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Swallowed by a cayman : integrating cultural values in Philippine crocodile conservation

Ploeg, J. van der

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Author: Ploeg, Johan van der (Jan)
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1. INTRODUCTION

> His son Tales (an abbreviation of Telesforo) had worked at first on shares on the lands of a capitalist, but later, having become the owner of two carabaos and several hundred pesos, determined to work on his own account, aided by his father, his wife, and his three children. So they cut down and cleared away some thick woods which were situated on the borders of the town and which they believed belonged to no one. During the labors of cleaning and cultivating the new land, the whole family fell ill with malaria and the mother died, along with the eldest daughter, Lucia, in the flower of her age. […] But when they began to harvest their first crop a religious corporation, which owned land in the neighboring town, laid claim to the fields, alleging that they fell within their boundaries, and to prove it they at once started to set up their marks. However, the administrator of the religious order left to them, for humanity's sake, the usufruct of the land on condition that they pay a small sum annually—a mere bagatelle, twenty or thirty pesos. Tales, as peaceful a man as could be found, was as much opposed to lawsuits as any one and more submissive to the friars than most people; so, in order not to smash a *palyok* against a *kawali* (as he said, for to him the friars were iron pots and he a clay jar), he had the weakness to yield to their claim, remembering that he did not know Spanish and had no money to pay lawyers. Besides [his father] Selo said to him, 'Patience! You would spend more in one year of litigation than in ten years of paying what the white padres demand. And perhaps they'll pay you back in masses! Pretend that those thirty pesos had been lost in gambling or had fallen into the water and been swallowed by a cayman.' (Rizal 1891: 31-32)

The tragedy of Tales is one of the most famous passages in Philippine literature. It forms an important subplot of José P. Rizal's second novel *El Filibusterismo,* which revealed the abuses of the Spanish colonial system. Rizal forever equated caimans with misuse of power, land dispossession and poverty in Philippine culture.

There are in fact no caimans in the Philippines, but crocodiles.[1] Two species occur in the archipelago: the Indo-Pacific or saltwater crocodile (*Crocodylus porosus*), and the Philippine crocodile (*Crocodylus mindorensis*). The saltwater crocodile is distributed widely throughout Southeast Asia, southern India and northern Australia. Large individuals can grow up to 6 m, and can pose a significant risk to humans (Webb *et al*. 2010).[2] The Philippine crocodile, in contrast, is a much smaller and innocuous species, endemic to the Philippine Islands (Schmidt 1935) (figure 1.1).[3]

Hunting and habitat loss have led to the disappearance of the Philippine crocodile in most parts of the archipelago (Ross 1982; Banks 2005). Remnant Philippine crocodile populations now only survive in the Liguasan Marsh on Mindanao and the northern Sierra Madre mountain range on Luzon (van Weerd 2010). The Philippine crocodile is classified as Critically Endangered on the IUCN Red List of Threatened Species (IUCN 2010), the category for species with the highest risk of extinction.[4] The Philippine crocodile could very well be the first crocodilian to go extinct in the wild due to anthropogenic activities.[5]

Responding to this alarming situation the Philippine government initiated a captive breeding program for the Philippine crocodile and enacted legislation protecting the species and its natural habitat. But the Department of Environment and Natural Resources, the mandated government agency to protect wildlife in the country, lacks the capacity and resources to control the remote rural areas where crocodiles still occur. Philippine crocodiles are still killed and captured, and wetland habitat continues to be overexploited, converted, degraded and polluted, also in protected areas (van Weerd & van der Ploeg 2004).[6] In fact, most people consider the preservation of the Philippine crocodile irrelevant, unfeasible and sometimes even illegitimate (WCSP 1997; Alcala 2008). Efforts to protect or reintroduce the species in the wild have been opposed by rural communities, who fear for the safety of children and livestock, and resist State-mandated restrictions on resource use (Ortega 1998). Policymakers claim that the strict enforcement of environmental legislation risks aggravating rural poverty and question whether the conservation of a large and potentially dangerous predator in the densely populated country is desirable at all. The Secretary of the Department of Environment and Natural Resources, Ramon Paje, for example, recently that remarked that 'there is no place for crocodiles in the Philippines' (AFP 2011).

