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Local Management of Mangrove Forests in the Philippines: Successful Conservation or Efficient Resource Exploitation?

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Recent environmental "narratives" suggest that local people are effective stewards of forest resources. Local restoration and management of mangrove forests, in particular, are now widely advocated as a solution to achieve both economic and environmental conservation goals. This paper presents findings from a study of 2 coastal sites in the Philippines that are renowned and often showcased as success stories in community-based, mangrove reforestation and management. These cases are especially intriguing because local tree planting and management emerged in both areas long before governments and nongovernment organizations began to promote such activities. These management systems are a successful economic innovation in that planted mangroves protect homes and fish pond dykes from wave and wind damage, and the production of high-value construction wood is dramatically enhanced through intensive plantation management. Mangrove plantations are an efficient alternative to harvesting from unplanted, natural mangroves and their spread may reduce harvesting pressures on existing forests. However, mangrove plantations are structurally and compositionaly very different from unplanted forests, a finding of particular concern given that such plantations are increasingly encroaching into and replacing natural forests. Furthermore, planted forests are not typically viewed by planters in terms of their environmental conservation values and are frequently cut and cleared to make space for alternative uses, especially fish farming and residential settlement. The suggestion that these local mangrove management systems are successful for conservation thus needs to be qualified.

KEY WORDS: community-based conservation; indigenous forest management; environmental narratives; mangroves; Philippines.

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INTRODUCTION

Governments are no longer viewed as the sole or even primary stewards of forest resources. Increasingly, policies and programs are crafted with the intent of enlisting local people as partners in forest land management. This reflects past failings of state management, plus a growing sense that local people can be both empowered and effective as resource stewards (Poffenberger, 1990; Poffenberger and McGean, 1996).[2] In fact, research in human ecology has revealed many cases where local people manage forests without government oversight (Anderson, 1990; Posey and Balee, 1989; Redford and Padoch, 1992). Some researchers even suggest that forests have been created and "enriched" over time as a result of local practices (Fairhead and Leach, 1995; p. 1028, 1996; Posey, 1984, 1985; but for critiques of this view, see Nyerges, 1998; Parker, 1992, 1993; Redford, 1992). These findings have encouraged a revision of the standard environmental narrative away from one in which rural people were cast as destroyers of forests, and toward one where they are seen as responsible forest stewards (for a discussion of these changing narratives, see Conklin and Graham, 1995; Eghenter, 2000; Fairhead and Leach, 1995). Consistent with this narrative is the assumption that forest management by local people will accomplish both development and environmental conservation objectives.

This revised narrative is increasingly embraced by researchers, activists, and policy makers concerned with the conservation of mangroves. Under past state management, vast tracts of mangrove forest throughout the tropics have been cleared for brackish water aquaculture ponds, cut for firewood and timber, and cleared for residential and urban development (Bailey, 1988; Dewalt *et al.*, 1996; Hamilton *et al.*, 1989; Meltzoff and LiPuma, 1986; Naylor *et al.*, 1998). The Philippines, in particular, has lost 70% of its original mangrove forests, mostly due to fish pond development (Baconguis *et al.*, 1990; Primavera, 1995; Siddall *et al.*, 1985). Cutting of mangroves for fuel wood and construction materials by coastal residents is also widespread and contributes in many areas to the continued degradation of remaining forests

[2]That local people can serve as effective forest stewards is presumed, if not overtly stated, in many such policies. For example, the belief is revealed in the title of the cornerstone policy on local forest management in the Philippines, Executive Order No. 263 of 1995: "Adopting Community-based Forest Management as the National Strategy *to Ensure the Sustainable Development* of the Country's Forestlands Resources" (italics mine). It is likewise expressed in the preamble to the Order, which recognizes . . . "the indispensable role of local communities in forest protection, rehabilitation, management, and utilization . . ." and further states that . . . "entrusting the responsibility for forest rehabilitation, protection and conservation to the community of stakeholders and affording them equitable access to the forest and coastal resources are viable forestland management strategies as born by the experience of the DENR and various supporting agencies" (DENR, 1996:242–243).

(Eusebio *et al.*, 1986). At the same time, support for the revised narrative comes from discoveries of cases in the Philippines and elsewhere in which local people have actively planted and manage mangrove forests entirely on their own initiative (Cabahug *et al.*, 1986; Fong, 1992; Smith and Berkes, 1993; Walters, 1997; Weinstock, 1994; Yao, 1996).

Mangrove reforestation and management are thus now being promoted enthusiastically by governments, nongovernment organizations, and aid agencies throughout South and Southeast Asia, and increasingly in Africa, the Caribbean, and Latin America (e.g., Kairo, 2002; Kaly and Jones, 1998; Lewis, 1990; Melana *et al.*, 2000; Saenger and Siddiqi, 1993; Thorhaug, 1990). Local people are typically viewed as potential partners in such reforestation efforts, and it is commonly assumed that their participation will enhance reforestation success by cultivating local stewardship of newly planted forests.

However, initial studies of mangrove reforestation and management give reason to pause. For example, recent reforestation projects in the Philippines and elsewhere have experienced high postplanting mortality (Calumpong, 1994; Lewis, 1990; Pomeroy *et al.*, 1996; Primavera and Agbayani, 1996; Saenger and Siddiqi, 1993). Even where initial planting has succeeded, it is still not clear whether local mangrove reforestation and management are likely to achieve desired economic and environmental conservation objectives, like the preservation of forests and biodiversity, over the long-term. One way to better understand this is to study local management systems that are already long-established.

This paper presents research findings from a study of two coastal sites in the Philippines — Bais Bay and Banacon Island — that are renowned and often showcased as long-established "success" stories in community-based mangrove reforestation and management. It will show that local people in these two areas were often "successful" at restoring and managing mangrove forests, at least where socioeconomic criteria were used as the basis for evaluation. However, these local management systems were less successful in terms of achieving environmental conservation objectives.

