Habitat Restoration Governance for Mangrove-based Fisheries and Livelihoods Around Jiquilisco Bay, El Salvador

Gobernanza de Restauración del Hábitat para Pesquerías y Sustentos, Basadas en el Mangle, en Bahía de Jiquilisco, El Salvador

La Gouvernance de la Restauracion de l'habitat pour les Mangroves de la Pêche et des Moyens de Subsistence de Baie de Jiquilisco, El Salvador

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ABSTRACT

El Salvador is island-sized, natural-resource dependent, and highly vulnerable to climate change, making it comparable to many Caribbean *Small Island Developing States* (SIDS). It has a lengthy coast and many poor mangrove-dependent communities with a history of neoliberal government neglect, strengthening the comparison further. Since 2011, civil society and local agents have filled the governance void in the area around western Jiquilisco Bay with grass-roots programs for mangrove restoration, shellfish and crustacean fishery management, and efforts to eradicate a blast-fishing problem impacting an endangered marine turtle species. Through a discussion of these initiatives, this paper argues that absence of government does not mean absence of governance, although long-term prognostication for profit-based fisheries in the region cannot be optimistic. The theory and methods used for the findings described in this paper are customary in the qualitative branches of the social sciences. The approach taken is that of the discipline of human-environment geography.

KEY WORDS: Hybrid governance, habitat restoration, mangrove-based livelihoods, El Salvador

INTRODUCTION: SMALL COUNTRY

Structural adjustment programs imposed by international financial institutions (IFIs) following the end of the Civil War in 1992 left the small Central American nation of El Salvador with limited resources for environmental government. The majority of the population of 6 million people depend on subsistence agriculture and fishing for their livelihoods, unevenly augmented by remittances from the conflict diaspora working abroad, mostly in the United States. The major urban centers of San Salvador and San Miguel, although offering limited livelihood alternatives in the manufacturing and service sectors, are bedeviled by gang violence and substandard living conditions. With much of the highland area either too arid for successful agriculture or occupied by privately-owned coffee estates, and the fertile coastal plain devoted to estate-style export agriculture, primarily sugar at the time of writing, the surplus population is confined to marginal areas along the 300 km coastline. Human pressures on the natural resources of the coastline are high and needs are increasing.

There are four areas of significant mangrove cover along the coast, associated with watersheds draining the volcanic highlands. In the far west, the Barra de Santiago of approximately 3,000 ha of mangroves is connected to the national park El Imposible by the Guayapo River. It is separated by an extensive tract of rocky coastline and surfing beaches, including the world-class site at La Libertad, from the central Estero de Jaltepeque (17,600 ha of mangroves) which unites the rivers Cordoncillo and Tasajera, before emptying into the Pacific Ocean immediately west of the Lempa River, the largest river in Central America. The Lempa River enters the Pacific adjacent to the island of Montecristo, a fishing and farming community discussed in more detail below. Mangroves associated hydrologically with the mouth of the Lempa intertwine with mangroves more properly considered part of Jiquilisco Bay to the east (32,000 ha of mangroves) (Figure 1). Extensive sand beaches along the coastline are used for nesting by four species of marine turtle, and comprehensively managed by a combination of the Environment Ministry, local and international NGOs and local community development associations (Asociación para el Desarollo Comunitario, or ADESCO) (Wilmot 2014). The endangered Eastern Pacific Hawksbill turtle (*Eretmochelys imbricata*) is of particular concern to local communities as the population uses Jiquilisco Bay extensively for foraging, as well as the Bay of la Unión (13,000 ha of mangroves) in the larger Gulf of Fonseca, which is bordered by Honduras and Nicaragua. This paper is limited to the communities of the Lempa River and the western half of Jiquilisco Bay, whose members harvest crabs, clams and shrimp from the mangroves, as well as fish in the mangrove fringes. As part of their livelihood strategies, they also participate seasonally in a subsidized program to protect turtle populations through the harvest of turtle eggs which are incubated in hatcheries for later release into the open ocean (Liles et al. 2011).