Figure 1.1: Juvenile Philippine crocodile. Photo by J. van der Ploeg (2013)

Conservationists postulate that people's antagonism towards Philippine crocodiles can only be transformed by generating economic incentives, for example through sustainable use, ecotourism or integrated conservation and development projects (*cf*. Ross 1982; Ortega *et al.* 1993; Ferrer 2008). This utilitarian logic, 'if crocodiles pay, crocodiles stay', has dominated conservation policy and practice in the Philippines over the past twenty-five years. In this thesis I question this reasoning, and I argue that cultural and intrinsic values can also form a motivation for people to tolerate the species in their surroundings.

BACKGROUND

> Another year passed, bringing another good crop, and for this reason the friars raised the rent to fifty pesos, which Tales paid in order not to quarrel and because he expected to sell his sugar at a good price. 'Patience! Pretend that the cayman has grown some,' old Selo consoled him. (Rizal 1891: 32)

José Rizal may have made a mistake in determining the species, but he accurately described the injustice and impotence of a system that in the name of the common good dispossesses poor people from their rights and livelihoods. Victorian ideas about pristine nature free of human interference led, particularly in (post-)colonial societies, to the exclusion, criminalization and marginalization of rural communities (Anderson & Grove 1987; Peluso 1992; Neumann 1998; Brockington & Igoe 2006). The apparent neglect of government agencies and conservation organizations for customary rights, local livelihoods and traditional values has often alienated rural communities from nature conservation (Ghimire & Pimbert 1997; Colchester 2003). The resulting conflicts over the use of natural resources made conservation policies impracticable on the ground (Brechin *et al.* 2003; Borgerhoff Mulder & Coppolillo 2005).

These moral and instrumental concerns have stimulated a search for alternative conservation approaches that explicitly link wildlife conservation to poverty alleviation, political participation and social justice (Western & Wright 1994; Baland & Platteau 1996; Kellert *et al.* 2000; Persoon & van Est 2003). Community-based conservation is based on the assumption that people who directly depend on a natural resource have a stronger interest in its management than the central State (Lynch & Talbot 1995; Brosius *et al.* 2005; Borrini-Feyerabend *et al.* 2007). Conservation, in this view, can only succeed when people benefit from wildlife through sustainable utilization: 'use it or lose it' (Adams 2001; Hutton & Leader-Williams 2003). Successful, and much cited, examples include the Communal Areas Management Program For Indigenous REsources (CAMPFIRE) program in Zimbabwe that generates revenues for rural district councils through trophy hunting (Metcalfe 1994; Olthoff 1995), the vicuña (*Vicugna vicugna*) management program in Peru that allows indigenous communities to harvest

and sell wool of wild vicuñas (Wheeler & Domingo 1997*)*, and marine protected areas in the Philippines that enable local fishers to catch more fish (Russ & Alcala 1999; White *et al.* 2002).

Interestingly, crocodiles are widely regarded as an outstanding example of conservation through sustainable use (*cf*. *The Economist* 2008). The regulation of international trade in crocodile leather reduced uncontrolled exploitation and provided an economic incentive to protect crocodiles and wetland habitat (Webb 2002).[7] The American alligator (*Alligator mississippiensis*) for example was considered endangered in the 1960s, but sustainable harvesting has led to the recovery of alligator populations in Florida and Louisiana (Hines & Abercrombie 1987). In Venezuela the controlled harvest of spectacled caimans (*Caiman crocodilus*) brings in approximately 25 million US$ annually, which forms an important argument for land owners to protect the species and its wetland habitat, and has given the caiman a much more positive image in the eyes of the public (Thorbjarnarson 1999). In northern Australia saltwater crocodile populations are now approaching pre-exploitation levels as a result of crocodile ranching (Webb *et al*. 2010). And in Papua New Guinea saltwater crocodile leather is an important source of cash for rural communities in remote areas, who therefore actively protect the potentially dangerous species on their communal lands (Cox 2009).