STUDY AREA AND RESEARCH METHODS

This research is based on field work conducted in 1997 in Bais Bay (9N/123E) and on Banacon Island (10N/124E), Philippines. Bais Bay is located on the eastern side of Negros Island and occupies an area of about 5400 ha. The Bay is divided into North and South by Daco Island and a constructed causeway that connects Daco to the mainland (Calumpong and Luchavez, 1997; Walters, 2003). Fifteen different villages ring North and South Bais Bay, each ranging in size from a few dozen to several

hundred households (Fig. 1). A majority of coastal residents here derive their principal income from fishing, aquaculture, or related activities (Luchavez and Abrenica, 1997). Mangroves fringe much of the coastline of North and South Bais Bay, and there is a large, contiguous stand of forest (app. 200 ha) that extends as a peninsula across the front of South Bais Bay (Calumpong, 1992).

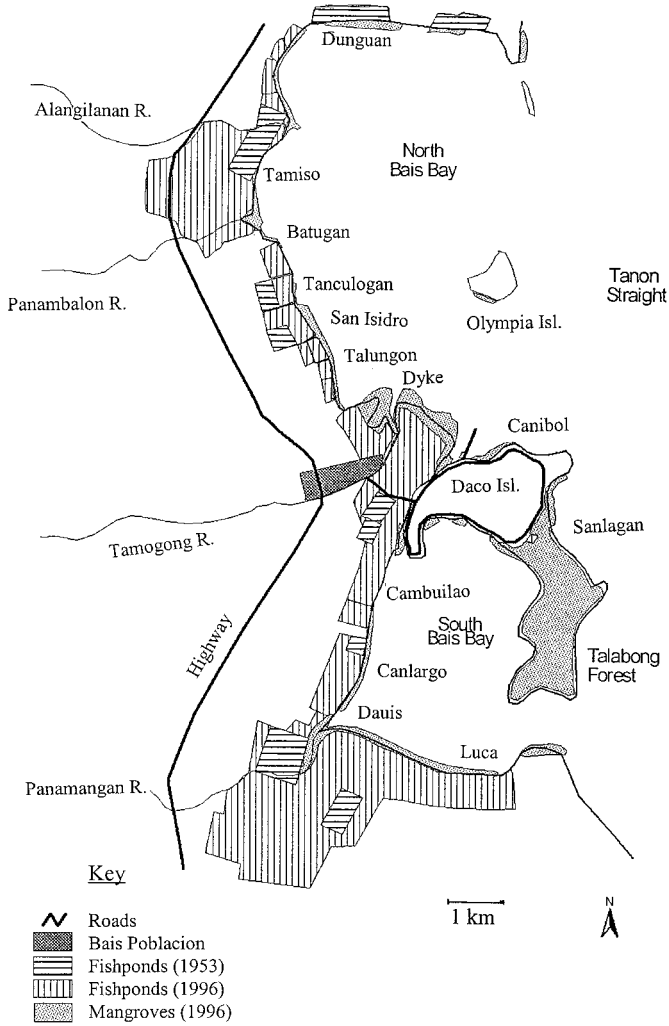

Fig. 1. Map of North and South Bais Bay, Philippines, showing location of coastal villages and distribution of mangroves and fish ponds.

By contrast, Banacon is a small, remote island, located 5 km off the northwest corner of Bohol Province and about 30 km east of Cebu City (Cabahug *et al.*, 1986). Over 95% of Banacon Island is forested in mangroves, but approximately 500 households are crowded onto 15 ha of dry land on the eastern tip. Virtually all of these households derive their principal income from fishing and related activities (e.g., fish processing, marketing, etc.).

Both ethnographic and ecological methods were used in the study. I interviewed 215 coastal residents in the study areas, 158 of whom had planted mangroves. In the interviews, people were asked about the history of mangrove changes; their motivations to plant mangroves; their experience with plantation management; etc. All plantation sites were visited to verify claims made by interviewees and I observed cases of planting first hand. Unpublished government reports and statistics and historical documents, including past minutes of the local City Council (1950–1997), were also studied.

Ecological data presented here are based on assessments of trees in 52 forest quadrats, each 100 m^2 (for a discussion of the quadrat method, see Cintron and Schaeffer-Novelli, 1984; Peters, 1996). Thirty-three mangrove plantations were surveyed this way, ranging from 5 to 60 years of age (mean = 30.3 years). Nineteen different unplanted, natural forest sites were similarly surveyed. Some of these "natural" forests had been impacted by past cutting and others were locally protected, but none displayed evidence of prior planting. Nearly 6,000 trees and 2,000 seedlings were measured in the 52 quadrats. Species identification was on the basis of Calumpong and Menez (1997). For a more detailed description of these methods, see Walters (2000, 2003).

MANGROVE CUTTING, PLANTING, AND MANAGEMENT IN BAIS BAY

Mangrove wood burns exceptionally hot and evenly and so has long been preferred as both a domestic cooking fuel and a fuel for commercial bakeries in the Philippines (Brown and Fischer, 1918; Jara, 1987; Wernstedt and Spencer, 1967). Over the past century, people living along the coast in Bais Bay relied heavily on cutting mangroves for domestic fuel and construction wood, especially for use as posts in fish weirs, called *bunsod*, which are abundant in the shallow waters of North and South Bais Bay. Between the 1930s and 1979, mangroves in the Bay were also heavily cut and the wood sold to bakeries in nearby towns under the auspices of a Minor Forest Products Lease (MFPL) that had been issued to a local entrepreneur by the then National Bureau of Forestry.

