses on the communities in the vicinity of the estuaries of El Morro and Data de Posorja in Southern Guayas province, Ecuador (**Figure 2**). This region coincides roughly with the ZEM¹ Playas-Posorja-Puerto El Morro, one of the five special management zones of the Coastal Resources Management Program, or *Programa de Manejo de Recursos Costeros* (PMRC). The region's commercial center is the town of Playas (or General Villamil), which has a population of 14,000. It is a popular destination for tourists from Guayaquil, the largest city in Ecuador (pop. 1,508,000), which is about 100 km away.

The climate of this region is dry tropical, with an average temperature of 23 to 25 °C and around 500 mm of precipitation annually, almost all of which falls in the months of January through April (Burgos & Mosquera 1997; Gómez 1996). The major factor in seasonal climate variability is the influence of cold Humboldt and warm El Niño currents (Gómez 1996). Major El Niño and La Niña events play a significant role in the local ecology and economy; floods and heavy rains in 1982-1983 destroyed roads, bridges, and shrimp ponds (Gaibor 1997). A less intense El Niño event in 1997-1998 caused flood damage and washed away the walls of some shrimp ponds; at the same time, the shrimp industry benefited from an abundance of postlarval shrimp brought by the warmer ocean currents (*El Comercio* 1998a). Intense periods of drought in the early part of the century caused a decline in agriculture and livestock-raising in Puerto El Morro, reorienting the local economy towards fishing (FPVM 1992).

Although the two estuaries are separated by merely 15 km, their physical geography is

¹ ZEM: *Zona Especial de Manejo*, or Special Management Zone.

Figure 2. Map of study area: southern Guayas province region.



source: PMRC 1993b

quite different. The estuary of Data is 18 km long, draining an area of 77 km², with an average slope of 0.3% (PMRC 1993b). It has a depth of 1-2 meters, making it navigable only by small boats. From 1991 to 1995, mangrove forest cover around the estuary declined from 150 to 129 ha, while area in shrimp ponds increased from 1,178 to 1,293 ha (CLIRSEN 1997). Aquaculture activity along the estuary has altered natural drainage patterns, causing seasonal flooding, and increasing siltation of the mouth of the estuary, which must be dredged frequently to allow for sufficient rotation of water (PMRC 1993b; Fundación CENAIME-ESPOL 1997). A few longtime residents of Arenal, an hamlet that occupies land between the estuary and the sea, indicated to me that shrimp farms have reclaimed a significant amount of land from the shallow estuary, making it much narrower than in the past.

The village of Data de Posorja has a population of about 700, according to 1990 census figures, but other estimates put this figure at closer to 3000 (Gaibor 1997; PMRC-INP 1997). Other hamlets along the estuary, such as Data de Villamil and Arenal, have about 1000 inhabitants, by local residents' accounts. This is an impoverished area, lacking in many social services; Data de Posorja has only a grade school, no pharmacies, and no sewage system (PMRC-INP 1997). Since the mid-1980s, the focus of economic activity has shifted spatially from the estuary to the beach, as the importance of the shrimp postlarvae fishery has grown. There is also an artisanal fishing fleet of about 40 boats that operates in the nearshore zone (PMRC-INP 1997). Other economic activities in the area include livestock-raising, agriculture, masonry, and carpentry. Some local residents find employment guarding vacation homes that overlook the beach (Zambrano 1998).

The estuary of El Morro is much larger than that of Data de Posorja, with a length of 25 km, a width of more than 1 km near its mouth, and a slope of 0.7% (PMRC 1993b). At the

town of Puerto El Morro, the estuary has a depth of 4-6 meters, permitting navigation of medium-sized fishing vessels (FPVM 1992). Despite the proliferation of shrimp aquaculture in the area, there remains a substantial fringe of mangrove along the estuary. From 1991 to 1995, mangrove forest cover declined from 1406 to 1309 ha, while the area in shrimp ponds increased from 2,340 to 3,021 ha (CLIRSEN 1997).

The town of Puerto El Morro (**Figure 3**) has a population of about 2800 (PMRC-INP 1997). Undoubtedly, the estuary is the economic focal point of the town. By one estimate, 97% of the actively employed population is dedicated to fishing, although the latest estimate by the National Fisheries Institute puts the total number of fisherfolk at 260 (FPVM 1992; PMRC-INP 1997). This sector is comprised of three major groups: *pescadores*, those who capture mainly finfish and shrimp in nets; *concheros*, those who collect clams in the muddy bottoms of mangrove stands; and *cangrejeros*, those who capture crabs, predominantly in upper mangrove forests. There is very little mixing, socially or at work, between these groups. Other activities in the area include shrimp farming, livestock raising, and transportation (PMRC-INP 1997).

Development of shrimp aquaculture in Ecuador

Since the early 1980s, shrimp exporting has rapidly ascended to a position of prominence in the Ecuadorian economy (**Figure 4**). This commodity now ranks third behind petroleum and bananas in terms of export revenues (CNA 1998). Approximately 90 percent of Ecuador's production of shrimp derives from aquaculture, with the remainder caught at sea by industrial and artisanal fishing fleets (Gaibor 1997). Shrimp aquaculture is one of the few sectors in which Ecuador can claim the position of industry leader. Ecuador accounts for 62

Figure 3. The town of Puerto El Morro. The low-angle view is deceptive: what appears to be contiguous mangrove forest in the background is actually fragementented by numerous shrimp ponds.

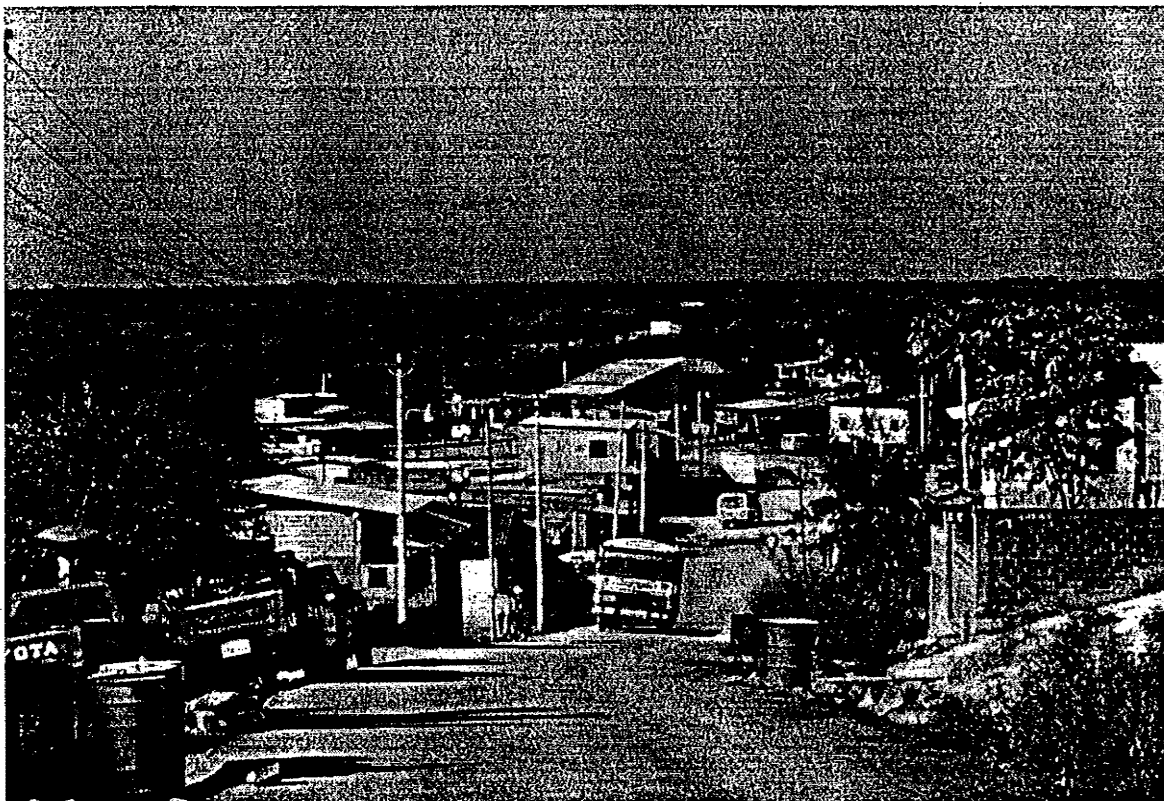
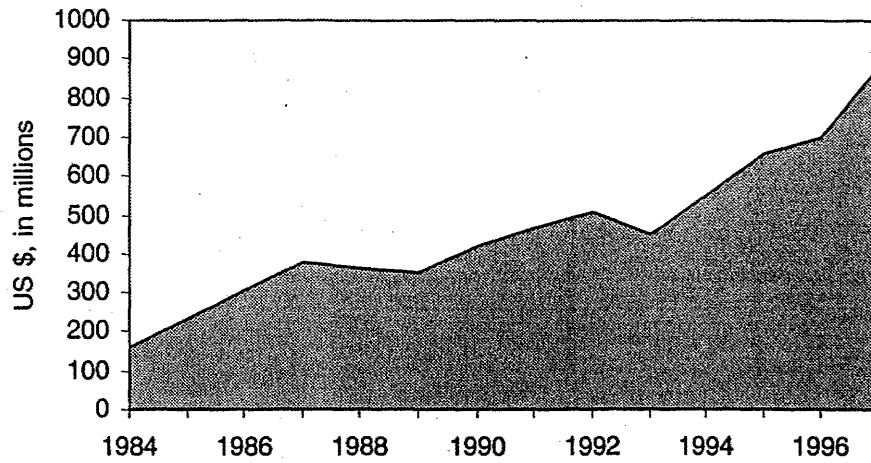
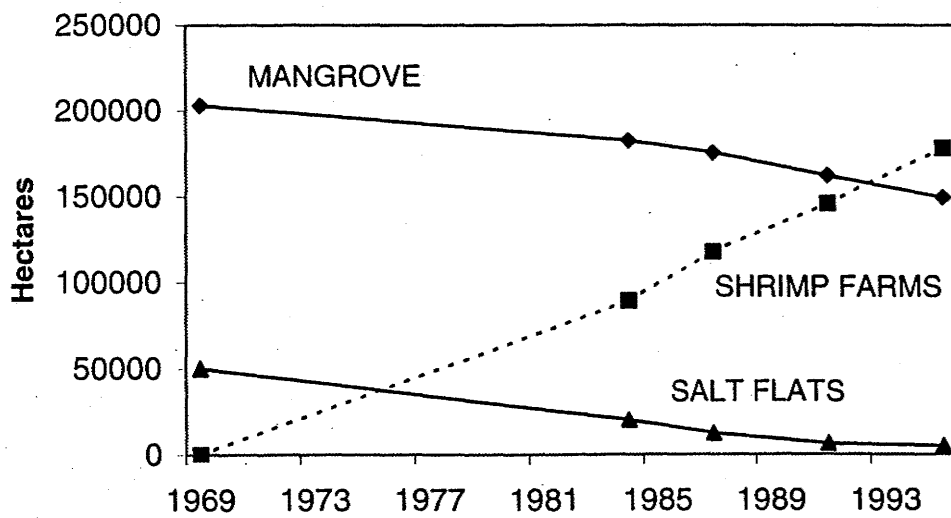


Figure 4. Ecuadorian shrimp exports, 1984-1997, in U.S. dollars.



source: CNA 1998; Gaibor 1997

Figure 5. Coastal land use change, 1969-1995.



source: CLIRSEN 1991, 1997

percent of all shrimp produced in Latin America and the Caribbean, and on a global scale ranks second only to Thailand in cultured shrimp exports (CNA 1997; Martinez & Pedini 1998). In 1997, a record year, Ecuador exported 241,833,000 pounds of shrimp with a value of US\$879,670,000, accounting for 22.5 percent of the value of all Ecuadorian exports (CNA 1997).

The dynamic rise to prominence of this industry is even more impressive considering its recent origins. In the early 1960s, farmers in El Oro province noted that especially high tides would strand shrimp in shallow pools for easy harvesting. This serendipitous discovery eventually led to construction of shrimp ponds in the province in 1966, and this enterprise spread to adjacent Guayas province in 1976 (Estupiñan 1995; Gaibor 1997). The early years of the shrimp industry were ones of experimentation and innovation. Originally, shrimp were harvested from the ponds by fishermen using nets; this inefficient method was eventually supplanted by the use of sluice gates to drain the contents of the ponds. The sluice gates, along with diesel-powered pumps, facilitated the exchange of water to maintain the quality of the pond environment. Ponds were predominantly *extensive* operations, meaning that they were stocked with low densities of postlarvae with very few additional inputs of feed, antibiotics, and other chemicals. Throughout the 1970s, ponds were constructed almost exclusively on salt flats and disused agriculture land adjacent to estuaries (Gaibor 1997). Meanwhile, ancillary activity in the shrimp postlarvae fishery flourished on beaches and in estuaries.