It is however becoming increasingly clear that the sustainable use model is not a panacea for all conservation problems (O'Riordan 2002; Adams & Hutton 2007). With fewer than 100 Philippine crocodiles remaining in the wild sustainable use is simply not a realistic management option for the species (Thorbjarnarson 1999). There is an urgent need to design novel solutions to conserve species, such as the Philippine crocodile, that have *no* economic value for rural communities (Woodroffe *et al.* 2005; Dickman *et al.* 2011). Clearly, alleviating poverty should be an important objective, or perhaps even a moral obligation, for conservationists working in the developing world (O'Riordan 2002; Adams *et al.* 2004). But there is growing evidence that a narrow focus on economic incentives can ultimately undermine conservation efforts, especially when the promised benefits do not materialize (Borgerhoff Mulder & Coppolillo 2005). By framing conservation solely as an economic issue, conservationists risk ignoring other valid motivations to conserve wildlife such as tradition, curiosity and emotion. In policy and academic discourses, which are currently dominated by utilitarian rationalism, such an argument might be easily dismissed as a 'western notion that is largely irrelevant for people in developing countries' (Meijaard & Sheil 2008: 167), 'too emotional' (Milton 2002: 4) or perhaps even as a call for 'resurgent protectionism' (Wilshusen *et al.* 2002: 17). Cultural and intrinsic values form, in fact, an important incentive for people to protect wildlife, and efforts to preserve species and ecosystems can be significantly strengthened if these values are taken into account (Adams 1996; Posey 1999; Infield 2001; Maffi & Woodley 2010).

RESEARCH QUESTIONS AND METHODOLOGY

> The father and grandfather then thought of providing some education for the two children, especially the daughter Juliana, or Juli, as they called her, for she gave promise of being accomplished and beautiful. A boy who was a friend of the family, Basilio, was studying in Manila, and he was of as lowly origin as they. But this dream seemed destined not to be realized. […] 'Patience! Pretend that the cayman's relatives have joined him,' advised Tandang Selo, smiling placidly. (Rizal 1891: 33)

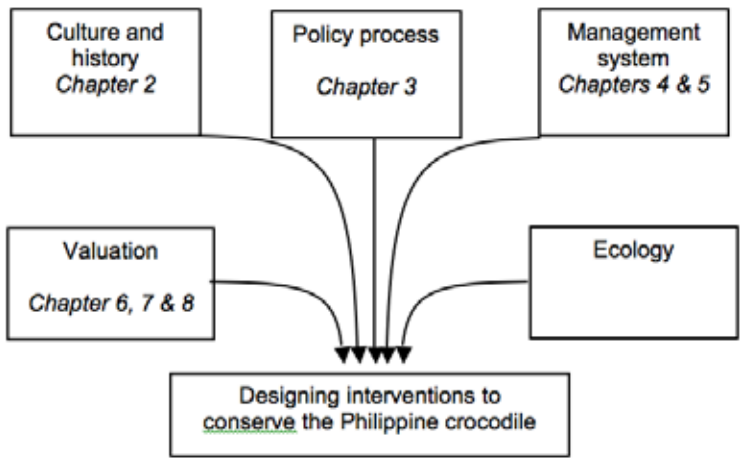
Since 2001 I have been involved in efforts to conserve the Philippine crocodile in the wild in the northern Sierra Madre mountain range on Luzon. After the discovery of a remnant Philippine crocodile population in the Disulap River in the municipality of San Mariano in 1999, the Northern Sierra Madre Natural Park Conservation Project (NSMNP-CP) designed an in-situ conservation strategy for the species (van Weerd 2000; van Weerd & General 2003). After the termination of the Northern Sierra Madre Natural Park Conservation Project, Philippine crocodile conservation efforts were continued in the framework of the Cagayan Valley Program on Environment and Development (CVPED), the academic partnership of Isabela State University (ISU) and Leiden University, for which I was working at that moment (van der Ploeg *et al*. 2008; Persoon *et al.* 2009). In 2003 I co-founded the Mabuwaya Foundation, a Philippine non-profit organization with the aim to preserve the Philippine crocodile in its natural freshwater habitat in the northern Sierra Madre. Mabuwaya is a contraction of the Filipino words *mabuhay* (long live) and *buwaya* (crocodile) (van Weerd & van der Ploeg 2012).[8]