Mangroves in Bais Bay have also been cut and cleared to make space for other uses. Undoubtedly, the largest impact on mangroves came from the

expansion of brackish water aquaculture. Between 1930 and 1980, close to 1000 ha of mangrove lands were cleared and converted to fish ponds in North and South Bais Bay (Walters, 2003; Fig. 1).[3] These ponds are completely devoid of mangroves while operational, although natural recolonization of forest has been observed in several abandoned ponds (personal observation). About 30 ha of mangrove in Bais have also been cleared since the 1960s to make space for residential housing for landless residents of Bais City.[4]

Mangrove cutting in Bais has slowed considerably in recent years—the combined result of several factors. For one, the MFPL was canceled by the national order in 1979 and consumption of mangrove wood by bakeries made illegal. All bakeries in the area that formerly burned mangrove wood now use either gas or other, dryland, wood species (e.g., *Leucaena, Gmelina*). The national government has also tightened requirements for new fish pond lease applications, making it more difficult for prospective entrepreneurs to obtain legal permits to clear forest. At the local level, the largest remaining tract of natural mangrove in Bais Bay, the Talabong, was designated a Marine and Wildlife Sanctuary by the City of Bais in 1986 (Fig. 1). This was followed in the early 1990s by a general city ban on the cutting of mangroves from all unplanted forests in the Bay. Illegal cutting is punishable by fine and, in the case of repeat offenders, incarceration. Local cutting restrictions are also increasingly enforced by private individuals who have planted and/or laid claim to specific stands of mangrove forest.

Many people in Bais still use mangrove wood for domestic fuel and especially for bunsod construction (Table I). However, the aforementioned cutting restrictions have caused many to switch to alternative sources, especially for fuel: *Leucaena leucephala* wood, coco fronds, and natural gas are now commonplace fuel substitutes in many coastal households (Walters, 2003).[5] Wood for bunsod posts is now mostly cut from locally-managed, mangrove plantations, although some now buy posts cut from nearby, upland forests of *Leucaena* (Table I).

Local planting and management of mangroves in Bais Bay emerged in the early 1900s. Early planting was done to provide a ready source of construction materials, especially posts for bunsod. As coastal populations grew in later years and mangroves were extensively cleared to make space for seaward-expanding fish ponds and residential settlements, people also

[3]Expansion of brackish water aquaculture nationwide during this period led to the loss of over half of the country's mangrove forests (Baconguis *et al.*, 1990; Primavera, 1995).

[4]Landlessness in Bais is commonplace and results, in large part, from the historical concentration of private land in the hands of a few families (Walters, 2003).

[5]Of 34 persons I asked who currently obtain fuelwood from alternative sources, 29 indicated that they used to cut such wood from unplanted mangroves. All but one of these indicated that increased government cutting restrictions were a factor influencing their decision to no longer cut mangroves and switch to alternatives.

Table I. Sources of Wood for Fuel and *bunsod* (Fish Weir) Posts in Bais Bay. Data Represent the % of Coastal Residents (With Number in Brackets) Indicating That They Obtain Wood From Said Source

	Sources of wood (% respondents using)		
	Plantation mangrove	Natural mangrove	Non-mangrove source
Fuelwood ($n = 123$)	23 (28)	28 (34)	80 (99)
Bunsod posts ($n = 52$)	81 (42)	10 (5)	31 (16)

began to plant mangroves to protect their homes and fish pond dykes from wave and wind damage. Most fisherfolk who live along the shore are unable to afford concrete or stone housing materials and so their homes are at great risk during storm events, especially typhoons. The strong trunks and structurally complex, above-ground root systems found in mature mangrove plantations provide an effective wind and wave break in most cases. Likewise, storm waves will blow holes through earthen fish pond dykes that are directly exposed to the sea. Alternatively, in areas where planting is not feasible fish pond owners will often make costly reinforcements to sea-facing dykes using stone or concrete.

Interviews of mangrove planters and observations of planted sites indicate that storm protection and bunsod construction are equally common today as motivations to plant (Table II). Other, less common motivations include the desire for firewood and to appease government officials who now allocate household mangrove leases under the condition that leaseholders plant.

Also worth noting is the finding that some planting was motivated more for strategic reasons than out of a desire to obtain particular wood products. Specifically, some people planted to enhance their security of tenure to sites and for land speculation (Table II). In these cases, people acknowledged

Table II. Motivations to Plant Mangroves. Figures Represent the Percentage of Resident Planters Indicating Said Motivation

Motivation to plant	% planters ($n = 190$)
Storm protection	47
Bunsod construction	44
Told to plant by officials	14
Firewood source	12
Tenure security	10
Capital investment	10
Other construction wood	6
Paid to plant	5
Land speculation	3
Amusement	3
Good for ecology	2

Table III. Environmental Factors Cited by Planters to Have Caused Mangrove Planting Mortality or Constrained Mangrove Planting in Bais Bay. Figures Represent Percentage of Respondents

Constraints to planting	% respondents ($n = 171$)
Shell infestation	42
Human or animal disturbance	26
Space limitation	22
Wave exposure/tide inundation	21
Substrate/soil quality	18
Entanglement by seaweed or garbage	14
Pest infestation	5

that competition for intertidal space was a concern and used planting as a means to enhance their tenure claims to otherwise common property lands (Walters, 1998). Often their goal was to eventually use the planted area for another purpose. In fact, numerous cases in Bais were documented where local people had planted mangroves, only to later cut them down to make space for a new house or fish pond (personal observation). Likewise, a number of people planted mangroves as a capital investment, not interested in the wood per se, but rather the money that selling the wood might bring in the future.

Mangrove planting today occurs in almost every village in North and South Bais Bay, but the distribution of plantations is uneven because environmental and social factors preclude the successful establishment of plantations at many sites. Many efforts to plant were unsuccessful because seedlings were destroyed by waves, shell infestations, or other persons disputing the rightful claim to an area (Table III; personal observation). Also, land ownership along the mainland coast of Bais is skewed with large land and fishpond owners staking claims to extensive shoreline. While many of these large holders plant mangroves, they sometimes have precluded others who lacked property from planting adjacent to their land. The net effect of these various factors is a patchy distribution of plantations, with most concentrated in bands along the shoreline, fronting either residential settlements or fishponds (personal observation). In total, there are several hundred mangrove plantations in Bais, varying in size from about 10 m^2–3 ha.