Since colonial times, the economy has been agricultural and export-oriented, dependent chronologically on indigo, coffee, cotton, cattle and now sugar (Lauria-Santiago 1999, Williams 1986). This history of intensive land-use has lead to portrayals of the country as a deforested, environmental basket-case, a charge briefly refuted after the civil war (1980 - 1992) drove extensive rural-to-urban migration and out-migration, which allowed for forest resurgence (Hecht 2007). The abandonment of cotton plantations in the coastal plain allowed for significant re-growth of woodland, including mangroves, making the area around Jiquilisco attractive for resettlement of returning combatants from both sides of the civil war (Wood 2003). These early settlers were mostly originally from the highlands and had no prior experience of living in mangroves, although one community, Ciudad Romero (eponymously named for the assassinated Archbishop of El Salvador), spent over a decade in exile on the Caribbean coast of Panamá and gained considerable experience with community-based food production in the humid tropics. This community proved pivotal in resolving the disputes between the exiles and former

military, by partitioning land and lobbying for resources from the central government. It is also key to providing environmental governance through a social justice movement that developed locally called the Coordinadora del Bajo Lempa (the Coordinadora), and it's extension organization, Asociación Mangle (Mangle) (Reyes 2012).

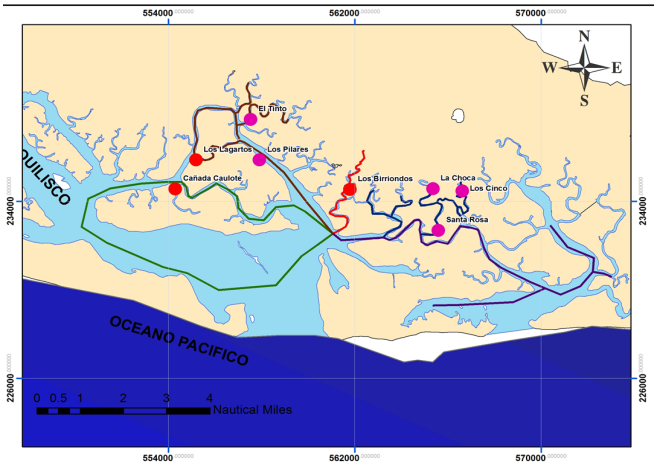

Figure 1. Map of western Jiquilisco Bay showing patrol routes as lines, known blast-fishing sites and mangrove destruction as circles.

BIG ISSUES

One of the early challenges the settler communities faced was access to the outside world. There was no infrastructure left from the plantation days, and no transportation other than foot. Community leaders from Romero formed the Coordinadora in response to a major flooding episode on the Lempa River, and used their organizational skills to pressure the central government in San Salvador to build an arterial road from the coastal highway into the hamlets of the Lower Lempa. This proved to be a double-edged sword, as it gave access to outsiders with trucks, guns, and chainsaws to come in and extract lumber and non-forest products unencumbered by law (Reyes 2012). The struggling peasants depended not only on maize and beans for their livelihoods, but also fish, turtle eggs, crabs, clams, charcoal, and other resources, which they harvested at will according to their needs. By 2007, a coalition of non-governmental entities from the capital, including an agency that disbursed debt-for-nature-swap funds from the US government, the Fondo Iniciativa de las Américas, El Salvador (FIAES) had joined forces with the Coordinadora and Mangle into pressuring the neoliberal government into designating the whole of the Lower Lempa and Jiquilisco Bay into a UN Biosphere Reserve, that of Xiriualtique-Jiquilisco. This titular structure overlay a mosaic of fifteen national protected areas (paper parks essentially) and a UN Ramsar site. Although not legally enforceable, it completely changed the discourse and enabled the Coordinadora to create an organization of resource guards to manage the relentless poaching from outside (Dávila 2011).

Another unfortunate legacy of the war was blast fishing in Jiquilisco Bay. Local sources suggest that it was instigated by an army colonel who gave some fishers grenades in exchange for fish, although there is no written confirmation of this account. At present, bombs are manufactured from easily available products from agricultural supply stores. While the damage to human life from these rudimentary devices has been considerable, the damage to the ecosystems of the bay is incalculable. There has been very little work done on characterizing the bay due to the destruction of the university system during the war, and the minuscule resources available to local scientists, most of the effort being directed towards establishing shrimp aquaculture in former saltpans in the northwest sector (Rivera and Cuéllar 2010). One effort to redress this data deficiency has been directed towards the endangered hawksbill turtle population, that not only nests on the beaches of the San Juan del Gozo peninsula, but also spends considerable time foraging in Jiquilisco Bay (Liles et al. 2011). Turtle mortality due to blast fishing is particularly troubling.