But how to conserve a critically endangered species in a context of rural poverty, social change, weak governance, rapid land use transitions, and a history of State-sponsored resource plunder? The main objective of this dissertation is to design a novel approach to preserve the Philippine crocodile in the wild. Conservation problems are generally defined from a narrow ecological and economic perspective, thereby ignoring the historical, social, psychological, cultural and political dimensions of the problem (Clark *et al*. 1996; Nie 2001). Such a biased approach often prevents the identification of effective solutions. Here clearly lies an important task for social scientists (Mascia *et al*. 2003). Over the past twelve years I have used anthropological theoretical insights (Ingold, 1994; Fergusson 1994; Scott 1998; Milton 2002; Berkes 2004) and research methods (Chambers 1983; Vayda 2008; Walters & Vayda 2009) to analyze 'the Philippine crocodile problem', and identify alternative ways to conserve the species in the wild.

To structure this thesis I use a method developed by Tim Clark *et al*. (1996) to systematically analyze conservation problems and identify innovative solutions. The model identifies five dimensions that explain why certain species, in their case large carnivores in North America, have declined and why current conservation approaches are inadequate: ecological factors, historical and cultural reasons, socioeconomic or

valuational considerations, management problems and policy processes (figure 1.2). Each of the subsequent chapters focuses on one of these dimensions, with the exception of ecology.[9] The model leads us to a set of research questions, wholly different than that are typically asked in conservation biology and environmental economics: *Why are crocodiles reviled in Philippine culture* (chapter 2)? *Why is conservation policy failing to preserve the Philippine crocodile in the wild* (chapter 3)? *How to enforce environmental legislation protecting the species in the remote rural areas* (chapter 4)? *How to mobilize local support for in-situ conservation, and how to determine whether these efforts actually improve the status of the Philippine crocodile in the wild* (chapter 5 & 6)? *How to justify Philippine crocodile conservation in the absence of direct economic benefits, especially when working with poor rural communities* (chapter 7)? *And how to deal with the risk of living with a potential dangerous predator* (chapter 8)? These questions draw attention to issues that are often ignored in conservation efforts, and identify alternative solutions to protect the Philippine crocodile in the wild.

Figure 1.2: Schematic representation of key dimensions necessary for analyzing and crafting solutions for complex conservation problems (Clark *et al.* 1996: 943). The corresponding chapters in this thesis are indicated in italics.



Inevitably this 'participatory action research' implies a certain bias and raises concerns about the objectivity of the analysis (Bacon *et al.* 2005: 1). Some scholars go as far to argue that efforts to address environmental and developmental problems are 'antithetical' to anthropology (Li 2007: 3). Personally, I do not think that societal engagement necessarily hampers an objective and honest scientific analysis; and I'm concerned about the fact that such a critical approach has become dominant in

Dutch academia. I would argue, following Kai Lee (1993) and Kay Milton (1996), that research and engagement can be mutually enriching: my dual role as researcher and conservationist has provided information and insights that a supposedly neutral observer could not easily have obtained (see also: Hale 2008; Kellett 2009). Moreover, I think that scientists working in tropical landscapes simply cannot afford being detached observers, but must make long-term commitments to alleviate poverty and conserve biodiversity (Sayer & Campbell 2004; Tyler 2006; Noss 2007). In the words of Nancy Scheper-Hughes (1995: 409): 'moral relativism is no longer appropriate to the world in which we live, and anthropology, if it is to be worth anything, must be ethically grounded.'