The early 1980s was a time of anarchic and unplanned growth in shrimp farming, as well as major land use change in mangrove estuaries (Figure 5). Spurred on by an unusual abundance of postlarval shrimp in the El Niño year of 1982-3, area in shrimp ponds expanded

rapidly and began to infringe on mangrove forests (Gaibor 1997). Before long, however, as supplies of postlarval shrimp dwindled, the industry experienced a mini-crash, so that in 1985 half of the ponds sat idle (Olsen & Figueroa 1986). Gradually, the sector began to recover and continue its inexorable expansion. To safeguard against shortfalls of wild shrimp postlarvae, the development of hatcheries to cultivate postlarvae accelerated (Gaibor 1997). However, increasing use of artificially reared larva had other negative ecological impacts, as capture of gravid female shrimp threatened stocks of wild shrimp (Coello & Olsen 1995).

The role of the Ecuadorian state in promoting the expansion of the shrimp industry has been inconsistent. At times, it has offered economic incentives to expansion. For example, beginning in the early 1980s, the government subsidized the cost of diesel fuel for the industry, waived import duties on inputs to aquaculture, and offered low interest loans for pond construction (Gaibor 1997). The National Fisheries Law (1974; revised, 1985), which offers incentives for fishing enterprises that are vertically integrated, and minimal restrictions on foreign investment, also encouraged the expansion of this capital-intensive sector (Olsen & Figueroa 1986). At other times, however, the government has imposed restraints on the industry; for example, the federal government required shrimp farmers to receive payments for their exports in domestic currency at the official exchange rate, which was well below the real exchange rate. This situation led to a black market trade in shrimp with Peru, Ecuador's southern neighbor, until the policy was overturned (Estupiñan 1995; Márquez et al. 1986).

The Ecuadorian state also facilitated the acquisition of concessions for shrimp farms. Although Ecuadorian law categorizes mangroves as "patrimony of the state" and therefore protected from exploitation, until recently there was little active intervention of government

agencies to prevent conversion of mangroves (Bodero & Robadue 1993; Estupiñan 1995). Concessions are inexpensive relative to the kind of profits that a successful shrimp farming operation can produce, and once secured, land in concessions is *de facto* private property. Today, even with increased vigilance, penalties for cutting down mangroves are negligible.

The rampant growth of shrimp farming and the environmental problems that accompanied it inspired conservation efforts beginning in the late 1980s. The most important response was the creation of the *Programa de Manejo de Recursos Costeros* (PMRC), or Coastal Resources Management Program. This program coordinates government and private institutions and generates community-based conservation and development projects in five special management zones along the Ecuadorian coast (Olsen et al. 1997). The PMRC originated as a joint project of the federal government, the University of Rhode Island's coastal resources institute, and the U.S. Agency for International Development, and is now an independent government agency functioning through a loan from the Inter-American Development Bank. The policies and ideology of the PMRC will be explored in further detail in Chapter III.

CHAPTER II: IMPACTS OF SHRIMP FARMING ON ARTISANAL FISHING COMMUNITIES

Introduction

Shrimp aquaculture has generated substantial benefits for the economy of Ecuador. However, as is the case with practically any industry, when the balance of costs and benefits is disaggregated from the abstract level of the nation, a different picture is revealed. Economic gains have accrued to an entrepreneurial sector of shrimp farmers, exporters, and feed and equipment suppliers. The industry has also generated new employment for semi-skilled and skilled workers, such as biologists, technicians, shrimp packers, truckers, and pond managers (CNA 1996a). Yet these gains have come at the cost of serious environmental degradation, especially to mangrove-fringed estuaries, where nearly all pond construction has been concentrated (Bodero & Robadue 1993; Estupiñan 1995; Webb-Vidal 1992). In turn, these ecological transformations have had uneven socioeconomic consequences. Those who have realized the greatest financial gains from shrimp aquaculture have felt little of its ecological impact. Conversely, artisanal fishermen, who have endured great hardships because of the deterioration of mangrove estuaries, have found few substantial economic opportunities in the cultured shrimp industry.¹

¹ I will often refer to those involved in fishing activities in the area as "fishermen." Although this term may be interpreted as diminishing the contributions of women to this activity, in Data de Posorja and El Morro, as is the case along most of the Ecuadorian coast, fishing is done almost exclusively by males (Bélisle, Cui, and Prieto 1987; Zambrano 1998). One notable exception is in the province of Esmeraldas, where women have a much more substantial role in fishing activity, especially clam gathering (Estupiñan 1995; Mitlewski 1987). Exploring the differences in the gender division of labor in artisanal fishing communities would be an interesting topic for further research.

The development of shrimp aquaculture has changed the lives of artisanal fisherfolk, almost always for the worse, not just in Ecuador but in tropical countries throughout the world (Guija & Finger-Stich 1996; Primavera 1997; Stonich 1993; Webb-Vidal 1992). In the estuaries of Data de Posorja and El Morro, in southern Guayas province, Ecuador, artisanal fishermen report that shrimp farming has transformed their livelihood in manifold ways. Foremost, they attribute a decline in their fishery to a loss of mangroves due to pond construction and the damaging effects of pond effluents. Secondly, shrimp farmers hinder artisanal fishermen from carrying out their work by threats of physical violence. Finally, while their incomes have diminished, artisanal fishermen have found few alternative opportunities for employment in the shrimp industry.

Decline in mangrove fishery due to shrimp aquaculture

For generations, communities all along the coast of Ecuador have depended on the rich and productive fisheries of mangrove-fringed estuaries (Bodero & Robadue 1993; Landázuri & Jijón 1988; Mathewson 1987). Although never a highly lucrative activity, traditional fishing has put food on the table and provided for other basic needs through small-scale market activity. In addition, mangroves have been a traditional source of firewood, tannin, and construction material (Bodero & Robadue 1993; CLIRSEN 1991; Ortiz 1992). However, in recent years, the area of mangrove forest has diminished rapidly, mainly due to shrimp aquaculture and urbanization (Bodero & Robadue 1993; CLIRSEN 1991, 1997). It is estimated that in the last 30 years, mangrove coverage has declined nationwide by 25 percent, and in some estuaries by as much as 90 percent (CLIRSEN 1997; PMRC 1993b).

The damaging impact of shrimp farming on these fisheries stems from two main sources: mangrove deforestation and aquaculture effluents (Coello & Olsen 1995). Although most aquaculture activities in Ecuador take place near mangrove-fringed estuaries, converted mangrove forests themselves are poor sites for aquaculture activities (Pillay 1992; Stevenson 1997). Mangroves are difficult to clear for shrimp pond construction and their acidic soils are known to create less than optimal conditions for shrimp growth (Estupiñan 1995; Pillay 1992; Stevenson 1997). For these reasons and, to a limited extent, because of the legal protection afforded mangroves, Ecuadorian shrimp farmers originally located primarily on salt flats and disused agricultural land. However, as aquaculture boomed and ecologically appropriate sites became scarce, especially in the years just following the El Niño event of 1982-3, many mangrove trees were razed to construct shrimp ponds (PMRC 1993b).

Mangroves are an important habitat for many species of fish, mollusks, and crustaceans, and consequently, a decline in mangrove coverage is clearly linked to a decrease in the population of these species (Barracough & Finger-Stich 1996; Boderó & Robadue 1993; Landázuri & Jijón 1988; Primavera 1997). Moreover, as mangrove forest coverage diminishes, fishermen gradually crowd into the remaining area. This creates the potential for overharvesting and further threatens the long-term sustainability of the mangrove fishery.

Rates of mangrove deforestation and new pond construction have fallen significantly since the early 1990s (CLIRSEN 1997). Yet the mangrove fishery faces ongoing deterioration due to shrimp pond effluents. Although substantive research to confirm the link between effluents and a decline in estuarine fisheries is scant, in all likelihood pond discharge is responsible for salinization, hypereutrophication, and eutrophication in estuaries (Pillay 1992;

Stevenson 1997). In addition, fertilizers, antibiotics, and other chemicals used in aquaculture operations may also have harmful impacts on mangrove fauna.

Documenting the decline

There is need for more scientific data to assess the exact nature of the transformations in the fisheries of these estuaries over the last 20 years or so, the period coinciding with the development of shrimp aquaculture in El Morro and Data de Posorja. Strong supportive evidence would include population counts of aquatic species in the estuaries, artisanal catch registries, and calculations of fishing effort. Although the PMRC and the INP are presently attempting to collect this kind of data, it is very difficult to ascertain the condition of the fishery in the recent past (INP 1998; PMRC-INP 1997). An important alternative method of obtaining this information is through a critical analysis of the testimony of those who are most familiar with the resource, artisanal fishermen.

There is almost unanimous agreement among fishermen that catches of fish, crustaceans, and mollusks have declined since the advent of the shrimp industry in the area, while average fishing effort has intensified. One former fisherman and community leader in Puerto El Morro estimates that the average catch for *cangrejeros* has declined perhaps tenfold in the last 25 to 30 years (I-PEM2).² A group of *concheros* contends that 15 years ago they gathered as many clams in two or three days as they now gather in a week (I-PEM3).³

² These codes (beginning with "I-") serve as references to testimony that I gathered during interviews in Ecuador. Refer to Appendix A for an explanation of interview codes.

³ The occurrence of a strong El Niño event in Ecuador in 1998 may complicate interpretations of the fishermen's testimony. Normally, the rainy winter season (December through March) causes a decrease in shellfish populations in mangrove estuaries. When the rains are extremely intense, as during an El Niño event, these populations fall off precipitously. Having conducted my interviews when artisanal fishing in the area was at

In the estuary of Data de Posorja the decline has been even more dramatic.

According to a survey of 61 households in the town of Data de Posorja, most locals agree that population and size of marine species have decreased in the last 15-20 years; reasons advanced for this change include alterations in climate, contamination and poor water quality in estuaries and coastal water, due in part to shrimp farming (Gaibor 1997). One resident of Arenal recalls that, "Before there were shrimp ponds, here one could find crabs, clams, and the fish known as the *lisa*. A great number of many species of fish." Today, however, "There is only shrimp. But there aren't any species of fish. Now there is nothing. Now there are no crabs, no clams, no oysters. Only shrimp—but not many. Very few" (I-A1). According to this informant, during the early years of pond construction on the estuary (ca. 1982), shrimp farmers employed *matamaleza*, a defoliant, to destroy the roots of mangrove trees to facilitate their removal. This caused the normally muddy water of the estuary to run red, and for one or two years, fish, crustaceans, and mollusks nearly disappeared altogether (I-A1). Tellingly, in a 1997 survey of Data de Posorja, only one type of artisanal fishing could be identified: the capture of finfish, *not* of crabs or clams (PMRC-INP 1997).

Evidence from other parts of Ecuador confirms the clear link between mangrove deforestation and decline in estuary fisheries. In the Chone river estuary in Manabí (Figure 1), about 90 percent of mangroves have disappeared in the last 30 years, due mainly to shrimp aquaculture (PMRC 1993a). In the same period, fishing has been devastated. For example, 30 years ago, *cangrejeros* could find about 3 *quintales* (1 *quintal* = 100 lbs) of crab,

a low point, almost any other year would seem better by comparison. However, in a study the year before conducted by the PMRC and INP, fishermen in Puerto El Morro affirmed that "the decline in the availability of the principal resources (clams and crabs) is due primarily to the indiscriminate deforestation of mangroves" (PMRC-INP 1997).

working about 8 hours a day; in the early 1990s, on the other hand, 10 or more hours of effort yield an average of just one half a *quintal* (Ortiz 1992). Some species of crab and clam have practically disappeared from the Chone estuary, and as a result, many fishermen have emigrated or been forced to find other employment (PMRC 1993a).

By all accounts, artisanal fishing in Data de Posorja was never as important as it is today in El Morro; furthermore, El Morro is a larger estuary which still has substantial mangrove forest left (CLIRSEN 1997). Nevertheless, the examples of the Data de Posorja and Chone estuaries are instructive: with sufficient mangrove deforestation and numbers of fishermen, the El Morro fishery could experience a crash. In the meantime, fishermen in El Morro struggle to maintain their livelihood in a time of diminishing resources.

Impacts from Pond Construction on Artisanal Fishing

Fishermen in El Morro and Data de Posorja attribute the decline of the estuary fisheries to the deforestation of mangroves for the development of shrimp ponds. The decline has manifested itself in various ways, not solely in smaller fish and shellfish populations. It is worth noting that while many species of aquatic fauna depend on the mangroves as feeding or nursery grounds, it is the relatively immobile mollusks and crabs that rely most on the mangroves as habitat. In turn, *concheros* and *cangrejeros*, rather than those who capture fish and shrimp in nets, have been most impacted by the loss of mangroves (Figure 6).