In addition to the challenges of resource depletion through over-use, poaching, and inappropriate harvesting technologies, are the complications of climate change. These are manifested primarily through droughts punctuated by extreme rain events. Sudden changes in salinity affect sensitive organisms, such as clams, and whole areas are rendered lifeless when the heavily-polluted Lempa River breaches its levees, as happened with Tropical Depression 12E in October 2011. Lack of baseline data and monitoring is most unfortunate in this instance as there was no understanding of where and how recovery efforts would be best directed. This was compounded by the absence of state aid and assistance, a phenomenon that has persisted despite massive injections of foreign aid both after the war and after Hurricane Mitch in 1998 (Wisner 2001). The 2009 election of the leftist Farabundi Martí National Liberation Front (FMLN), a coalition of five former guerilla groups, brought scant relief after four right-wing presidencies from the ARENA party. The incoming government inherited a corrupt, crony-based system considerably reduced in capacity to confront the myriad economic, security, and environmental challenges which it had inherited (Seelke 2012). A hybrid environmental governance system had already arisen to meet the challenges to the artesanal, mangrove-based fisheries of Jiquilisco Bay. Here, as analyzed by two distinguished scholars in a frequently cited review, we define environmental governance as "the reflection and projection of economic and political power via decisions about the design, manipulation and control of socio-natural processes" (Bridge and Perrault 2009). Hybrid governance is further defined as *an empirical approach that considers whether state or non-state actors determine the means and objectives of policy* (Brannstrom et al. 2012). In El Salvador, the state actor has traditionally been the Ministry of the Environment, the least-funded agency of the government, and the non-state actors are the Coordinadora, Mangle, FIAES and a US-based non-profit, Eco-Viva, that works almost exclusively in the Lower Lempa. Much of the impetus for change from the process of steady resource depletion has come from Mangle, whose founder, Arístides Valencia, was a guerilla leader during the war and is now an FMLN legislator representing the department of Usulután. The other legislator representing the department is Estela Hernández, herself a former President of Mangle, who holds a seat on the Environment Committee of the legislature. Innovations in environmental government in El

Salvador are driven by this committee, and not by the under-funded Ministry of the Environment. We consider the hybrid governance of three fisheries: clams, crabs and turtles.

CLAM FISHERY

Many species of mangrove clams are harvested worldwide, two of which are collected in Jiquilisco, known in the region as *curiles* (*Anadara* tuberculosa) and *casco de burro* (*Anadara grandis*). In common with other parts of Pacific Latin America, they are harvested and marketed by collectives from a 'commons' that is managed locally, but theoretically subject to manipulation and control by the state (Beitl 2012). Two communities within Jiquilisco Bay have adopted different strategies for managing clam populations so that they are not over-exploited, although there are indications that this is not entirely successful, as size classes for *casco de burro* have decreased over the past decade, and only older and more experienced clam collectors, or *curileras,* tend to find them (Wilmot 2014).

The first community, on the southern edge of the bay, at Isla de Méndez adopted a strategy of moving their harvesting grounds around every six months, so that clam populations could recover before another intense period of exploitation took place. Two naturally occurring events disrupted this system, however. In 2009, an unusually large flock of Black-bellied whistling ducks (*Dendrocygna autumnalis*) settled on the mangroves at a roosting site called 'Palacio de las Aves', perhaps due to drought conditions elsewhere. Within a few weeks they had physically destroyed the trees, leading to soil erosion and thus loss of clam habitat. The Ministry of the Environment permitted a cull and the birds have not returned in such numbers since. The clam collectives of Méndez with the help of NGOs established a reforestation program for red mangroves at the site which has proven remarkably successful, unlike some other planting efforts in the area (Argueta, unpublished data, Weller 2012). It is anticipated that clam collecting can be resumed there in the near future. A massive weather event, Tropical Depression 12-E in October 2011, broke the levees along the Lempa River and deluged the western end of the bay with freshwater carrying presumed heavy burdens of industrial and fecal contaminants from the San Salvador area, which became impounded and stagnant for long enough that almost all the clams were killed, leaving the *curileras* without their alternative collecting grounds. Since the average collector is poor even by local standards, it is politically difficult even to talk of an outright ban on collecting. The problems of die-offs after major rain events and over-harvesting thus seem intractable, although loss of mangrove habitat has proven remediable at a small local scale.

The second community, at Puerto Parada, on the northern side of the bay adopted a slightly different approach to overharvesting. With funding from the Japanese government and institutional support from the fisheries agency CENDEPESCA, a program to grow out spat on artificial structures within the mangroves was adopted, and this proved quite successful for as long as the funds were available (Noticias 2010). The population of Puerto Parada (1500) is larger than that of Mendez (600) and voluntary avoidance of fishing grounds on a community basis is impossible to enforce. There had also been limited input from traditional policing until EcoViva brokered an arrangement with the local force to enforce environmental laws already on the books.