Management of mangrove plantations in Bais Bay is typically intensive. Most people plant only one species of mangrove tree, *Rhizophora mucronata* (Table IV), and typically at very high densities (100–2,500 seedlings per 100 m^2). *Rhizophora* spp. produce seeds in the form of viviparous propagules that can be picked off a branch when ripe and simply placed in mud, whereupon they will begin to sprout roots and leaves if conditions are suitable and the seedling is not damaged. Other tree species are often cut back or weeded out of planted areas. Among mangroves, *R. mucronata* is par-

Table IV. Percentage of Mangrove Planters in Bais Who Claim to Have Planted Different Species

Species planted	% planters ($n = 158$)
R. mucronata	99
R. apiculata	6
A. marina	4
N. fruticans	4
Sonneratia spp.	2
B. cylindrica	1
C. decandra	1

ticularly easy to plant because it reproduces with abundant propagules that can be readily identified, collected, and transplanted. This contrasts with other common local species that either produce fewer propagules (*R. apiculata*) or germinate by seed (*Avicennia* spp., *Sonneratia* spp.) and so are more difficult to establish. Second, *Rhizophora* trees grown at high densities produce straight stems, the wood of which is especially strong and heavy and so preferred as posts for bunsod.

Plantations valued for storm protection in Bais Bay are usually not cut by their owners, although branches, dead wood and the occasional live stem may be removed and consumed as fuel or construction wood. By contrast, plantations valued primarily for construction wood are selectively harvested when stems reach a desired size. For most, this means cutting stems that are 2.5–5.0 cm dbh, the preferred size for posts used in bunsod construction in Bais. Less frequently, trees are allowed to grow to a larger size whereupon stems are cut for use as beams in the construction of homes, wharves, etc.

That such plantations are potentially an abundant and efficient source of construction wood can be illustrated with reference to data on *Rhizophora* stem size distribution in plantations and unplanted forests (Fig. 2). These data reveal that, in contrast to unplanted mangrove forests, plantations have 20–25 times higher density of *Rhizophora* stems in the most desired size class (2–5 cm dbh). Thus, not only are plantations likely to be more proximate in location to wood consumers, but they clearly enable a more efficient production of desired wood products. The value of plantations as a source for wood is all the more obvious today in light of the increased cutting restrictions over most mangroves in Bais Bay.

It should be obvious from the foregoing summary that plantations are qualitatively different from unplanted, natural mangroves. Detailed analysis of structural and compositional differences between the two forest types has been done and the results presented elsewhere (Walters, 2000). The profound difference can be estimated here from data on species composition alone (Table V). These data show that plantations in Bais Bay are species

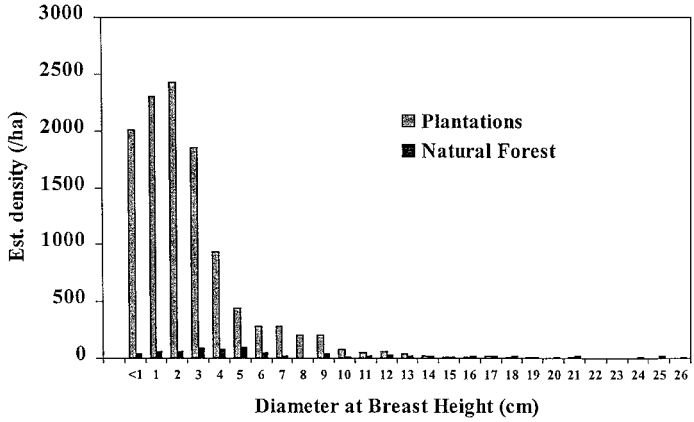

Fig. 2. Size-frequency distribution (dbh) of live *Rhizophora trees* (per ha) in natural and plantation forests in Bais Bay.

poor compared with unplanted forests, being almost completely dominated by the one species that is usually planted (*R. mucronata*). The significance of species richness differences are even more striking when considered in relation to plantation age. For while it might be thought that younger plantations evolve into more diverse forests with time, this was not found to be the case. Plantations ranging from 5 to 60 years were similarly monospecific, and this pattern held across a wide variety of sites and management protocols.

Table V. Species Composition (% Abundance) of Live Mangrove Trees (n) in Natural and Plantation Forest Plots in Bais Bay

	Percent (%) abundance	
Species	Natural forests ($n = 799$)	Plantation forests ($n = 4310$)
R. mucronata	4.9	89.2
R. apiculata	8.9	0.5
A. marina	54.3	9.1
S. alba	11.9	0.2
S. caseolaris	4.9	0
C. decandra	7.6	0.3
O. octodonta	5.6	0
B. cylindrica	0	0.6
B. gymnorrhiza	0.9	0
X. granatum	0.6	0
Other species	0.4	0.1
Total	100.0	100.0

MANGROVE CUTTING, PLANTING, AND MANAGEMENT ON BANACON ISLAND

Lacking alternative wood sources, residents on Banacon have always relied on local mangrove forests to meet virtually all of their domestic fuel and construction wood needs. A Minor Forest Product Lease (MFPL), similar to that in Bais Bay, was applied to Banacon Island between the mid-1950s and 1979. Under this MFPL, mangroves were harvested for transport and sale to bakeries and other industries in Cebu City, 30 km away by sea. The MFPL was bitterly contested by the locals who were restricted from cutting mangroves under the lease. As in Bais, the MFPL on Banacon was canceled in 1979 by national order, although not until most of the original forest of the island had been degraded from cutting. In 1981, Banacon Island received Wilderness Area designation under Presidential Proclamation No. 2151 (DENR, 1990). Despite this designation, local people continued to cut mangroves to meet most of their domestic fuel and construction needs. However, virtually all of this wood is today harvested from locally managed plantations that have replaced much of the original forest on the island.

Mangrove planting was first introduced to Banacon Island in 1957/8, but has since become widely practiced throughout the community. Although people on Banacon generally recognize that mangroves are important for sustaining locally important crab and shell fisheries, they are entirely dependent on mangroves for wood, and most plant with the intent of harvesting wood for construction of their homes, fences, and bunsod. Many also plant mangroves as a contingency investment with the knowledge that they can sell their trees if and when extra cash is needed. For example, buyers occasionally visit the island to purchase posts for use in the construction of buildings or aquaculture operations elsewhere. Planted parcels on Banacon are also bought and sold while the trees are still standing, and certain wealthier individuals in the community have come to acquire through purchase numerous parcels that others have planted.