Concheros and *cangrejeros* in the area of Puerto El Morro have low levels of social organization and occupational territoriality relative to other groups of artisanal fishermen along the coast of Ecuador (INP 1998, PMRC-INP 1997). There are few rules regulating

Figure 6. A conchero from Puerto El Morro. In his hand is a *concha prieta*, or black clam, the most valuable kind of clam found in the mangroves, worth about US\$8 per hundred.



access to the mangrove fishery—essentially, it is a first come, first serve system. A clam collector may favor a particular *conchal* (clam gathering grounds) and return to it on a regular basis, but he has no formal or informal entitlement to use of that area. In this sense, the *concheros* and *cangrejeros* of the area are similar to the fishermen of the Cayapas river in Esmeraldas province; for them, there are “no parts of the river reserved for certain individuals or families” (Mitlewski 1987: 172). In Puerto El Morro, most of the *concheros* work alone or in groups of two or three (I-PEM3). They are fiercely protective of their occupational independence; “*cada uno coge por su lado*,” or “each person collects on his own” is a common expression of their individual autonomy (I-PEM3).⁴

As fishing grounds have disappeared, the number of fishermen has held steady or even increased in El Morro. This has led to overcrowding of remaining fishing grounds and overharvesting of species. It is unclear how much mangrove forest is necessary to provide a living wage for a single *conchero* or *cangrejero*, but the kind of harvesting they carry out is extensive by nature. According to local fishermen, before the advent of the shrimp industry in the area, overcrowding was never a problem. There was space for everyone and shellfish were plentiful. Today, however, fishermen find themselves increasingly concentrated, with several *concheros* visiting the same site in a day. Out of necessity or desperation, *concheros* have been taking clams that have not yet reached maturity or optimum size. More alarmingly,

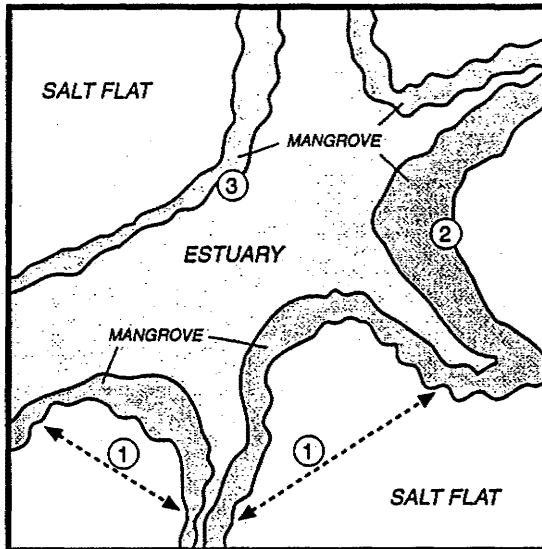
⁴ Often, artisanal fishers have informal or unwritten modes of sea tenure that may be observed separately from written ordinances or even surreptitiously (Cordell 1989a). These rules may be very strict; for example, in some small-scale estuarine fisheries of the Brazilian coast, certain fishermen may lay claim to particular spots, and there is strong social pressure to maintain these claims (Cordell 1989b). Along the coast of Ecuador, various systems of sea tenure and cooperative organization have been used by different communities (Mitlewski 1987; Pollnac and Poggie 1991; Pollnac, Poggie, & Fierro 1987; Southon 1989). In the beaches near Data de Posorja, local *larveros*, or shrimp postlarvae catchers, are only recently beginning to organize into cooperatives, while the best organized groups are actually seasonal migrants from the province of Azuay in the southern highlands (Gaibor 1997; Zambrano 1998).

cangrejeros have recently begun to capture the *machorros*, or female crabs, jeopardizing the long-term sustainability of the resource.

Pond construction in the El Morro estuary has impacted traditional fishermen in other ways. The creation of shrimp ponds and associated infrastructure has fragmented fishing grounds, leading to increased travel time, expense, and exposure to piracy for the fishermen (Figure 7). As recently as twenty years ago, clam collecting areas, known as *conchales*, were located adjacent to or near the village of Puerto El Morro. *Conchales* were typically separated by salt flats or scrub, so that *concheros* could easily walk from one expanse of mangrove to another. Today, however, there are few contiguous mangrove zones near the town. Shrimp farmers have constructed ponds on former salt flats and scrub, prohibiting the free passage of *concheros*; the ponds present not only a formidable physical obstacle to movement on foot, but also a new set of legal barriers: what was once treated as an open-access resource is now, for all practical purposes, private property.

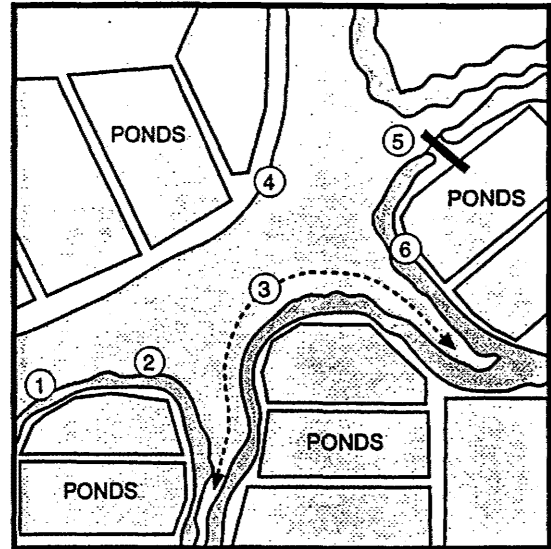
Thus, it is no longer possible for *concheros* and *cangrejeros* to reach their customary areas of collection on foot or by a brief canoe trip. Rather, they must travel farther out into the estuary and closer to the Gulf of Guayaquil to find a sufficient catch. This entails long excursions of an hour or more in rowboats, or the expense of renting outboard motors. Few artisanal fishermen own their own canoes, much less motorized transport. The Puerto El Morro fishing cohort numbers about 260 people, but there are only about 45 boats in their fleet; about a dozen are equipped with outboard motors (PMRC-INP 1997). In general, fishermen must rent boats and pay for fuel; for a *conchero*, the value of one day's catch barely covers the cost of fuel alone (PMRC-INP 1997). Furthermore, fragmentation of fishing grounds necessitates shorter and more frequent trips during a day, leaving less time for

Figure 7. Schematic map of changes in mangrove estuary fishery since the development of shrimp farming.



BEFORE SHRIMP POND CONSTRUCTION

1. *Concheros* and *cangrejeros* can walk over salt flats between collection sites in mangroves.
2. Interior mangroves, the primary crabbing grounds, are plentiful.
3. Fishermen have relatively unfettered access to mangrove zones.



AFTER SHRIMP POND CONSTRUCTION

1. Mangrove coverage in general is reduced to a mere fringe around the estuary.
2. Because shrimp farms are located so close to mangroves, fishermen must be careful to avoid violent confrontations.
3. Because salt flats have been replaced by shrimp ponds, *concheros* and *cangrejeros* must travel between sites by boat, considerably increasing working time.
4. Some pond construction leaves no mangrove fringe at all and reclaims land from the estuary.
5. Ponds release harmful effluents in the course of normal operations.
6. Interior mangroves have been eliminated by pond construction

fishing. In any event, increased travel time and expense makes fishing even less lucrative and puts pressure on fishermen to over-harvest to cover increased costs of operation.

Moreover, as fishermen are forced farther away from Puerto El Morro, they must contend with a greater risk from pirates who patrol the vicinity of the Gulf of Guayaquil. Although pirates may seem a relic of a bygone era, in actuality they represent a persistent threat to sea and river vessels in Ecuador. The pirates are known to steal boats, outboard motors, cargo, and even fishing catch. In Puerto El Morro, at least, there have been no human casualties due to piracy; nonetheless, many fishermen express a constant fear of pirates and consider piracy to be one of their most serious occupational hazards (INP 1998).

Impacts from Aquaculture Effluents

The degradation of the mangrove fishery may also be associated with a decline in estuarine water quality due to shrimp pond wastes. Unfortunately, there is a conspicuous lack of studies addressing the impact of shrimp pond effluent on mangrove fauna. The inadequacy of information can be attributed in part to the apathy of aquaculture research institutions, which have shown little interest in discussing environmental impacts outside the limits of the ponds (Pillay 1992). Because of wide variation in aquaculture management techniques and physical characteristics of mangrove ecosystems, it is risky to draw conclusions from analogous cases (Pillay 1992). Nevertheless, in Ecuador, as early as 1987, a decline in growth rates and massive mortality of shrimp in ponds was recognized as related to a growing decline in water quality in adjacent estuaries and coastal waters (Olsen & Figueroa 1986; PMRC 1993a). Some of the pollutants were heavy metals, pesticides, toxic materials, red tides, and

high concentrations of organic matter leading to a decline in dissolved oxygen content. It was acknowledged that data was incomplete and the need for regular environmental monitoring was crucial. Moreover, it was difficult to distinguish among industrial pollution, urban development, and shrimp aquaculture as the primary factor (Olsen & Figueroa 1986).

Hypernutrification and eutrophication are processes that are well-known to be consequences of most forms of aquaculture (Pillay 1992). Evidence of eutrophication attributed to aquaculture has been found in the Río Chone estuary (Olsen, et al. 1997). Organic enrichment of an estuary could lead to increased oxygen consumption and the creation of an anoxic environment in the sediment, which could change the composition of benthic fauna (Pillay 1992). But benthic mangrove fauna are already adapted to anoxic soil conditions, and increased concentrations of nutrients favor filter- and detritus- feeding invertebrates, such as clams and some crabs (Pillay 1992). Plaziat (1984) found that low pH levels are associated with an increase in bivalve shell corrosion and mortality. According to Stevenson (1997), shrimp pond effluents have lower pH levels than adjacent estuaries. Thus, all other things being equal, pond effluents could lead to a decline in bivalve populations. Unfortunately, there are no empirical studies to prove this particular link.

In a survey of a community of *larveros* in Data de Posorja, respondents speculated that the deterioration of the fishery was due in part to poor water quality in the estuary brought on by shrimp farming (Gaibor 1997). The fishermen I spoke with, however, did not speculate in detail about the nature of the relationship between shrimp aquaculture and a perceived decline in mangrove fisheries. They were convinced that the nearby shrimp farms were in some way responsible for the decline, but the thought that shrimp pond effluents were to blame was

never volunteered. However, when I mentioned this hypothesis to them, many agreed that it was a possibility. By and large, they were unaware of the composition of shrimp pond effluents and the possible effect they might have on water quality in estuaries. Of all the ecological changes brought on by the shrimp industry, mangrove deforestation, rather than a decline in water quality, was the most obvious change and the cause for most concern. A workshop organized earlier this year by the National Fisheries Institute to determine what issues were most important to *concheros* found similar results (INP 1998). This is probably due to the high visibility of mangrove deforestation and the immediately perceptible changes that it creates.

The Estuary: a Site of Daily Conflicts

On a daily basis, the relationship between shrimp farmers and fishermen is tense, confrontational, and sometimes violent. Because shrimp ponds have encroached on mangroves and the very banks of estuaries, fishermen have little choice but to work close to shrimp farm boundaries (**Figure 8**). These boundaries are often ambiguous in multiple ways. First, the border of the shrimp farm may be poorly posted, without stakes or fences as clear markers. Second, the dynamic nature of tidal estuaries sometimes makes boundaries on paper difficult to apply; for example, in the course of a day, muddy estuary bottoms may turn to dry ground, and during the rainy season estuary channels may shift erratically. Third, pond owners may purposely misrepresent the extent of their property to include mangroves, with an eye toward future development or to create a kind of buffer zone around their farms. It is in this context of ambiguity and confusion that conflicts arise.

Figure 8. Two concheros digging for small clams on the banks of the El Morro estuary. Note the proximity of shrimp pond operations in the background.



Fishermen contend that they are often warded off by gunshots or by verbal threats of physical violence simply for working on the fringes of shrimp farms. More often than not, it is not the pond owners who make these threats, but rather managers, guards, or other employees. Some shrimp farmers erect fences in estuary channels to cut off access to the fishermen (INP 1998). The shrimp farmers' rationale behind such actions is their belief that fishermen steal equipment and even shrimp from the ponds (I-PEM1). One pond owner even accused fishermen of drilling holes in the pond levees to steal shrimp just before harvest (I-PEM5). However, all of the fishermen that I spoke with adamantly denied such accusations. It is more likely, they argue, that the thefts are carried out by the farms' own employees, who may make scapegoats of the fishermen to cover their own misdeeds (I-PEM4, I-PEM5). This assessment was also endorsed by a shrimp farmer native to Puerto El Morro (I-PEM6). In any event, the conflicts persist.

To be sure, the law, as written, is on the side of the fishermen. By Ecuadorian law, mangroves are property of the state, and shrimp pond concessions cannot extend into mangrove zones (Armada del Ecuador 1997; Boderó & Robadue 1993; Pérez 1988). Artisanal fishermen are entitled to unfettered use of the estuaries and their mangrove fringes. However, these laws are seldom enforced. The refrain, "*Las leyes no se cumplen*" ("laws are not obeyed"), is a common expression of frustration with the impotence of laws relating to the mangrove resource. Under these circumstances, relations between fishermen and shrimp farmers are shaped not by point of law but rather by daily conflicts and negotiations over use privileges. Each fisherman must form personal relationships with shrimp farm workers in order to gain access to fishing grounds, and must accept that an agreement forged on one day may not be valid the next. As fishermen usually travel unarmed and alone or in small groups, the shrimp

farm personnel hold a clear advantage in the daily battle over resource access.