Obviously, combining academic inquiry with conservation action can pose ethical dilemmas (Scheyvens 2003; Persoon & Minter 2011). In interactions with farmers, fishers, loggers, village leaders and government officials I have been transparent about my objectives. People participated voluntarily in interviews, surveys, dialogues and community consultations. No payments were made for information. The disclosure of sensitive information, for example about illegal logging or the use of destructive fishing methods, has never led to repercussions for individual respondents. Overall, I think that the information gathered in the course of my research has contributed to the design of a community-based conservation program that reflects and respects the values, rights, culture, livelihoods and knowledge of local people. One of the problems with discussions on the ethics of combining conservation with science is that they are often obscured by the question whether it is right to protect a potentially dangerous predator in a human-dominated landscape. It's beyond the scope of this introduction to answer that legitimate question; I only hope that the reader will answer it positively after reading this thesis.

This thesis combines qualitative and quantitative anthropological research methods (Bernard 2006). It is based primarily on informal interviews with more than 200 farmers and fishers in the northern Sierra Madre. Interviews were always conducted with the assistance of an interpreter, and recorded in notebooks. In addition I interviewed local government officials, forest rangers, politicians, conservationists and scientists on their views of the 'Philippine crocodile problem.' Focus group discussions were another important source of information. Over the past years the Mabuwaya Foundation organized 53 community consultations in *barangays* (villages) in the municipality of San Mariano to discuss possible steps to protect crocodiles in the wild. These meetings were usually recorded on video, and transcribed afterwards by staff members of the Mabuwaya Foundation. A structured questionnaire was administered among 550 in 14 barangays in the northern Sierra Madre, generating important insights in changing perceptions of and attitudes towards Philippine crocodiles. I also made extensive use of the field reports of Mabuwaya Foundation staff who systematically recorded observations on Philippine crocodile occurrence and threats. In addition, I supervised

46 Dutch and Filipino students who collected data on a variety of topics ranging from Philippine crocodile ecology and behavior to people's awareness of environmental legislation, and from local ecological knowledge to land use changes (see appendix 1 for a comprehensive list of student reports). Specific research methods and techniques are discussed in greater detail in the subsequent chapters.