Most of the planting on Banacon has been done in extensive areas that were previously occupied by diverse, natural forests, but subsequently degraded by cutting under the MFPL. In fact, planting today actually erodes the remaining unplanted forests of Banacon because, as they plant, people typically cut back the existing trees that remain on the site so as to make more space for the planted trees. With so much suitable planting habitat and a relatively small resident population, problems of planted seedling mortality and conflict over space are infrequent here compared to Bais Bay. Management of individual plantations is intensive, although relatively little maintenance is required once the trees have been established until they are cut. Only one species, *R. stylosa*, is planted on Banacon. *R. stylosa* has

similar reproductive and wood quality characteristics to *R. mucronata*, the species most commonly planted in Bais Bay. (*R. mucronata's* absence from Banacon Island is thought to reflect the more sandy soils there). Trees are typically planted at high densities (200–900 seedlings per 100 m^2) and in stands ranging in size from a few hundred m^2 to about 4ha. As in Bais, other mangrove species are often cut back or weeded out from planted sites (personal observation). Approximately 400 ha of plantations have been established on the island.

The net effect of widespread planting and management on Banacon Island has been the creation of hundreds of small patches of forest that cumulatively form a large, monospecific mosaic of different-aged stands which are separated only by the occasional walking or boat path. The entire mangroves of Banacon received national Wilderness Area designation in 1981 (DENR, 1990), but this has in no way deterred local people from continuing to plant and cut mangroves there. As already described, this contrasts with Bais Bay where regulatory initiatives by the local government have curtailed cutting substantially.

DISCUSSION

Local management of tropical forests has been documented by many researchers and is now presumed to be a widespread phenomenon (Anderson, 1990; Posey and Balee, 1989; Redford and Padoch, 1992; Smith and Berkes, 1993; Weinstock, 1994). In particular, local forest users in many tropical countries have established forest plantations or practiced enrichment planting of natural forests to increase the production of high-value tree species (Anderson *et al.*, 1995; Balee, 1989, 1992; Fairhead and Leach, 1996; Gomez-Pompa and Kaus, 1990; Hyman, 1983; Pasicolan *et al.*, 1997; Romm, 1989; Thacher *et al.*, 1997; Walters, 1997). These findings have encouraged a revision of the standard environmental narrative: away from one in which rural people were cast as a threat to forests, and toward one where they are seen as responsible forest stewards (Broad and Cavanaugh, 1993; Fairhead and Leach, 1995).

At first glance, the local mangrove management systems of Bais Bay and Banacon Island appear to conform to this revised narrative. In fact, these have been portrayed by foresters, researchers, and the media as successful cases of local, community-based action having positive outcomes for environmental conservation (Cabahug *et al.*, 1986; Mantilla and Melana, 1991; Yao, 1996). They have served as models and have been showcased to enlist support for wider efforts to promote community-based mangrove management led by the World Bank, United States Agency for International

Development, and the Philippine Department of Environment and Natural Resources (Cabahug *et al.*, 1986; Yao, 1996; Fred Vande Vusse, personal communication).

Findings from *this* study both support and contradict this general narrative. On the one hand, the widespread planting and management of mangroves is evidence that local people can be forest stewards, even without the support and endorsement of external agencies. These cases are impressive by virtue of the sheer numbers of people voluntarily participating and, especially in the case of Banacon, the area of forest actually replanted and managed. Findings show that these mangrove management systems are successful economic innovations because they provide important benefits (notably valued wood products and property protection) in a practical and highly efficient manner. Although difficult to quantify, evidence is also suggestive that the establishment of intensively managed plantations has served to reduce cutting pressure on existing unplanted forests by providing alternative sources of fuel and construction wood. This was especially apparent in Bais Bay where increased policing against cutting of natural mangroves created added incentive to source wood from elsewhere.

However, that these management systems are so exceptional is reason, in itself, to be cautious about extrapolating their wider applicability, but especially given that recent efforts to promote community-based mangrove planting elsewhere have experienced little success (Calumpong, 1994; Pomeroy *et al.*, 1996; Primavera and Agbayani, 1996). As was found here, environmental and socioeconomic factors often precluded successful planting, even where people were motivated to do so. For example, because most fish ponds were constructed in areas previously with mangroves, these represent the most abundant and often most suitable sites for mangrove reforestation (Stevenson *et al.*, 1999). But acquisition of fish ponds for this purposes is a contentious political issue in the Philippines, in part because of the considerable clout wielded by fish pond owners, many of whom are wealthy and politically influential.

But even where it has been feasible to establish plantations, these were typically viewed by local people in practical, economic terms, with environmental conservation values like species diversity readily compromised in management decisions (c.f. Hackel, 1999). Because planted mangroves are privately owned, the specific forms of management varied depending on situational factors and individual planters' motives. Mangrove plantations were often treated like any capital investment: bought; sold; concentrated in the hands of wealthier individuals in some cases, and progressively subdivided in others; and cut when cash was needed (Walters, 1998, 2003). Furthermore, the establishment of plantations in many sites has been accomplished at the expense of the more species-diverse, natural forests that were once

found there. Once established, plantations are consciously managed to be monospecific and structurally homogeneous so that economic benefits are maximized (Walters, 2000).[6]

The long-term fate of many such planted forests is also uncertain given that development along the coastline is especially intense and likely to increase in many places. In Bais Bay, many planters have been readily willing to cut and convert their stands to other valued uses, like fish ponds and home sites. In fact, this pattern has occurred before and elsewhere in the Philippines: vast mangrove plantations that once encircled Manila Bay early in the 1900s were later totally destroyed to make space for fish ponds, residential housing and urban infrastructure (Brown and Fischer, 1918; Walters, 2003).