Fishermen seldom bother protesting to authorities, not because of fear of reprisal, but because of frustration with the inability of the legal system to protect their rights.

Limited Employment Opportunities for Artisanal Fishermen

Shrimp aquaculture advocates assert that this industry has generated substantial employment for Ecuadorians in the last twenty years and is one of the few dynamic sectors in an otherwise stagnant economy (CNA 1997). Estimates of the total number of people employed in the shrimp industry range from 90,000 to 250,000, including biologists, technicians, equipment and feed suppliers, packers, truckers, pond managers, and guards (Gaibor 1997). By the industry's own calculations, a fifth of the people who live in Ecuador's four coastal provinces depends on shrimp aquaculture (CNA 1997). However, fishermen displaced by the development of this sector have found few employment opportunities within it.

By their nature, shrimp farm operations are not very labor intensive. Referring to aquaculture on a global scale, J. H. Primavera writes:

Modern shrimp farms are capital- rather than labour-intensive. A 40-ha shrimp farm in India employs only 5 labourers while an equivalent rice farm would need 50 [. . .]. Employment of local people in shrimp farms is often limited to low-paying, unskilled jobs such as labourers and guards, while technical and managerial positions are reserved for outsiders. Moreover, funds invested in these farms are mostly generated from the outside, therefore profits also leave the community (1997: 821).

For most of the rural communities of coastal Ecuador, shrimp farming does not represent a regular source of household income, but the industry has created new flows of migrant labor (Márquez et al. 1986). Most shrimp farms in southern Guayas province rely on an enclave system to provide full-time labor. In the area of Data de Posorja and El Morro the few

available positions on shrimp farms are seldom filled by locals. Workers are brought in primarily from Manabí province, and housed and fed within the confines of the farm. *Camaroneros* believe that locals are more likely to steal and malingering than outside laborers (I-PEM1). Ostensibly, local workers could remove stolen goods to their houses or drift away in the middle of the day to carouse with friends, attend to family obligations, or do other work. Temporary work is available for locals during pond harvests when substantially more labor is required. However, a pond harvest typically lasts only one night and though there may be many ponds in an area, this is by no means considered regular work. Furthermore, many interviewed fishermen in Puerto El Morro complain that pond owners do not pay the promised wages after the work is done (I-PEM5).

Residents near the estuaries of El Morro and Data de Posorja do not perceive themselves as beneficiaries of the expansion of shrimp farming and view shrimp farmers with suspicion—they are seen as outsiders who have very little interest in the welfare of their communities. In fact, most shrimp farms in these areas are not owned by locals; most owners are Ecuadorians who live and work in Guayaquil. Frequently, these people are not experts in aquaculture but rather savvy investors with diverse portfolios working primarily in unrelated occupations (I-PEM1, I-G4).

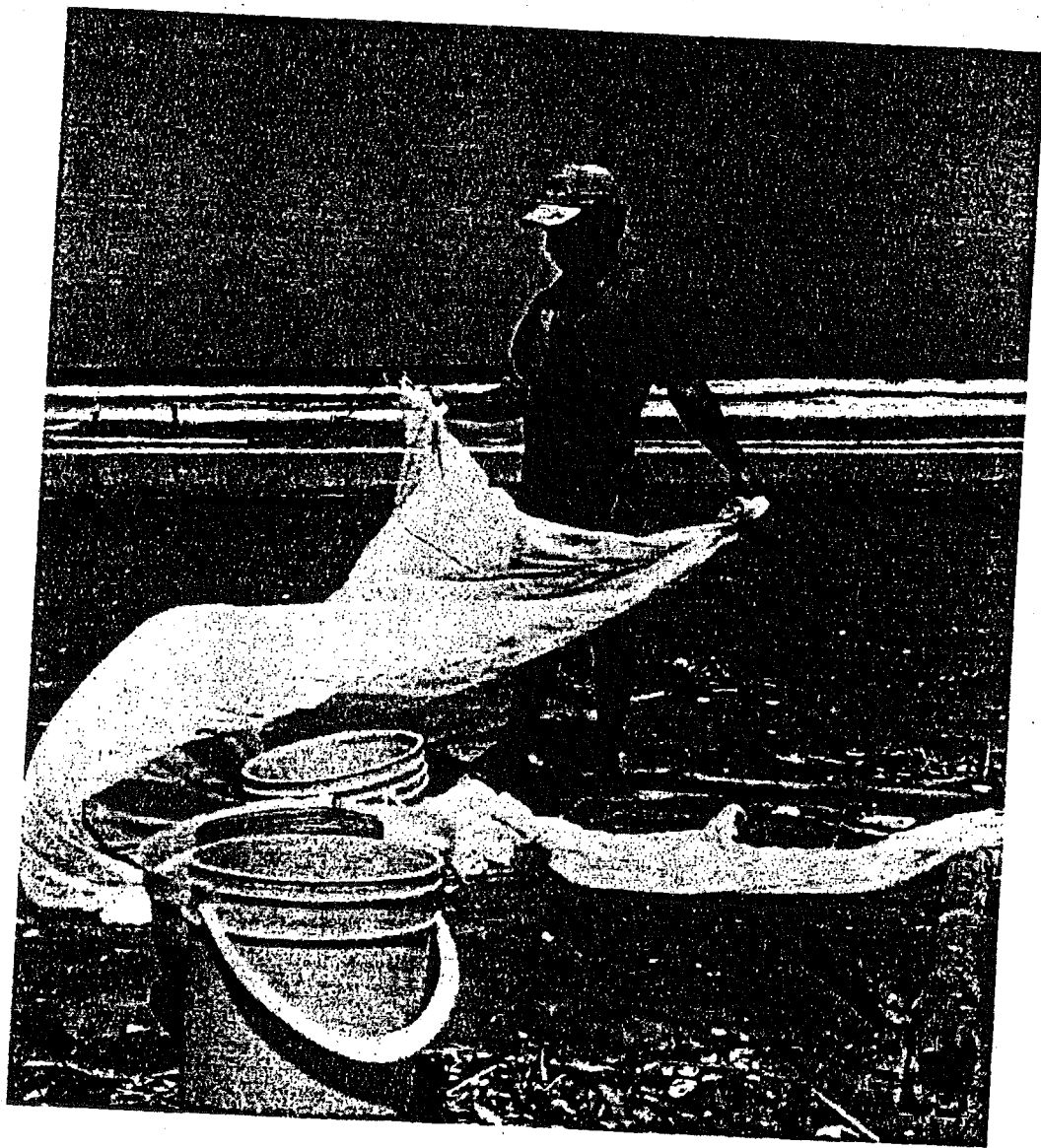
Yet, few local people would know even this much about the pond owners; their visits to the shrimp farms are usually infrequent, and daily operations are left in the hands of employees. This kind of absentee ownership regime makes it difficult for locals to determine who is responsible for responding to their grievances. When shrimp farm development began in the Data estuary around 1982, local fishermen appealed to local authorities to halt construction; while these officials squandered time seeking the owner of the farm,

construction continued unabated. Shrimp farmers rarely participate in or send representatives to community council meetings. Many incidents illustrate the aloof attitude of most shrimp farmers to the town of Puerto El Morro. A few years ago, the community council, in conjunction with the PMRC, called a meeting to attempt to resolve the kinds of use conflicts in the estuary described above. Only two shrimp farmers (out of approximately 30 in the vicinity of Puerto El Morro) attended the meeting, and they were not even from the specific area in dispute (I-PEM2, I-PEM5).

José Luis Villón, the executive director of the PMRC office in Playas, asserts that efforts to integrate shrimp farmers into the resource management process have mostly failed. Shrimp farmers are mostly apathetic to the PMRC's agenda—until problems arise. For example, when the outlet of the Data estuary became blocked by silt, shrimp farmers on the estuary appealed to the PMRC to help expedite permits (I-PL2). Furthermore, shrimp farmers are often accused of making use of public infrastructure without paying their “fair share” to maintain it. In Puerto El Morro, shrimp farmers use trucks to transport shrimp and supplies, which exerts a heavy toll on dirt roads, and utilize the municipal dock, especially during the rainy season when roads are often impassable. Yet when the community council of Puerto El Morro made an appeal to the approximately 30 shrimp farmers of the area to assist in making repairs to roads damaged by El Niño, only five responded with contributions, according to a town resident employed by the PMRC (I-PEM5).

Artisanal fishermen have found work in one sector associated with shrimp farming, as *larveros*, or shrimp post-larvae catchers. Throughout the year, but especially from January through May, tens of thousands of *larveros* may be found on the beaches and in the estuaries of Ecuador, catching postlarval shrimp to stock the nation's shrimp ponds (Figure 9). From

Figure 9. A larvero preparing his net on the beach at Arenal.



the perspective of the artisanal fishermen, this kind of work carries several advantages: it is sometimes remunerative, requires little skill or start-up costs, and is done independently. Then again, there are numerous disadvantages: the work is mostly seasonal, prices for larvae are unpredictable, there are few barriers to entry by laborers from outside the artisanal fishing sector, middlemen are exploitative, and there is little long-term security, because the work of *larveros* may eventually be replaced by laboratory larva cultivation (Gaibor 1997).

In this chapter, I have challenged the claim of shrimp industry advocates that the benefits of aquaculture development far outweigh its social and environmental costs. Perhaps it is inevitable that some social groups are "left behind" in the process of economic development. However, the irony in this case is clear: artisanal fishermen, whose livelihoods have been severely diminished because of shrimp farming, have found few worthwhile alternatives in the shrimp industry. Moreover, the Ecuadorian government has generally failed to protect the health of a valuable public resource, the mangrove estuaries, which have traditionally been the basis for small-scale fishing. Why have the shrimp farmers prevailed so decisively? In the next chapter I will argue that it is not by mere fact of their economic productivity, but also by use of a progressive socioenvironmental narrative that engages dominant discourses in Ecuadorian society.

CHAPTER III: NARRATIVES AND COUNTER-NARRATIVES

Theoretical Notes: Narratives as Contested Terrain

Thus far, I have examined the impacts of shrimp aquaculture on mangrove estuaries and the people who depend most on their continued integrity. In this account, the central characters are the artisanal fishermen of the estuary. The setting is circumscribed, isolated to the estuaries and adjacent towns. As the fishermen tell the story, the narrative arc is one of decline: a relatively easy life based on abundant resources and occupational independence has given way to a life of struggle with suddenly degraded resources, due to outside forces. But this is only one story out of many that are being told. In this chapter, I propose that the environment of social conflict and inequality generated by the expansion of shrimp farming in mangrove estuaries should be considered not only as a contestation over material resources, but also as a clash of conflicting *narratives* produced by distinct groups of social actors. Put another way, the contested physical landscape is also a contested ideological landscape. There is nothing altogether novel about this conceptualization. A wealth of recent literature, associated primarily with the school of political ecology, stresses that an interpretation of distinct actors' perceptions of the natural environment is key to understanding the causes of environmental degradation and evaluating conservation programs (Arizpe, Paz, & Velázquez 1996; Peluso 1993; Sundberg 1998; Zimmerer 1993). In this chapter, I integrate this nascent body of work with the concept of narrative as articulated by environmental historians, and construct a heuristic model of the relationship between narrative and social power. I will

begin by discussing the elements of this model, then apply it to the case of the shrimp industry.

The Power of Narrative

Both environmental history and political ecology seek to contextualize social and environmental change by emphasizing contested facts and representations, and bringing perceptions and discourses to the foreground. One form of contextualization is the narrative. In some sense, narratives do not simply relate facts or events about the past, but actually construct past reality (Cronon 1992, 1994; Demeritt 1994; Worster 1994). Since a historical narrative is, in essence, a response to the fundamental question, "How did we get to where we are today?", conceptions of the past are not fixed; we reshape our views of the past according to present circumstances.

Despite their constructedness, narratives are compelling because we tend to order our lives as if we were living out a story. As historian William Cronon states:

Insofar as people project their wills into the future, organizing their lives to make acts in the present yield predictable future results—to just that extent, they live their lives as if they were telling a story. It is undoubtedly true that we all constantly tell ourselves stories to remind ourselves of who we are, how we got to be that person, and what we want to become. The same is true not only of individuals but of communities and societies: we use our histories to remember ourselves, just as we use our prophecies as tools for exploring what we do or do not wish to become (Cronon 1992: 1369).