CRAB FISHERY

Residents of the Lower Lempa, like many denizens of mangroves, harvest crabs as an important source of dietary protein. A preferred species is *Ucides occidentalis*, known locally as *punche.* Crabs are collected by two methods. One involves the *punchero* plunging an arm into the crab burrow and physically removing the animal, a risky approach to say the least. The second involves the construction of a wooden trap which is placed over the mouth of the burrow in the evening and checked in the morning. This is more costly in terms of effort, and leaves itself open to poaching if the *puncheros* don't get to their traps in time. A single ball of mangrove crabs tied together with twine can fetch US$10 on the coastal highway before noon, with the price falling towards evening as they take time to prepare and mortalities occur overnight. The village of Montecristo at the mouth of the Lempa River has a mature collective with access to extensive areas of black mangrove (*Avicennia germinans*) and a marketing system that involves a member of the collective taking a night's catch to the coastal road via motor launch and motorbike in the morning, returning with the proceedings for redistribution in the evening. If gas prices are high and the catch small, it is not worth the effort. The *puncheros* cannot influence global commodity prices, but they can work towards higher catches through proactive management of their resources. Two factors pushed them towards this route. One was that entry into the fishery was unregulated. A young boy from a neighboring community, La Tirana, started catching dozens of gravid females from Méndez common grounds and selling them outside the collective to a restaurant, breaking all the unwritten codes of the collective. The second was that members of a community across the river were coming over at night in a motor launch and emptying the traps to sell to the weekend tourists that come to the beach by road from the capital. This is a market that is closed to Montecristo for access reasons, both physical and political.

According to the President of the Montecristo collective, it met many times between 2011 and 2013 and came up with consensus on the following resolutions called the Local Plan for Sustainable Use (Plan Local para Aprovechamiento Sostenible, PLAS) (Geovanni Díaz, personal communication):

i) To seek recognition as a legal entity under Salvadoran law from the Ministry of Environment; they were sworn in by the Vice Minister in 2012,
ii) To work with the community of La Tirana in zoning harvesting grounds for each community,
iii) To establish limits on entry into the fishery; approval by the collective after discussion is necessary and each member has marked traps,
iv) To set up closed areas on a seasonal basis,
v) To establish size limits so that juveniles are not taken; no animal under 6cms carapace length is accepted,

vi) To build a guard house at the entrance to the creek from the Lempa which both communities share; FIAES funded this,
vii) To maintain a rotation of *puncheros* every night to hold vigilance in the guard house; three people take turns every 19 days, and
viii) To prohibit the taking of gravid females; the collective will not market gravid females.

It should be noted that no-one at Montecristo has more than a high-school education, yet these community-based decisions are quite in keeping with science-based management of small-scale fisheries (Berkes et al. 2001). In order to cope with over-harvesting, harvesting of juveniles and gravid females and to control poaching, the grassroots effort came up with time- and labor-intensive solutions on their own, with no scientific input, government regulation, or financing from outside, apart from construction of the guard post. As Ostrom (2009) argued, however, over the long-term, without some form of government support, the burden will become too much and the system will become unsustainable. Through coordination with Mangle, FIAES and EcoViva, and other NGOs have provided material support for daytime resource guards to work in the mangroves around Montecristo, occasionally supplemented by funding from the Ministry of the Environment. Although the guards are armed with nothing more than machetes and their personal cell phones, they have helped through persistent education and pressure to reduce the levels of unwanted harvesting of *punches* from the area, and live in hope that they will eventually become government employees.

TURTLES

A week after being tagged with a radio transmitter in 2012 'Manglita', a female eastern Pacific hawksbill turtle, was killed by blast fishers. She had spent the entire time foraging in and around Jiquilisco Bay (Liles, personal communication). Blast fishing has taken place in the bay for the past 34 years, but only in the past three have records been maintained. During that time, eight turtle deaths have been recorded from Puerto Parada and three from Isla de Méndez. Efforts are being made by both communities to bring the situation under control. Although it is an illegal activity in El Salvador, which is a signatory to CITES, insufficient law enforcement resources are committed to environmental crimes. In Isla de Méndez the local development association, ADESCOIM, has spearheaded the effort, with the help of 24 members of a fishing cooperative, and in Puerto Parada Cooperativa, El Flor has united with three others to bring 143 members into the program (Table 1). There are fewer than 100 blast fishers in the entire bay, but the damage they inflict through bycatch impacts the whole region. The role of the Iniciativa Carey del Pacífico Oriental (ICAPO) as the primary conservation organization and EcoViva as a funding source within the bay has far outshadowed any effort by the Ministry of the Environment or the Zoological Society in El Salvador, FUNZEL.