The role of the state as a steward of forests has been subject to considerable and often deserved criticism (Fairhead and Leach, 1996; Peluso, 1992; Poffenberger 1990). However, this critique has prompted a relatively uncritical embrace of community forest management as an alternative to the state by many researchers, policy-makers and nongovernment activists. The findings here contribute to an emerging literature which scrutinizes more carefully the theory and practice of community resources management (e.g., Agrawal and Gibson, 1999; Eghenter, 2000; Hackel, 1999; see also Vayda and Walters, 1999).

Findings in this study raise the question of whether the state, despite its many past failings, may still have an important role to play in the conservation and management of mangrove forests; a role above and beyond simply facilitating local management. Such a role might be especially important in cases where critical environmental conservation values, like rare species, wildlife, or marine habitat, are important attributes of particular mangrove forests. The Talabong Marine and Wildlife Sanctuary in Bais Bay is a notable example of successful, government-led protection of a species-rich site that is regarded by scientists and many local fishermen as critical for sustaining local fisheries (Walters, 2003). The sanctuary now also forms the basis of a thriving ecotourism operation. Successful protection of the Talabong was achieved, in part, by enlisting local fishermen as guards and by investing in considerable community outreach (Walters, 2002). Nonetheless, the "heavy-hand" of government was an essential component of this particular conservation strategy. Considering that conservation of mangroves has only recently become a priority of the Philippine government, it is likely that such government-led success stories will become more common.

[6]Experience from elsewhere shows that multispecies planting can be both practical and economically attractive to local mangrove users (e.g., DENR, 1994; Siddiqi and Khan, 1990). The City of Bais already does multispecies reforestation in the Talabong Sanctuary.

It is important that we better understand the conditions under which local forest users are more or less likely to adopt conservation-oriented practices like tree planting and forest management (Anderson, 1990; Arnold and Dewees, 1995; Cernea, 1989; Poffenberger, 1990; Poffenberger and McGean, 1996; Tucker, 1999). However, it is doubtful that the adoption of an alternative, universal narrative on the basis of assumptions of a harmonious, rather than destructive relationship between local people and forests will be of benefit to either researchers or policy-makers (Eghenter, 2000; Nyerges, 1998; Roe, 1991; Tucker, 1999; Vayda and Walters, 1999). Results from this study suggest that the relationships between local people and forests are unlikely to be as tidy and predictable as any one narrative represents.

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REFERENCES

Agrawal, A., and Gibson, C. C. (1999). Enchantment and disenchantment: The role of community in natural resource conservation. *World Development* 27: 629–649.

Anderson, A. B. (ed.) (1990). *Alternatives to Deforestation: Steps Towards Sustainable Use of the Amazon Rain Forest*, Columbia University Press, New York.

Anderson, A. B., Magee, P., Gely, A., and Jardim, M. A. G. (1995). Forest management patterns in the floodplain of the Amazon estuary. *Conservation Biology* 9: 47–61.

Arnold, J. E. M., and Dewees, P. A. (eds.) (1995). *Tree Management in Farmer Strategies: Responses to Agricultural Intensification*, Oxford University Press, New York, 287pp.

Baconguis, S. R., Cabahug, D. M., and Alonzo-Pasicolon, S. N. (1990). Identification and inventory of Philippine forested-wetland resource. *Forest Ecology and Management* 33/34: 21–44.

Bailey, C. (1988). The social consequences of tropical shrimp mariculture development. *Ocean and Shoreline Management* 11: 31–44.

Balee, W. (1989). The culture of Amazonian forests. In Posey, D. A., and Balee, W. (eds.), *Resource Management in Amazonia: Indigenous and Folk Strategies (Advances in Economic Botany 7)*, New York Botanical Garden, Bronx, New York, pp. 1–21.

Balee, W. (1992). People of the fallow: A historical ecology of lowland South America. In Redford, K. H., and Padoch, C. (eds.), *Conservation of Neo-tropical Forests: Starting from Traditional Use*, Columbia University Press, New York, pp. 35–57.

Broad, R., and Cavanagh, J. (1993). *Plundering Paradise: The Struggle for the Environment of the Philippines*, University of California Press, Berkeley.

Brown, W. H., and Fischer, A. F. (1918). *Philippine Mangrove Swamps. Bulletin No. 17*, Bureau of Forestry, Department of Agriculture and Natural Resources, Manila.

Cabahug, D. M., Jr., Ambi, F. M., Nisperos, S. O., Truzan, N. C., Jr. (1986). Impact of community-based mangrove forestation to mangrove dependent families and to nearby coastal areas in Central Visayas: A case example. In National Mangrove Committee (ed.), *Mangroves of Asia and the Pacific: Status and Management*, Natural Resources Management Center, Ministry of Natural Resources, Quezon City, Philippines, pp. 441–466.

Calumpong, H. P. (1992). Vegetation of the Talabong mangrove forest reserve: Suggestions for rehabilitation. *Silliman Journal* 36(1): 123–128.

Calumpong, H. P. (1994). Status of mangrove resources in the Philippines. In Wilkinson, C., Sudara, S., and Ming, C. L. (eds.), *Proceedings of the Third ASEAN-Australia Symposium on Living Coastal Resources*, Bangkok, Thailand, May 16–20, 1994, Vol. 1. Australian Agency for International Development (AUSAID) and Australian Institute of Marine Science, Townsville, Australia, pp. 215–229.

Calumpong, H. P., and Luchavez, J. A. (1997). Profile of the Bais Bay Basin. *Silliman Journal* 37(3/4): 1–27.

Calumpong, H. P., and Menez, E. G. (1997). *Field Guide to the Common Mangroves, Seagrasses and Algae of the Philippines*, Bookmark, Makati City, Philippines, 197pp.

Cernea, M. (1989). User groups as producers in participatory afforestation strategies, World Bank Discussion Papers 70, The World Bank, Washington, DC.

Cintron, G., and Schaeffer-Novelli, Y. (1984). Methods for studying mangrove structure. In Snedaker, S. C., and Snedaker, J. G. (eds.), *The Mangrove Ecosystem: Research Methods*, UNESCO, Paris, pp. 91–113.

Conklin, B., and Graham, L. (1995). The shifting middle ground: Amazonian Indians and eco-politics. *American Anthropologist* 97(4): 695–710.