Thus, we are all historians. Regardless of social status, every individual at least has the power to tell the story of his or her own life. Yet these kinds of stories necessarily encompass elements beyond the immediate events of a person's own life. An individual cannot tell his story without telling the story of other people, places, and social institutions, as well as interpreting natural and social processes. These elements are given meaning by their

placement within the narrative (Cronon 1992). In a single spatial and temporal context, there are a multiplicity of clashing narratives. James Scott writes:

As we listen to the rich and poor of Sedaka attempting to make sense of the massive changes they have all experienced over the past decade, we find ourselves in the midst of an ideological struggle, however small in scale. It is a struggle over facts and their meaning, over what has happened and who is to blame, over how the present situation is to be defined and interpreted. Having lived through this history, every villager is entitled, indeed required, to become something of a historian—a historian with an axe to grind. The point of such histories is not to produce a balanced and neutral assessment of the decade but rather to advance a claim, to levy praise and blame, and to justify or condemn the existing state of affairs. (Scott 1985: 178)

We build narratives to remember, to explain who we are, and to guide our future actions.

Another characteristic of narrative is that it is *directed*. A story seldom ends in the same place that it begins. “Where are you going with this story?” is a common refrain. As environmental histories describe change over time, they are rarely circular in form.

Conventionally ordered by chains of cause and effect, such narratives typically take one of two forms: progressive and declensionist (Cronon 1992). Not only do these narratives address the question, “Have things gotten better or worse?”, they also project their trajectories into the future: “Will things get (keep getting) better or will they get (keep getting) worse?”

Narratives as Object of Study

Narrative is a kind of epistemology, a way for an historian or other scholar to organize and give meaning to past events. For example, if the object of study is, say, the impact of climate change and human land use practices on the composition of a forest, a writer may choose to organize the disparate evidence into the form of a narrative. However, it is also possible to think about narratives *themselves* as objects of study. In this case, the researcher

attempts to isolate different stories articulated by individual actors or groups of actors, compare the stories, and interpret their significance in a larger socio-cultural context.

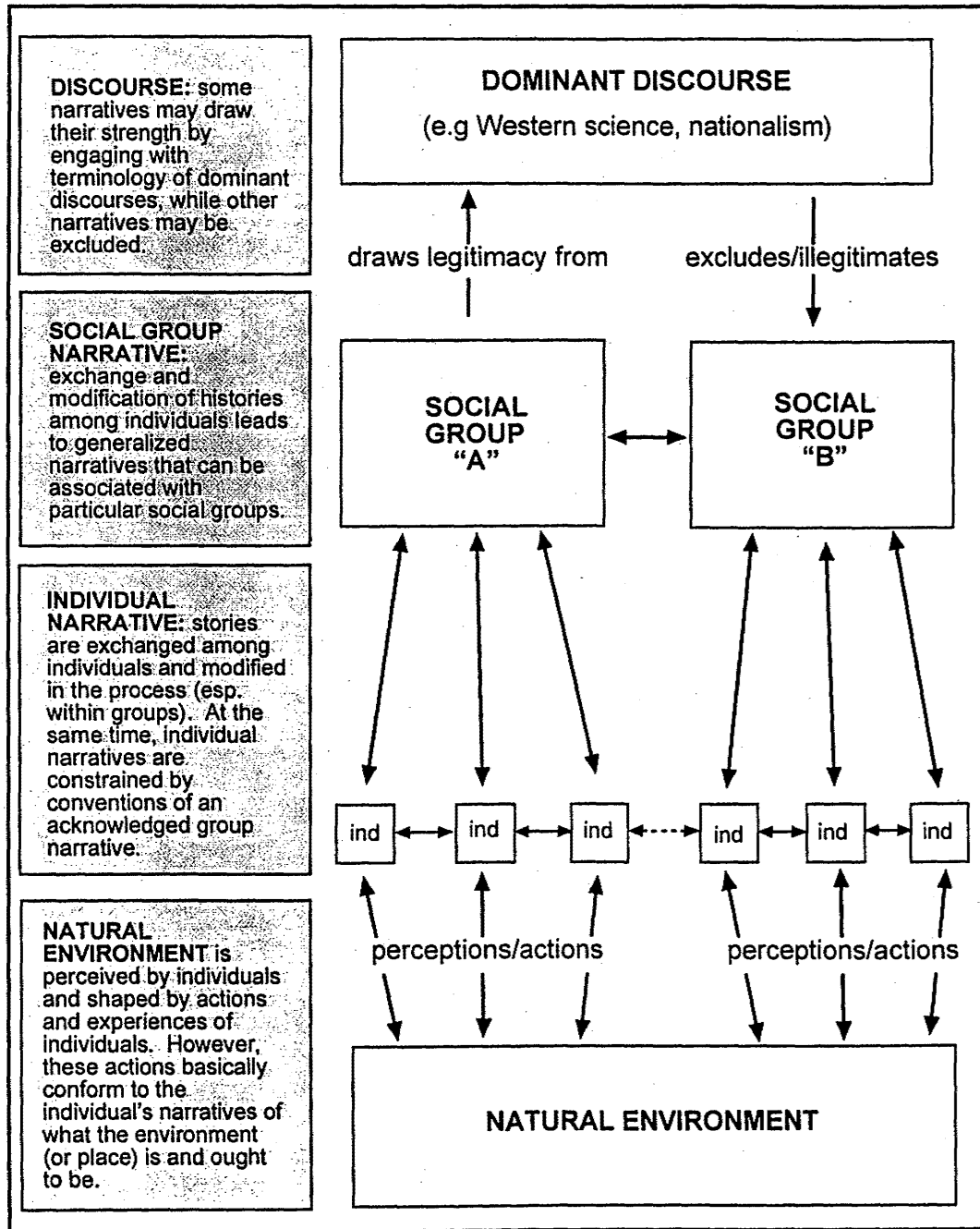
While it is indisputable that human beings are apt to tell stories about themselves and the places in which they live, even the most “objective” observer cannot help but contribute to shaping these narratives. For example, an interviewer may hope to elicit free and open responses from a subject on a wide range of topics, but by necessity must direct the focus to some extent. Even a broad question such as, “What have been some of the major changes you have seen in the estuary in your lifetime?”, influences the content of a response; it calls for illustrations of change, rather than stability; it limits the scope of the informant’s response to her living memory, precluding anything that came before. Moreover, the researcher may reorganize the informant’s responses into a narrative after the fact.

Narratives of individuals, groups, or institutions have a special appeal for political ecologists and other scholars who wish to analyze the complex, dynamic relationship between environmental change and social processes. Even if the narrative is characterized as an “environmental history,” within the story itself fixed and impermeable boundaries between “environment,” “society,” and “economy”—to name just a few analytical divisions—are absent. The genius of the narrative is that all of these elements and forces interact naturally and effortlessly, with the narrative structure providing cohesion and direction.

Group-Individual Dialectic in Narrative

How are narratives of environmental and social change constructed? To address this question I offer a heuristic model of the construction of socioenvironmental narratives in **Figure 10**; referring to this diagram may help to clarify the following discussion. I contend

Figure 10. A model of the construction of socioenvironmental narratives.



that the generation of these narratives begins at the personal scale (**individual narratives**), with the stories that people tell about themselves and the places they live. Individual tales build on each other; stories are exchanged, modified, recomposed, and become collective stories. Narratives of family, community, place, and environment are created. This generative process is continuous, but over time, individual stories coalesce into **group narratives**. Social groups, in this sense, can be distinguished by characteristic perspectives and narrative form and content. This follows from Zimmerer's (1993) study in Bolivia, in which numerous personal viewpoints of the causes of soil erosion were assembled into three major perspectives according to social group.

But how do individual stories turn into discernible group narratives? Some may argue that this process cannot be reified, that it depends on the observer/scholar to first identify social groups (according to occupation, political allegiance, economic position, etc.), then to compose a profile of the group based on a selective interpretation and aggregation of individual stories. However, I believe that there is a real and recursive relationship between individual and group narratives. As people exchange and modify stories, a collective consciousness of a larger narrative grows. **Individual narratives** are constrained by the conventions of the **group narrative**, while the group narrative is altered over time by individuals. In other words, the individual may be free to tell his story, but cannot stray too far from the general perceptions and truth claims of his group; otherwise, he, or others, might question his identity with that particular group. At the same time, individuals have the capacity to alter the contours of the group narrative, although this process may be slow, and not every person is equally influential in this process. This might be termed a structurationist

approach to narrative-building (on structurationist approaches in general see Giddens 1979, 1981; on the use of structurationist approaches in political ecology see Zimmerer 1991).

Meanwhile, non-discursive divisions between groups, based on economic, political, and cultural distinctions, limit the exchange of stories across group boundaries. Thus, group narratives require a degree of isolation in order to develop, much as different social groups develop particular institutions and customs. Social groups begin to perceive that the divisions between them are ideological, not just material—they talk past each other, because their communicative structures are based on different norms. Some narratives may even form in opposition to the narratives of other groups. These can be termed counter-narratives.

Another element in this scheme is how individuals perceive the **natural environment** and act upon it. Ultimately it is the self, not the group, that perceives its surroundings; however, the range of perceptions is constrained by the rules and conventions of the group narrative. Simultaneously, individual action reshapes the environment and group perceptions will eventually be altered in light of these changes.

To complicate the model somewhat, but perhaps to make it more plausible as well, social boundaries are fluid and constantly shifting. Individuals associate themselves with several social groups at once; perspectives of different groups may coalesce on certain issues but not on others; groups may disappear as others form; and so on. Thus, this model of narrative formation relies on an idealized level of social stability that may not always exist in reality.

Relationship Between Narrative and Social Power

Finally, there is a positive, recursive relationship between narrative power and social power. This is not to say that the best storytellers will gain social power. Rather, the content of the story, while not irrelevant, is perhaps secondary to the ability of a particular group to disseminate their version of the truth. For what is power but the ability to make others see things as you see them?

Narratives may gain strength by borrowing vocabulary from dominant, or hegemonic, **discourses**. Discourse as used here refers not to verbal or written communication in general, but rather to discrete systems of knowledge and power that function according to certain rules that produce seemingly incontrovertible and stable versions of reality (Escobar 1995). The reason that a particular discourse dominates is its *apparent* objectivity, impartiality, and capacity to represent perspectives across social lines. However, in reality the dominant discourse subtly but surely favors and gives strength to certain narratives, while excluding others (Escobar 1995). For example, social group "A" may draw legitimacy from the discourse of Western science. The seeming objectivity and rationality of the discourse may justify a particular group's truth claims in the face of contention from other social actors. Although the group's primary motivation may be to increase its social or economic power, making a claim based on this desire is unlikely to bring about the sanction of other members of society. Thus the successful employment of a seemingly neutral discourse makes a group's narrative more palatable while concealing its true motives. This is especially key in the context of putative representative democracies, in which the state is expected to be just and prevent unequal distribution of social power. If a particular social group can effectively situate

themselves within a seemingly neutral discourse, the state can more easily favor their interests in policy issues.

While hegemonic discourses may legitimate the narratives of some groups, they necessarily exclude or illegitimate those of other groups. These marginalized or subaltern groups may lack the economic power to engage in these discourses. For example, members of these groups may be unable to commission scientific investigations to support their claims, or lack the means to hire attorneys to negotiate the opaque discourse of the legal system. Moreover, these groups may not have access to media to diffuse their claims to a wider audience, which may include people in other places with similar experiences of marginalization. Importantly, as we will see in applying this model to the case of the shrimp industry, socially disadvantaged groups lack the tools to engage successfully in dominant systems of knowledge.

This chapter will analyze the narratives of two social groups, shrimp farmers and artisanal fishermen. I argue that the shrimp farmers' story of social and economic progress prevails not only because this group has enjoys material social power, but because the narrative itself gains power by engaging in dominant discourses of Ecuadorian society, such as scientific expertise, modernization, economic development, and nationalism. Meanwhile, the traditional fishermen tell a story of betrayal and decline, in which they are the victims of aquaculture's explosive growth. Before launching this discussion, it is worth offering a few caveats. First of all, although I use the stories of individuals to underscore important elements of social group narratives, clearly there is dissent within these groups. For example, not every shrimp farmer would subscribe to what I identify as the shrimp farmers' narrative.

Nevertheless, based on my research I believe it is possible to generalize the main points of a

story that most shrimp farmers would support; the same could be said of traditional fishermen.

Second, there are obviously more than just two groups involved in the discourse over the degradation of mangrove estuaries and the development of shrimp aquaculture. The most notable group not included here is the conservationists, who have of late assumed an important role in mediating among traditional users, shrimp farmers, the Ecuadorian government, and international scholars. Yet I have chosen not to give the conservationists the same prominence as other groups in this analysis, for two main reasons. First of all, institutions dedicated to conservation and coastal resource management have not been influential in the area of El Morro and Data de Posorja until just the last few years. Although their role is growing, in reality they are still minor players in stories of social and environmental change over the last twenty years.

Second of all, it is difficult to generalize a "conservationist narrative," because this class is extremely diverse ideologically and politically. Some organizations accept the role of the shrimp industry and seek to accommodate their interests; others believe that sustainable resource use and aquaculture are incompatible. Between these two extremes, it is hard to identify a "center." Thus, the conservationists will be left out of this analysis; however, I will demonstrate that the shrimp farmers' narrative borrows heavily from the discourse of conservation science.