Liles et al. (2011) describe the conservation efforts to enhance the populations of *Eretmochelys imbricata* and other nesting turtles in El Salvador through the egg collecting and hatchery program that has been established in several coastal communities. The practice of engaging turtle egg-collectors for human consumption in non-consumptive cash-for-eggs programs as a conservation measure is widespread in the region (Campbell 2007). What is novel in the Salvadoran turtle conservation effort is the grassroots effort to enhance the livelihoods of blast fishers through a program to create artificial reefs associated with improved dwellings for the fishers. Blast fishers exist on the margins of bay society, socially, economically, and physically. They live in stilt dwellings on the water territorially associated with an area of mangroves which they use to harvest clams, and from which they move around the bay, often into other communities' territories in order to fish for cash. The impetus to assist them to become better integrated community members comes from other fishers, organized in cooperatives, with the help of Mangle in Isla de Méndez and the sister organization Cincahuite in Puerto Parada. The hatcheries receive funding from FIAES and other organizations, and technical support from ICAPO and other organizations. The program involves the creation of artificial reefs as fishery attraction devices (FADS) which replace the structures made of mangrove branches that have habitually been used to draw fish before the bombs are tossed into them. The artificial reefs are located near to the stilt dwellings so that they can be monitored for poachers around the clock. Since it is now illegal to cut mangroves in the bay, many of the stilt dwellings are in a dangerous state of disrepair. EcoViva has started a program to replace them with platform houses floating on drums, which have great acceptance, in exchange for compliance with fishing gear guidelines. Anyone living in a floating house with its own reefs must agree never to blast in the bay again, and only use hook and line to catch finfish. Some of the former blast fishers are now also ecotour guides, using their considerable ecological knowledge of the bay for non-destructive financial gain. Descriptive statistics of the pilot effort are summarized in Table 1.

Table 1. Data on blast fishing in Jiquilisco Bay, El Salvador 2011-2013.

	Isla de Méndez	Puerto Parada
Years of blast fishing	34	34
Turtle deaths, past 3 years	3	8
Fisher coops	1	4
Fishers in program	24	143
Artificial reefs	120	160
Floating houses	1	4
Program cost	US$5000	US$8000

DISCUSSION

Berkes et al. (2001, p. 177) reviewed collective action management in small-scale fisheries, and noted that *fishing societies are capable of making their own rules to manage resources on which their lives depend*, and further that the rules are focused on fisher behavior and non-quantitative controls. The perception of a problem in the commons in Jiquilisco Bay developed very recently. After a hiatus in significant human settlement of many years (due to the

war) ended in the Peace Accords and resettlement in 1992, an increase in pressure on natural resources was sudden and intense. As noted earlier, most of the new inhabitants had no prior experience of living in the region, and therefore no immediately relevant ecological knowledge they could apply. What they did have from the war and diaspora experiences was a sense of collective action in other arenas which could be applied in an ecological context. The conservation measures employed in the clam, crab, and turtle fisheries could have been drawn directly from Johannes' work in the Pacific, summarized in Berkes et al. (2001, p. 178): closed fishing areas, closed seasons, slot sizes, ban on taking of turtle eggs, gear restrictions. Johannes notes however, that traditional fishery management systems based on reciprocity and exchange cannot function within capitalist economic systems, so that managing fisheries for surplus and for profit is unsustainable in the long term (Johannes 1978, p.356).

The transaction costs for community management can be high, and as Ostrom observed, where moral and ethical standards are not shared, the costs rise considerably, presenting the sensible strategy of opting out of group management (Ostrom 2009). In Jiquilisco Bay in the absence of substantive input from the Salvadoran government, much of the financial burden for conservation is borne by EcoViva and FIAES, with outside funding based on philanthropy and politically based agreements. While the arrangement of hybrid governance of marine resources is in existence, with little direct input from the Salvadoran government or the US government, the arrangement works reasonably well. Absence of government is clearly not absence of governance. If the US government decides not to fund FIAES, or the EcoViva support base thins with restrictions in the global economy, the long-term prognostication is not promising, as intensified pressure on resources is likely to be the outcome to maintain the money-based economy of the fishers. If on the other hand, the communities around the bay opt for subsistence fisheries and adopt other, more traditional, holistic behavioral measures, they may in the long term achieve a system of management that Johannes would consider self-sufficient.

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