DENR. (1990). *Compilation of Mangrove Regulations*, Coastal Resources Management Committee, Department of Environment and Natural Resources, Quezon City, Philippines. 47pp.

DENR. (1994). *Mangrove Regeneration and Management*, Mangrove Technical Review Committee, Fisheries Sector Program, Department of Environment and Natural Resources, Quezon City, Philippines.

DENR, (1996). Executive Order No. 263: adopting community-based forest management as the national strategy to ensure the sustainable development of the country's forestlands resources and providing mechanisms for its implementation. In *Compilation of Rules and Regulations (Integrated Social Forestry Program). Social Forestry Division*, Forest Management Bureau, Department of Environmental and Natural Resources, Quezon City, Philippines. pp. 242–245.

Dewalt, B. R., Vergne, P., and Hardin, M. (1996). Shrimp aquaculture development and the environment: People, mangroves and fisheries on the Gulf of Fonseca, Honduras. *World Development* 24: 1193–1208.

Eghenter, C. (2000). What is *Tana Ulen* good for? Considerations on indigenous forest management, conservation, and research in the interior of Indonesian Borneo. *Human Ecology* 28(3): 331–357.

Eusebio, M. A., Tesoro, F. O., and Cabahug, D. M. (1986). Environmental impact of timber harvesting on mangrove ecosystem in the Philippines. In National Mangrove Committee (ed.), *Mangroves of Asia and the Pacific: Status and Management*, Natural Resources Management Center, Ministry of Natural Resources, Quezon City, Philippines, pp. 337–354.

Fairhead, J., and Leach, M. (1995). False forest history, complicit social analysis: Rethinking some West African environmental narratives. *World Development* 23: 1023–1025.

Fairhead, J., and Leach, M. (1996). *Misreading the African Landscape: Society and Ecology in a Forest–Savanna Mosaic*, Cambridge University Press, New York, 354pp.
Fong, F. W. (1992). Perspectives for sustainable resource utilization and management of nipa vegetation. *Economic Botany* 46: 45–54.
Gomez-Pompa, A., and Kaus, A. (1990). Traditional management of tropical forests in Mexico. In Anderson, A. B. (ed.), *Alternatives to Deforestation: Steps Towards Sustainable Use of the Amazon Rain Forest*, Columbia University Press, New York, pp. 45–64.
Hackel, J. D. (1999). Community conservation and future of Africa's wildlife. *Conservation Biology* 13(4): 726–734.
Hamilton, L. S., Dixon, J. A., and Miller, G. O. (1989). Mangrove forests: An undervalued resource of the land and of the sea. In Borgese, E. M, Ginsburg, N., and Morgan, J. R. (eds.), *Ocean Yearbook 8*, University of Chicago Press, Chicago, pp. 254–288.
Hyman, E. L. (1983). Smallholder tree farming in the Philippines. *UNASYLVA* 35(139): 25–31.
Jara, R. S. (1987). Traditional uses of the mangrove in the Philippines. In Field, C. D., and Dartnall, A. J. (eds.), *Mangrove Ecosystems of Asia and the Pacific: Status, Exploitation and Management. Proceedings of the Research for Development Seminar held at the Australian Institute of Marine Science, Townsville, Australia, May 18–25, 1985*, Australian Development Assistance Bureau and Australian Committee for Mangrove Research, pp. 114–130.
Kairo, J. G. (2002). Community participatory forestry for the rehabilitation of deforested mangrove areas in Kenya. Paper presented at the *International Tropical Timber Organization's International Mangrove Workshop*, Cartagena, Colombia, February 19–22.
Kaly, U. L., and Jones, G. P. (1998). Mangrove restoration: A potential tool for coastal management in tropical developing countries. *Ambio* 27: 656–661.
Lewis, R. R. (1990). Creation and restoration of coastal plain wetlands in Florida. In Kusler, J. A., and Kentula, M. E. (eds.), *Wetland Creation and Restoration: The Status of the Science*, Island Press, Washington, DC, pp. 73–101.
Luchavez, J. A., and Abrenica, B. T. (1997). Fisheries profile of Bais Bay, Negros Oriental. *Silliman Journal* 37(3/4): 93–171.
Mantilla, C. L., and Melana, E. E. (1991). Folk technologies of mangrove reforestation in Bohol. (Philippines Department of Environment and Natural Resources). *Ecosystem Research Digest* 1(2): 50–57.
Melana, D. M., Atchue, J., III, Yao, C. E., Edwards, R., Melana, E. E., and Gonzales, H. I. (2000). *Mangrove Management Handbook*, Department of Environment and Natural Resources, Manila, Philippines through the Coastal Resources Management Project, Cebu City, Philippines. 96pp.
Meltzoff, S. K., and LiPuma, E. (1986). The social and political economy of coastal zone management: Shrimp mariculture in Ecuador. *Coastal Zone Management Journal* 14: 349–380.
Naylor, R. L., Goldburg, R. J., Mooney, H., Beveridge, M., Clay, J., Folke, C., Kautsky, N., Lubchenco, J., Primavera, J., Williams, M. (1998). Nature's subsidies to shrimp and salmon farming. *Science* 282: 883–884.
Nyerges, A. E. (1998). Review of J. Fairhead and M. Leach's "Misreading the African Landscape: Society and Ecology in a Forest–Savanna Landscape." *Journal of the Royal Anthropological Institute* 4: 390–391.
Parker, E. (1992). Forest islands and Kayapo resource management in Amazonia: A reappraisal of the *apete*. *American Antrhopologist* 94: 406–428.
Parker, E. (1993). Fact and fiction in Amazonia: The case of the *apete*. *American Antrhopologist* 95: 715–723.
Pasicolan, P. N., Udo de Haes, H. A., and Sajise, P. E. (1997). Farm forestry: An alternative to government-driven reforestation in the Philippines. *Forest Ecology and Management* 99: 261–274.
Peluso, N. L. (1992). *Rich Forests, Poor People*, University of California Press, Berkeley.
Peters, C. M. (1996). Beyond nomenclature and use: A review of ecological methods for ethnobotanists. In Alexiades, M. N. (ed.), *Selected Guidelines for Ethnobotanical Research: A Field Manual*, The New York Botanical Garden, Bronx, New York, pp. 241–276.