Dominant Narrative: Aquaculture Triumphant

The narrative that prevails in the discourse on shrimp farming in Ecuador is the one that is articulated by shrimp farmers and others who perceive themselves as benefiting directly

or indirectly from the industry. The arc of this story can best be described as one of progress—a transformation of nature into something more productive and somehow better than before, while maintaining or perhaps even enhancing a harmonious relationship between nature and society. Mangrove estuaries are portrayed as having been unproductive resources before their transformation by shrimp farming. In the past, these places were useful only to backward and indolent peasants taking advantage of, rather than improving on, the bounty of nature.

While not enemies of progress (a designation reserved for conservationists), the fishermen represent a sharp contrast to the heroes of the narrative, the shrimp farmers, who began with nothing and parlayed it into a wildly successful enterprise of national and even international prominence. Through ingenuity, wise investment, strategic planning, and perseverance, the shrimp industry overcame natural, economic, and political obstacles, such as flooding, shortages of wild shrimp larva, viral epidemics, fluctuations in international markets, unfair tax burdens, and anti-business conservation efforts (CNA 1998).

In the shrimp farmers' tale, entering the risky atmosphere of the free market makes them deserving of their hard-won gains. Yet most continue to doggedly pursue the improvement of their enterprises and the industry as a whole, through continual re-investment of profits. In fact, they are in pursuit of a larger good, the modernization of Ecuador, and deserve accolades for improving the lot of the common man. An excerpt from the National Aquaculture Council's magazine illustrates the benevolence of the shrimp industry:

The development of shrimp farming brought with it development for the people; the small communities located all along the coast were benefited by the opening of local roads and lines of communication, the gift of electricity, potable water, and telephones. The generation of new employment in different areas has allowed the population to improve its standard of living. (CNA 1998)

In economic terms, then, the development of the shrimp industry has been a success story for everyone on the Ecuadorian coast.

Despite the progressive bent of the narrative, the shrimp industry acknowledges that mistakes were made during a reckless youth. Perhaps it grew too large too quickly, leading to overutilization of natural resources, such as wild shrimp larva and mangroves. Yet by having suffered through such trials, the shrimp industry has emerged wiser and better prepared to protect the environment:

The organized shrimp farming sector in Ecuador knows very well what mangroves represent. It knows of their ecological importance and the transcendent role that these trees play in benefiting the habitat of many species, including shrimp, the basis of the industry. For that reason, the National Aquaculture Council is seeking to establish an equilibrium between protecting the environment and economic development. The formula? Applying the concept of sustainable development. (CNA 1995)

Here, the official literature of the shrimp industry engages the “higher” discourse of sustainable development. Undoubtedly, cynics would ask if utilization of this terminology implies sustaining the ecosystem or sustaining profits. In any event, what matters here is that the shrimp industry has enough power to significantly shape the agenda of sustainable development in coastal Ecuador according to their needs. Also, this is just one of many discourses that the shrimp farmers’ narrative borrows from and makes their own—others include scientific management, laissez-faire economics, and nationalism.

Case Study 1: Mr. Reynaldo Arriaga, *camaronero*, Puerto El Morro¹

Mr. Arriaga is 52 years old, and has been involved in shrimp farming since 1981. He was born and raised in Quito, but lives in Guayaquil, where he also owns a wholesale

construction supply company. By pickup truck and cellular phone—the indispensable tools of the successful *camaronero*—he oversees four shrimp farms, which contain 64 separate ponds that cover a total of 400 hectares. None of the ponds, he contends, were built over mangrove forest, only on salt flats and higher ground. In fact, on one shrimp farm, through an extensive system of canals and pumps, he maintains ponds about 40 meters above the level of the estuary. The tenure of his ponds is a mixture of private property and government concessions, but he treats all areas of the farms as if they belong to him, making improvements as he sees fit. Concessions are held for a period of ten years, and can be renewed automatically; Mr. Arriaga is unaware of any shrimp farmer ever having been stripped of a concession (I-PEM1).

He has fifteen full-time employees on each farm, or roughly one employee for every six hectares. This labor is needed “permanently, every day of the year, night and day.” Tasks include monitoring water quality, running the diesel pumps, and cleaning the screens that go over the sluice gates. Mr. Arriaga refuses to employ local people, because, he says, “they are thieves.” Rather, all of the workers come from Manabí province or Milagro, in eastern Guayas province. They are housed in barracks and work shifts on the “ten and four” system: ten days “inside” the farm followed by four days “outside,” spent far from Puerto El Morro. In this way, the farm maintains a permanent staff and makes it impossible for employees to have “intimate contacts” in the area (I-PEM1).

To Mr. Arriaga, the growth of his business and the shrimp industry in general has been a story of perseverance against various and ever-present obstacles. Since the “golden age” of the industry in the early 1980s, when profits came easily, getting ahead has been a

¹ The names of the persons selected for case studies have been changed.

constant struggle. Only the most efficient operations survive. While some shrimp farmers may get rich, pay off all their bank loans, and live the good life, Mr. Arriaga—and, by his estimate, 90 percent of his colleagues—is still repaying debts, and incurring new ones with the goal of continued growth (I-PEM1).

Yet in this atmosphere of heightened competitiveness, the government imposes new taxes on the sector, threatening the competitiveness of Ecuadorian producers in the world market. Although he does not consider the taxes to be that high, he still feels the government has put the sector at a competitive disadvantage by not offering the kind of support that shrimp farming receives in other countries. Although he admits that he avoids paying taxes whenever possible, he wonders why he should have to pay to line the pockets of corrupt government officials. Moreover, shrimp farmers often have to pay for infrastructure improvements, such as clearing the mouth of the Data estuary, that the state ought to take care of. The shrimp aquaculture sector owes no obligation to the country at large, since the state itself squanders the one natural resource that it controls, petroleum, through mismanagement and corruption. He has joined the CNA (Cámara Nacional de Acuacultura) mainly because this group alliance has been effective in preventing what he views as excessive and injurious government policies (I-PEM1).

The industry has also faced serious environmental constraints. The price of larva has gone up because of shortages of wild stocks, which he attributes to overharvesting of gravid female shrimp for larva hatcheries. He admits that his own hatchery in Salinas has been guilty of not returning gravid females to the sea after they lay their eggs, but justifies this behavior because it was only in “small amounts.” Shrimp farms must deal with contaminated water, especially in the Gulf of Guayaquil; he attributes this pollution primarily to urban and

industrial wastes. Shrimp ponds effluents cause little damage because they are “biodegradable.” Mangrove deforestation has been a problem in the past, but today it has diminished—mostly because the shrimp farmers themselves vigilantly protect the mangroves around their concessions. Thus, from his perspective, the most efficient and reliable form of guarding the environment is through the enlightened self-interest of the private sector, not through government interference (I-PEM1).

Case Study 2: Xavier Noboa, *camaronero*, Puerto El Morro

Mr. Noboa’s story demonstrates the ambiguities of the model of narrative analysis, as he has strong allegiances to more than one group involved in this drama. He is not representative of the stereotypical shrimp farmer in that he lives in the area in which his ponds are located. As a lifelong resident of Puerto El Morro, he deals with other local people on a daily basis, and is sympathetic to the plight of those who work in what has historically been the mainstay of the town, small-scale fishing. However, though he is not formally allied with any aquaculturists’ association, in many ways, his personal story incorporates important elements of the shrimp farmers’ group narrative.

Mr. Noboa, 46, was never a fisherman by trade. Before setting up his own shrimp farm, he was a master builder and mason. His first work in aquaculture was constructing concrete sluice gates and buildings on shrimp farms in the area. In 1986, he purchased private property on a salt flat near the estuary, and after soliciting a permit from DIGMER, began construction of his first pond. He borrowed the funds for this project from the Banco de Fomento, a state-owned development bank, in Guayaquil (I-PEM6).

Since then, he has enjoyed a measure of economic success, but it has not come effortlessly. His is a story of starting out with nothing, building an enterprise, and reaping the rewards of hard work and wise investment: "One who starts out from below, comes out fighting from below, struggling, so it's very difficult, it's tough on a person. The little that one earns from production goes into investing in [reinforcing the ponds'] levees." He takes great pride in the strength of his levees and sluice gates, as they symbolize his prudential planning for the long term. He is conscious that some shrimp farmers are more interested in short run profits, and they pay the price for poor planning: "If you don't have good levees, it's like having nothing at all. There are cases of shrimp ponds that have very thin walls that wash away easily. These are very thick walls—what's important is that, if I want to have something, it has to be built to last for a long time [...] thinking of the future, not just in the moment" (I-PEM6).

While he takes pride in his personal achievements, he also emphatically supports the notion that the shrimp industry has improved the nation as a whole. The most important accomplishment of the industry is that it has put idle people to work in all sorts of occupations: postlarvae catching, shrimp packing, and work on the farms themselves (although he employs few local people aside from his family). The industry is helping to build an industrious and responsible citizenry: "Thanks to this industry, the people have work to do [...] When one is responsible, I think that is the most important thing, that's how you achieve success. Because if a person is irresponsible, when will he ever get ahead? Never" (I-PEM6).

His opinion of the local people in Puerto El Morro is ambivalent. On the one hand, he has never had any conflicts with fishermen of the estuary, and lets them work freely in the mangroves that fringe his property. He is a leader in the community, and serves on the

Community Council as well as the Zonal Council of the PMRC office in Playas. He was one of the few area shrimp farmers to offer financial assistance to the town during reconstruction after the most recent El Niño event. However, he also feels that the people in the town need to do more to help themselves, but are “*durmidos*,” or asleep—constrained by ignorance and apathy (I-PEM6).

Thus, his narrative of the changes generated by shrimp farming includes several important elements of the dominant narrative. First, Ecuadorians should be thankful for the growth of the shrimp industry, because of the substantial and diverse benefits that it has generated for the working class. Second, shrimp farmers *deserve* their success, because it is the product of hard work, ingenuity, and wise investment. Thus the main impediment to the success of other individuals, and of Ecuador as a whole, is not structural inequality, debilitating poverty, or lack of viable opportunities, but *unwillingness to work hard*. By making success or failure dependent on individual choice, the shrimp farmers’ narrative neatly depoliticizes the causes and consequences of their achievements.

Declensionist Narrative of Artisanal Fishermen

The fishermen’s story was explored in detail in Chapter II. Essentially, it is one of decline that stands in sharp contrast the shrimp farmers’ narrative of progress. In the fishermen’s counter-narrative, the mangrove ecosystem started out as a productive resource. Members of nearby fishing communities portray the past as idyllic, at least relative to the present day. Fish and shellfish were plentiful and fishermen had practically unhindered access to the mangrove zones. Overcrowding was never a problem, because there was always enough to go around. *Concheros* and *cangregeros* could expect to find an adequate catch with an

effort of only a few hours' work. The mangroves provided a reliable source of income for the fishermen, who may not have been wealthy, but at least enjoyed a substantial degree of independence.

However, since the encroachment of shrimp farming, things have gone steadily downhill: the mangrove fishery has declined and their independent way of life is gradually falling apart. Mangrove coverage has been reduced to a mere fringe around the estuary; fishermen, especially *concheros* and *cangregeros*, must expend greater time and effort than before to attain their catch; and fishermen now must deal with a tense and sometimes violent atmosphere of resource conflict. The fishermen blame aquaculture, primarily, for the decline of the mangrove fishery. Scientific evidence from around the world suggests that shrimp farming can have a negative impact on wild stocks of fish and shellfish, but the artisanal fishermen of El Morro and Data de Posorja have generally been unable to utilize such evidence to support their claims.

Moreover, most of the fishermen have been excluded from the economic opportunities created by the development of the shrimp industry. From the perspective of the demoralized fishermen, the future looks just as bleak: although some assistance has come from the PMRC, fishermen realize that the shrimp farmers still hold the upper hand and continue to consolidate their gains. Artisanal fishermen have witnessed the transformation of their way of life and fear that it may disappear altogether. In this section, I relate the stories of two individuals that exemplify the artisanal fishermen's declensionist narrative.

Case Study 3: Mr. Vicente Márquez, *cangrejero*, Puerto El Morro

Mr. Márquez is 56 years old, married, with seven children. When he was fifteen years old, and finishing the equivalent of eighth grade, his father became ill with a severe case of tetanus and he was forced to begin working with his uncles as a *cangrejero*. In those days, about 40 years ago, skilled *cangrejeros*, like his uncles, could capture 50-60 *atados* of crabs per day. In that era, an *atado* was comprised of 9 or 10 crabs; today, because the crabs are not as large, there are 12 to 18 crabs in an *atado*. Now, however, one is lucky to bring home four *atados* per day, and finding only two is common (I-PEM4).