Poffenberger, M. (ed.) (1990). *Keepers of the Forest: Land Management Alternatives in Southeast Asia*, Kumarian Press, West Hartford, Connecticut.
Poffenberger, M., and McGean, B. (eds.) (1996). *Village Voices, Forest Choices: Joint Forest Management in India*, Oxford University Press, Delhi, 356pp.
Pomeroy, R. S., Pollnac, R. B., Predo, C. D., and Katon, B. M. (1996). *Impact Evaluation of Community-Based Coastal Resource Management Projects in the Philippines*, International Center for Living Aquatic Resources Management (ICLARM), Makati City, Philippines.
Posey, D. A. (1984). A preliminary report on diversified management of tropical forest by the Kyapo Indians of the Brazilian Amazon. *Advances in Economic Botany* 1: 112–126.
Posey, D. A. (1985). Indigenous management of tropical forest ecosystems: The case of the Kayapo Indians of the Brazilian Amazon. *Agroforestry Systems* 3: 139–158.
Posey, D. A., and Balee, W. (eds.) (1989). *Resource Management in Amazonia: Indigenous and Folk Strategies*, Advances in Economic Botany 7, New York Botanical Garden, Bronx, New York, 237pp.
Primavera, J. H. (1995). Mangroves and brackish water pond culture in the Philippines. *Hydrobiologia* 295: 303–309.
Primavera, J. H., and Agbayani, R. F. (1996). Comparative strategies in community-based mangrove rehabilitation programs in the Philippines. Paper presented at the *ECOTONE V: Community Participation in Conservation, Sustainable Use and Rehabilitation of Mangroves in Southeast Asia*, Ho Chi Minh City, Vietnam, January 8–12, 1996.
Redford, K. (1992). The ecologically noble savage. *Cultural Survival Quarterly* 15(1): 46–48.
Redford, K., and Padoch, C. (eds.) (1992). *Conservation of Neo-Tropical Forests: Working from Traditional Resources Use*, Columbia University Press, New York.
Roe, E. M. (1991). Development narratives, or making the best of blueprint development. *World Development* 19: 287–300.
Romm, J. (1989). Forestry for development: Some lessons from Asia. *Journal of World Forest Resources Management* 4: 37–46.
Saenger, P., and Siddiqi, N. A. (1993). Land from the sea: The mangrove afforestation program in Bangladesh. *Ocean and Coastal Management* 20: 23–39.
Siddall, S. E., Atchue, J. A., III, and Murray, R. L., Jr. (1985). Mariculture development in mangroves: A case study of the Philippines, Ecuador and Panama. In Clark, J. R. (ed.), *Coastal Resources Management: Development Case Studies. Renewable Resources Information Series*, Coastal Management Publication No. 3. Prepared for the National Park Service, US Department of Interior, and the US Agency for International Development. Research Planning Institute, Columbia, South Carolina.
Siddiqi, N. A., and Khan, M. A. S. (1990). Growth performance of mangrove trees along the coastal belt of Bangladesh. Mangrove Ecosystems Occasional Papers No. 8 (Part-I), International Society for Mangrove Ecosystems, pp. 4–14.
Smith, A. H., and Berkes, F. (1993). Community-based use of mangrove resources in St. Lucia. *International Journal of Environmental Studies* 43: 123–131.
Stevenson, N. J., Lewis, R. R., and Burbridge, P. R. (1999). Disused shrimp ponds and mangrove rehabilitation. In Streever, W. (ed.), *An International Perspective on Wetland Rehabilitation*, Kluwer Academic, The Netherlands, pp. 277–297.
Thacher, T., Lee, D. R., and Schelhas, J. W. (1997). Farmer participation in reforestation incentive programs in Costa Rica. *Agroforestry Systems* 35: 269–289.
Thorhaug, A. (1990). Restoration of mangroves and seagrasses—Economic benefits for fisheries and mariculture. In Berger, J. J. (ed.), *Environmental Restoration: Science and Strategies for Restoring the Earth*, Island Press, Washington, DC, pp. 265–281.
Tucker, C. M. (1999). Private versus common property forests: Forest conditions and tenure in a Honduran community. *Human Ecology* 27: 201–230.
Vayda, A. P., and Walters, B. B. (1999). Against political ecology. *Human Ecology* 27: 167–179.
Walters, B. B. (1997). Human ecological questions for tropical restoration: Experiences from planting native upland forest and coastal mangrove trees in the Philippines. *Forest Ecology and Management* 99: 275–290.

Walters, B. B. (1998). Muddy mangroves and murky common property theories. Paper presented at the 1998 meeting of the International Association for the Study of Common Property Resources, Vancouver, Canada, June 6–9, 1998. Abstract published on pp. 285–287, *Book of Abstracts: Crossing Boundaries*, 7th Conference of the International Association for the Study of Common Property (1998).
Walters, B. B. (2000). Local mangrove planting in the Philippines: Are fisherfolk and fishpond owners effective restorationists? *Restoration Ecology* 8(3): 237–246.
Walters, B. B. (2002). Government policy and local practice for mangrove protection in the Philippines. Paper accepted for presentation at the *Annual Meeting of the American Association of Anthropologists*, New Orleans, November 20–24.
Walters, B. B. (2003). People and mangroves in the Philippines: Fifty years of coastal environmental change. *Environmental Conservation* 30(2): 293–303.
Weinstock, J. A. (1994). *Rhizophora* mangrove agroforestry. *Economic Botany* 48: 210–213.
Wernstedt, F. L., and Spencer, J. E. (1967). *The Philippine Island World: A Physical, Cultural, and Regional Geography*, University of California Press, Berkeley.
Yao, C. E. (1996). Mangrove reforestation in the Central Visayas. *Greenfields* 24(5/6): 29–31, 34–37.