Typically, he works in three-day shifts. For example, alone or with a companion, he sets out on a skiff Wednesday morning and sails all day, arriving at his crabbing grounds in the Gulf of Guayaquil by dawn on Thursday. After working all day Thursday, he turns back on Friday morning to arrive home by Saturday. He sells his catch to his brother, who takes them to Guayaquil by bus for resale. A *plancha* (four *atados*) is worth about 70,000-80,000 sucres (about US\$15 last year) in Guayaquil, but he sells them to his brother at 50,000 sucres. He estimates that, of late, on a typical week's catch he makes a profit of 6,000 sucres (a little more than US\$1) (I-PEM4).

Mr. Márquez recalls, in accordance with the recollections of many local people, that the first shrimp ponds in the area were constructed 12 or 15 years before. "Since then," he claims, "crab is scarce. That's when it [scarcity] began." He asserts that because of mangrove deforestation, crabs, mussels, and oysters are disappearing. The shrimp ponds have occupied some of the best land for finding crab, the higher ground, leaving narrow strips of mangroves in the intertidal zone, which are poor for the growth of crabs. He also attributes the scarcity

to an overpopulation of fishermen, and climatic factors: years of drought, followed by the strong El Niño event of 1998 (I-PEM4).

The presence of shrimp farms has severely limited his freedom of movement when fishing. He and his fellow *cangrejeros* have had to deal with so much harassment on the part of shrimp farmers that they tread carefully and avoid trouble at all costs. They avoid areas they think might be dangerous. In the past, the *cangrejeros* would carry nets to catch shrimp from the estuary to feed themselves; now, however, they leave the nets at home in fear that they will be accused of using them to steal shrimp from ponds (I-PEM4).

Once, in 1997, he and his companions were fishing on Moquiña island in the gulf, in an area near a shrimp farm that they had known for several years. One of the many friends they had made on the island over the years informed them that the shrimp farm had recently changed ownership, but they continued fishing. Before long, a boat approached, with a pilot and guard aboard; each carried a machine gun. Mr. Márquez and his companions were asked to leave, and complied. But others aren't so polite, and often fire without warning (I-PEM4).

Mr. Márquez, like many of his fellow *cangrejeros*, is dissatisfied with this state of affairs. However, little improvement is in sight. One of the main difficulties lies in organizing the *cangrejeros* for collective action in defense of their right to work. Although many agree, in principle, with forming a union, there have been few results. This is due to a lack of leadership and an attitude that "each person works on his own," or "*cada uno por su lado*" (I-PEM4).

Case Study 4: Mr. José Molina, *larvero*, El Arenal

Mr. Molina is a *larvero*, or shrimp larvae catcher, in El Arenal. He is 55 years old, and has lived in El Arenal for most of his life. He considers his primary occupation through the years to be fishing. For many years, he fished in the estuary with his family and companions, mostly for *pescas blancas* (finfish such as *lisa*, *róbalo*, and *corvina*), and shrimp, although there were also clams and oysters. Most of the catch was reserved for home consumption, although there was some marketing in nearby Playas. By his account, corroborated by others, mangroves were abundant and the fishery was very productive—typically, a day's work in the 1970s was about 3 or 4 hours (I-A2).

In 1981, the practice of shrimp postlarvae catching began in the area. A *larvero* from El Oro province came to the Data estuary, and hired locals to assist him in catching larva. Before long, local fishermen took to the activity on their own, and found it to be quite lucrative. There was an abundance of shrimp postlarvae in the estuary, so much that the *larveros* would often catch more than they could sell, and return larva to the estuary (I-A2).

The following year, approximately, the first shrimp ponds were constructed along the estuary. He recalls that the shrimp farmers resorted to chicanery and bribery to expand their concessions into mangrove zones. Initially, ponds were constructed following the boundaries surveyed in the concession shrimp farmers received from DIGMER². However, little by little they expanded their farms into adjacent mangroves. Some shrimp farmers would begin clearing mangroves well within a particular stand and expanding outwards, to hide their actions from authorities and fishermen. To destroy mangroves, many shrimp farmers made

² *Dirección General de la Marina Mercante y del Litoral*, the National Merchant Marine, which has jurisdiction over estuaries and other tidal zones

use of "matamaleza," a defoliant, which nearly decimated populations of aquatic species in the estuary for two years. Fishermen's complaints about this deforestation were met with indifference from shrimp farmers and authorities alike. Although he has no proof, Mr. Molina contends that shrimp farmers bribed officials to turn a blind eye to this conduct (I-A2).

In the early 1990s, larva-catching activity had moved to the beach, because *larveros* had discovered that larva was plentiful on the beach and larva populations had declined in the estuary. Shrimp farmers also began to prevent artisanal fishing in the estuary at night. The fishermen turned to the PMRC (Coastal Resources Management Program), recently established in the area, for assistance. An accord was negotiated whereby shrimp farmers recognized the right of local fishermen carrying a special *carnet*, or license, created by the PMRC to make use of the estuary at night (I-A2).

As fish, crustaceans, and mollusks diminished 15 years ago, the once thriving larva fishery has also begun to decline in the last 4 to 5 years. Larva, once plentiful year-round, is scarce from about May to November. Mr. Molina attributes this to overharvesting, and agrees with efforts to place a moratorium on larva-catching when stocks are especially low. He also acknowledges that *larveros* may be partially responsible for the continued degradation of the estuarine fishery, because of their haphazard disposal of bycatch. Mr. Molina is more successful than most in the community of Arenal; he, along with his brother and a few others, constructed "pre-criaderos," or nursery ponds, along a bank of the estuary, providing some extra income when larva prices are low. Furthermore, he has emerged as a local leader, heading the community council and organizing an artisanal fishermen's association. However, he does not believe that the shrimp industry has bettered the lives of people in Arenal:

"Shrimp are not processed here. They harvest the ponds, and one or two trucks come to carry the cargo to the packing plant in Guayaquil. And the worker in Guayaquil is not from the community [...] here there is no work for us to do" (I-A2).

Why the shrimp farmers dominate

Superficially, at least, the shrimp farmers' and fishermen's narratives are centered on the same changes over the same timespan; why, then, have two such different stories been produced? And why has the industry's narrative prevailed? The key to answering these questions lies in the differing capacities of the two groups to participate in particular dominant discourses. To elaborate on this idea, I focus on a specific point of contention between artisanal fishermen and shrimp farmers. The fishermen contend that aquaculture has impoverished the water quality of estuaries, thereby threatening the source of their livelihood. The industry denies this. But why has the industry's version been widely accepted, while the fishermen's voices have gone unheard?

Even if *concheros* and *cangrejeros* could overcome problems of disorganization and alienation from society at large, they would still have little concrete evidence to press their claims against shrimp farmers through mainstream political processes. As a group that is socially marginalized, the fishermen are accused of shirking, stealing, and lying. Their word, on almost any subject, is not to be taken at face value. Would quantitative, scientific evidence be an equalizer? Could it provide them the ammunition they need to validate their assertion? It is difficult to consider this hypothetical scenario. It is clear, however, that the aquaculture industry in Ecuador exercises a great deal of control over the scientific discourse related to the environmental effects of shrimp farming.

Science and Aquaculture

Some of the best biologists in Ecuador are employed by the shrimp industry. The ponds themselves are constantly monitored for water quality, salinity, oxygenation rates, as well as shrimp growth rates, disease, and pests. The technological capacity and expertise exist for widespread environmental monitoring. Not surprisingly, however, the shrimp industry seldom turns its attention to what goes on outside the pond (Pillay 1992).

The Ecuadorian shrimp industry realizes that scientific research keeps it competitive. As one leading researcher proclaimed, "The sustainability of this industry depends in the long run on parallel development scientifically" (CNA 1996a: 51). However, this scientific and technological development agenda is not just a private industry initiative. The Ecuadorian government, along with international actors, has lent support to these efforts through the creation of CENAIM (*Centro Nacional de Acuicultura e Investigaciones Marinas*), the National Center for Aquaculture and Marine Studies. This institution was created in 1990 as a joint effort with ESPOL (*Escuela Superior Politécnica del Litoral*), the state-funded national polytechnic university, with the assistance of a grant of US\$12,000,000 from the Japanese government (CNA 1996b).

Its founding principles are to research aquatic species already under cultivation and develop new techniques for aquaculture production. Research is divided into three major areas of investigation: fundamental (immunology, virology, bacteriology, etc.), applied (bioassays, reproduction, larva culture, environmental analysis, etc.), and technical (molecular biology, chromatography, biochemistry, histology, etc.). The Center has profited from international cooperation: CENAIM technicians have received training in countries such as

Japan, Belgium, Chile, France, United States, Brazil, and Egypt. CENAIM has also received funding from and undertaken joint ventures with FAO, UNESCO, the World Bank, and the governments of Japan, France, Belgium, and the European Union (CNA 1996b). After CENAIM severed its financial relationship with ESPOL at the end of 1995, it received a donation of US\$7,000,000 from the Ecuadorian government to continue its operation (CNA 1996b).

Studies have focussed mainly on pathogens and diseases affecting shrimp, shrimp immune and respiratory systems, nutritional requirements of *P. vannamei* (the most valuable type of cultured shrimp), artificial diets that increase output of fertile eggs, and use of alternative foods such as frozen artemia. CENAIM-ESPOL has also introduced technology in Ecuador for the cultivation of oysters and scallops.³ CENAIM-ESPOL has studied the mangrove ecosystem only insofar as it relates to improving the production of shrimp in ponds. In conjunction with the government of Belgium and the CNA, CENAIM-ESPOL has developed a biomonitoring project that will use zooplankton as an indicator of the quality of water entering ponds. However, little if any study has been devoted to the quality of water discharged from the pond. Outside of the pond or laboratory, there have been efforts to better understand larval shrimp in their natural environment (CNA 1996a).

To some extent, CENAIM-ESPOL has served as the scientific research branch of the CNA (*Cámara Nacional de Acuacultura*), the National Aquaculture Association. Studies by CENAIM have been prominently featured in *Acuacultura del Ecuador*, the CNA's monthly magazine, many of which adamantly deny aquaculture's complicity in degradation of

³ Interestingly, and perhaps adding to the hardships that *concheros* are experiencing, some Ecuadorian enterprises have begun to develop scallop aquaculture, with seed (larva) imported from Mexico (Martínez, et. al. 1996).

mangrove ecosystems. One study argues that the water leaving the shrimp ponds may be of better quality than the water entering from adjacent estuaries and other bodies of water. For example, an analysis of data taken from four points in the Guayas River estuary found that water pumped into the ponds, on average, carried a dissolved oxygen content of 4.1 mg/l while effluents contained an average of between 4.9 and 6.2 mg/l (Cordovez 1996).

Other CENAIM research argues that mangrove forests must be preserved because they act as effective filters for pond effluents; as mangrove trees and soils take up these nutrients, ecosystem productivity increases, including growth in populations of aquatic macrofauna, such as crabs and fish (Boyd 1997). The shrimp industry, through the CNA, has often portrayed itself as the *victim* of water contamination rather than a contributor to it:

Often, shrimp farms are situated downstream from large cities and agricultural and industrial areas. The water for the ponds may have already been contaminated with nutrients, organic material, suspended solids, pesticides or other industrial chemical products. For that reason, the biggest threat to shrimp farms is the contamination of water, over which aquaculturists can exercise no control (Boyd 1997:14).

CNA/CENAIM research characterizes mangrove ecosystems as resilient, while shrimp ponds are vulnerable to degradation from the outside:

Coastal waters have a certain capacity to assimilate contaminants that flow into them if their capacity is not exceeded. *The discharges of water from shrimp farms do not cause damage.* There are certain places where the excessive discharges from shrimp farms have contaminated coastal waters; when this occurs, the water available for use in shrimp ponds will be of variable quality. For this reason, methods to reduce the potential of contamination of shrimp pond effluents are essential, not only to diminish contamination of coastal water but also to protect water supplies for the shrimp ponds. (Boyd 1997:15; emphasis mine)

We may be skeptical of some of the shrimp industry's scientific claims, but in a very real sense they control the discourse on environmental effects of aquaculture. The CNA is more than just a public relations machine for the shrimp industry; it also has a prominent role in coastal resource conservation and management. It is the only representatives of private industry in

the UCV (*Unidades de Control y Vigilancia*), a surveillance unit of the Ecuadorian government set up to control illegal activities in mangrove zones. And it had a hand in the drafting of the plan for the Cayapes-Mataje Ecological Reserve in Esmeraldas province. It is doubtful that the CNA could have gained such legitimacy without emphasizing its association with institutions that engage the discourse of science and technology. In this way, they transcend their status as a special-interest industry group.

Moreover, the shrimp industry, unlike the artisanal fishermen, has the power to *disseminate* their perspective through the national media. For example, in July 1998 the CNA took out a large advertisement in *El Comercio*, the major newspaper of Quito, Ecuador's capital (*El Comercio* 1998b). The ad proclaims "*Un ecosistema equilibrado es la mayor riqueza del Ecuador*", or "A balanced ecosystem is Ecuador's greatest wealth." The ad copy details the CNA's efforts to protect mangrove forests and endorses government efforts to sanction those who continue to cut down mangroves. It also emphasizes that "more than a million Ecuadorians" depend on the shrimp industry, a dubious figure far above most estimates (Gaibor 1997). Of course, just because the shrimp industry has the economic means to publicize its claims does not imply that they will be believed. However, the CNA is at least able to present a positive image of the shrimp industry and defend it from ideological assault. It is probably no coincidence that the ad appeared in the same week that a highly publicized confrontation between a Greenpeace vessel and shrimp farmers in Esmeraldas province occurred (*El Comercio* 1998c).

The Marginalizing Power of Information

Thus, the shrimp industry, though not omnipotent, exercises a great deal of control over the means of production: land, labor, technology, and *information*. The artisanal fishermen are lacking in these things. They are marginalized in nearly every way. One might ask, do they lack information because they lack political power? Or do they lack political power because they lack information? Probably both. There is a complex, recursive relationship among the various forms of marginalization: political, economic, legal, social, informational.

Scientific data is a commodity. Those who have money and power are also able to buy accurate information about the environments in which they have a stake. Because they are poor, the artesanal fishermen lack this information. Because they lack this information, they are powerless. Does this necessarily mean that the traditional fishermen's understanding of their environment is not legitimate? At the very least, their understanding is illegitimate within the context of the dominant discourses. They can hope to make few successful challenges to the existing organization of power relations unless they are armed with legitimate and *legitimizing* scientific evidence.

Much has been made in political ecology over the importance of *perceptions*: different groups of resource users perceive the environment and environmental change in different ways, often in opposition to dominant discourses (Peet & Watts 1996; Peluso 1995; Zimmerer 1993). While this work is important, it must not descend into relativism. The realization that some discourses or ways of knowing or perceptions are privileged over others does not abrogate the need to challenge the dominant discourses on their own ground, to fight fire with fire, as it were. The traditional fishermen of Ecuador, along with many other subjugated

groups around the world, need concrete, quantitative evidence to support their struggle. Try as they might, researchers cannot ignore real-world concerns: “data,” “facts,” “information” will inevitably be put to use by somebody in a political battle. By accepting this self-consciously, researchers might direct their efforts to the people who they believe are most in need.

CHAPTER IV: CONCLUSION

In this thesis I have demonstrated that the costs and benefits of the development of shrimp farming have not been shared evenly across Ecuadorian society. Ecological degradation of mangrove estuaries is not merely an unfortunate side effect of aquaculture but a necessary condition for its rapid development. By appropriating resources once held in common for aquaculture enterprises, and shifting most of the environmental costs of this activity onto remaining common property resources, shrimp farmers limit their financial liability and thus increase their profits. Moreover, those who bear the greatest burden of degradation of the mangrove estuaries, artisanal fishing communities, realize few economic opportunities in the shrimp industry. While shrimp farming has generated substantial employment, most of it is centered in areas far removed from the farms themselves.

The encroachment of aquaculture activities in coastal and estuarine zones has generated many resource conflicts, primarily between shrimp farmers and traditional fishermen. However, the conflict between these groups can also be viewed as an ideological clash in which opposing narratives of social and environmental change are developed. The shrimp farmers' narrative has prevailed over that of the fishermen, primarily because the former has the social and economic power to acquire the tools that facilitate the integration of their narrative with dominant discourses in Ecuadorian society.

I contend that the success of the shrimp farmers' narrative will impact future coastal resource management policy in Ecuador. The arc of this narrative implies sustaining economic growth in the industry and constraining environmental impacts through cautious scientific management and private stewardship—in other words, a recipe for “sustainable

development.” It follows that the shrimp industry will consolidate control over the resources in the mangroves, not only for their own benefit, but for the sake of protecting the environment as well. From the shrimp farmers’ perspective, they have a vested interest in protecting the mangrove ecosystem and the economic resources to do so.

In March of this year, the CNA proposed that the Ecuadorian constitution be amended to enable a transfer of shrimp pond concessions to private ownership (*Diario Hoy* 1999). Under this plan, the government would give up the yearly revenue from concession payments but receive a lump-sum payment of about US\$60 million when these areas are alienated. Under present circumstances, with the Ecuadorian government extremely short on hard currency, this radical idea could become a reality.

However, I propose that increased privatization of the mangrove estuaries is ill-advised. Social and environmental conditions have worsened in the areas around mangrove estuaries as shrimp farmers have consolidated private control over resources. To continue this process would only worsen the circumstances of traditional user groups, maintain an unjust system of land and wealth distribution, and force unsustainable practices into other marginal ecosystems. On the other hand, I acknowledge that artisanal fishing may be an outdated and inefficient economic activity that cannot thrive in the late 20th century. Nor is it worthwhile to sustain it through subsidies and similar policy instruments.

What is the role of the PMRC in improving the conditions of artisanal fishermen? The PMRC has achieved success at many levels; simply fashioning such an ambitious Integrated Coastal Zone Management (ICZM) plan that seeks to incorporate diverse ecosystems and groups of social actors is an impressive feat, considering the relatively anarchic conditions that prevailed in the 1980s (Olsen et al. 1997). The PMRC and its surveillance arm,

the UCV, have been instrumental in decreasing the rate of mangrove deforestation, and in creating institutions for local self-governance.

Yet, the PMRC is both powerful and powerless at the same time. It exercises substantial power over social groups, such as small-scale fishermen, that have typically been neglected by the state and marginalized in the national economy. To some extent, with these groups the PMRC serves a quasi-governmental function, and has authority that is often accepted by local residents. However, the PMRC is also powerless, because it has no true authority to sanction violations of the law, such as mangrove deforestation—it can only coordinate the operations of government agencies that actually have jurisdiction in such matters. Moreover, participation in the PMRC management process is completely voluntary, so that those who feel they have an incentive to participate, such as poor residents who receive benefits in the form of infrastructure improvements, do; by the same token, those who feel that they have little to gain by dealing with the PMRC, such as most shrimp farmers, generally do not. Thus, the PMRC has little sway over the group that is probably most responsible for environmental degradation and social dislocation in the area over the last two decades. Instead, the PMRC concentrates on relatively trivial and unproductive efforts, such as controlling the disposition of bycatch by *larveros*.

Essentially, the PMRC is well-meaning but has no teeth. Their capacity for implementing true reform is extremely limited. Artisanal fishermen and other traditional resource users are unlikely to improve their lot without some outside assistance, but radical solutions are needed. I propose a fivefold plan:

- The Ecuadorian government should commit itself to restoring and protecting the rights of artisanal fishermen to make use of estuaries that are, after all, “property of the state,” not private property.
- Artisanal fishing communities along the coast of Ecuador should receive monetary compensation from shrimp farmers for the damage they have caused to the mangrove ecosystem over the years.
- These communities, and the nation of Ecuador in general, should increase funding to public education, so that the next generation in places such as Puerto El Morro is not obliged to join the ranks of artisanal fishermen simply for a lack of better alternatives.
- Biologists, ecologists, and other scientists interested in the protection of mangrove ecosystems should recognize traditional users of this resource, who presently lack the means to participate in scientific discourse, as allies in their conservation efforts. Thus, conservation science, especially environmental monitoring, should be applied to substantiate artisanal fishermen’s claims of a decline in wild mangrove fisheries. This recommendation applies not only to Ecuador, but also to other countries where mangroves and traditional users are under assault from aquaculture and other forms of economic development.
- Industrialized countries that are the main consumers of farmed shrimp should recognize their complicity in the degradation of mangrove ecosystems. International efforts to pressure the cultured shrimp industry to reform should be intensified. Certification of “environmentally friendly” and “socially just” shrimp through “green labeling” programs should be instituted so that the price of shrimp more closely reflects true social and environmental costs.

The chances of this plan ever being executed are slim. It is not practical in the context of contemporary Ecuadorian society and the reality of global economics. But those interested in the conservation of mangrove forests and the well-being of poor people who depend on them should not be fooled: continuation of or minor adjustments to the status quo will most likely lead to further environmental degradation and social inequality.

APPENDIX A: INTERVIEW CODES

Code	Date of Interview	Name	Occupation	Place of Residence
I-A1	6/16/98	(anonymous)	Larvero	Arenal
I-A2	6/20/98	José Molina*	Larvero	Arenal
I-A3	6/26/98	(anonymous)	Larvero	Arenal
I-D1 ^a	6/22/98	(anonymous)	Larvero	Data de Villamil ^b
		(anonymous)	Larvero	Data de Villamil ^b
I-G1	6/1/98	Nikita Gaibor	Biologist, INP	Guayaquil
I-G2	6/2/98	Leonardo Maridueña	Advisor to CNA	Guayaquil
I-G3	6/2/98	Manfred Altimirano	Biologist, PMRC	Guayaquil
I-G4	6/3/98	(anonymous)	Shrimp farmer	Guayaquil
I-G5	6/5/98	Mario Hurtado	Administrator, Proyecto PATRA	Guayaquil
I-G6	6/11/98	Rafael Elao	Biologist, PMRC	Guayaquil
I-G7	6/11/98	Raul Carvajal	Conservationist, Fundación Natura	Guayaquil
I-G8	6/15/98	Bolivar Maldonado	Director, CNA	Guayaquil
I-M1	7/5/98	(anonymous)	Shrimp Farmer	Manta
I-M2 ^a	7/6/98	(anonymous)	Shrimp packing plant worker	Manta
		(anonymous)	Shrimp packing plant worker	Manta
		(anonymous)	Shrimp packing plant worker	Manta
		(anonymous)	Shrimp packing plant worker	Manta
I-M3 ^a	7/6/98	(anonymous)	Shrimp packing plant worker	Manta
		(anonymous)	Shrimp packing plant worker	Manta
		(anonymous)	Shrimp packing plant worker	Manta
I-PEM1	6/17/98	Reynaldo Arriaga*	Shrimp farmer	Guayaquil ^c
I-PEM2	6/19/98	(anonymous)	President, Community Council	Puerto El Morro
I-PEM3 ^a	6/22/98	(anonymous)	Conchero	Puerto El Morro
		(anonymous)	Conchero	Puerto El Morro
		(anonymous)	Pescador	Puerto El Morro
I-PEM4	6/23/98	Vicente Márquez*	Cangrejero	Puerto El Morro
I-PEM5	6/24/98	(anonymous)	Student/conchero	Puerto El Morro
I-PEM6	6/25/98	Xavier Noboa*	Shrimp farmer	Puerto El Morro
I-PL1	6/19/98	(anonymous)	Fisherman/PMRC Council Member	Playas
I-PL2	6/25/98	José Luis Villón	Coordinator, PMRC Playas	Playas
I-POR1	7/3/98	(anonymous)	Aquaculture equipment supplier	Portoviejo
I-Q1	5/20/98	Franz Ríos	Biologist, CCD	Quito
I-Q2	5/26/98	Doris Ortiz	Biologist	Quito
I-Q3	5/26/98	Luis Suarez	Conservationist, EcoCiencia	Quito
I-Q4	5/27/98	Cecilia Cherrez	Conservationist, Acción Ecológica	Quito

Note: most informants were promised anonymity, except for the "professional" sector of government officials, conservationists and CNA executives. If a pseudonym was used in the text, it is denoted by an *. Unless otherwise noted, interviews took place in the informant's home town.

^a Group interview

^b Interview took place in Playas

^c Interview took place in Puerto El Morro

APPENDIX B: GLOSSARY

camaronera : shrimp farm

camaronero -a : shrimp farmer

cangrejero -a : person who captures crabs

CENAIM-ESPOL : Centro Nacional de Acuicultura e Investigaciones Marinas-Escuela Superior Politécnica del Litoral: an aquaculture institute associated with Ecuador's national polytechnic university

CLIRSEN : Centro de Levantamientos Integrados de Recursos Naturales por Sensores Remotos; a remote sensing agency affiliated with the military geographic institute

CNA : Cámara Nacional de Acuicultura, or National Aquaculture Council, a shrimp farmers' organization.

conchal : a conchero's gathering grounds

conchero -a : a person who collects clams, oysters, and other mollusks

DIGMER : Dirección General de la Marina Mercante y del Litoral, the National Merchant Marine, which has jurisdiction over estuaries and other tidal zones

estero, estuario : estuary

INP : Instituto Nacional de Pesca: the National Fisheries Institute, an agency of the ministry of agriculture and livestock

larvero -a : a shrimp postlarvae (shrimp fry) catcher

pescador -a : general term used for fisherman or woman; sometimes applied only to persons who capture finfish or shrimp in nets

PMRC : Programa de Manejo de Recursos Costeros: Coastal Resources Management Program

sucre : the monetary unit of Ecuador

UCV : Unidades de Control y Vigilancia: the coastal rangers' corps associated with the PMRC

ZEM : Zona Especial de Manejo: Special Management Zone of the PMRC. There are five of these zones on the coast of Ecuador

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