RESEARCH AREA

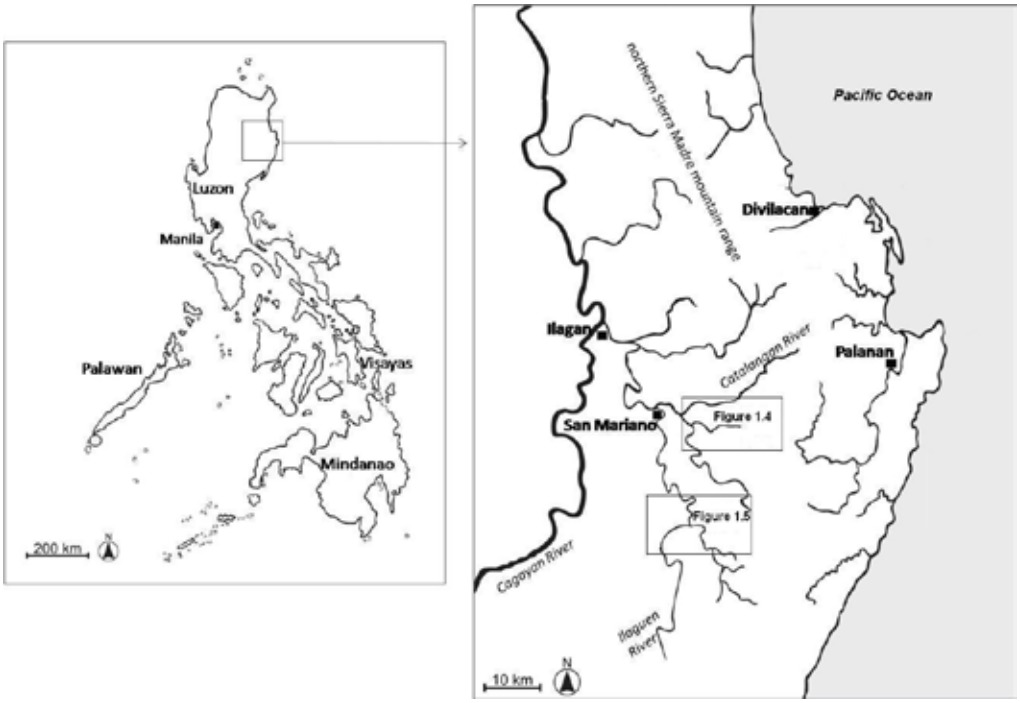
> Tales became serious and scratched his head. The clay jar was giving up all its rice to the iron pot. When the rent had risen to two hundred pesos, Tales was not content with scratching his head and sighing; he murmured and protested. […] Who was this intruder that he should have any right to his land? Had he brought from his own country a single handful of soil? […] Old Selo, on looking at his son's face, did not dare to mention the cayman, but tried to calm him by talking of clay jars, reminding him that the winner in a lawsuit was left without a shirt to his back. 'We shall all be turned to clay, father, and without shirts we were born,' was the reply. (Rizal 1891: 33)

The research and conservation activities, on which this thesis is based, have mainly focused on the municipality of San Mariano in Isabela Province, specifically on three sites where Philippine crocodiles breed in the wild: Disulap River, Dunoy Lake and Dinang Creek (see figure 1.3). Most households in this remote rural area cultivate 3 to 4 ha (Overmars & Verburg 2005; Huigen & Jens 2006). Farmers practice slash-and-burn techniques (*kaingin*) to clear forest vegetation. Steep slopes are planted with banana, cassava and upland rice. Irrigated rice fields are constructed in the valleys. In recent years hybrid yellow corn has replaced banana as the dominant cash crop. As a result farmers have become increasingly dependent on traders who supply credit for seeds, fertilizer and pesticides in return for exclusive procurement rights.[10] Logging remains an important source of cash for many poor households along the forest frontier (van der Ploeg *et al.* 2011e) Fishing is another important, yet often overlooked, livelihood activity.[11] San Mariano ranks among the poorest municipalities of the Philippines: 60 percent of the people live on less than US$ 1 per day (NSCB 2007).

San Mariano has long been inhabited. Agta hunter-gatherers lived in the forest, and traded forest products with farming communities in the Cagayan Valley and Palanan (Minter 2010). During the 18th century Ibanag and Gaddang communities who resisted colonial repression and conversion settled in the Catalangan and Ilaguen river valleys. Collectively these refugees are referred to as 'Kalinga', literally meaning 'enemy' in Ibanag (Keesing 1962). The town of San Mariano was founded in 1896 by the Spanish colonial administration. Ibanag farmers settled in and around the town. In the 1950s Ilocano settlers from Central Luzon reclaimed lands in the forest of San Mariano. Rapid population growth, land scarcity and the construction of logging roads led to a massive influx of farmers from 1965 onwards (van den Top 1998). A new wave of migrants,

mainly from Ifugao province, settled on the forest frontier in the late 1990s (van der Ploeg *et al*. 2007). At present approximately 45,000 people live in the municipality.

Figure 1.3: the northern Sierra Madre



Site 1: Disulap River

The Disulap River is a fast flowing river characterized by shallow rapids interspersed with deep pools. Underwater caves and crevices provide excellent hiding places for Philippine crocodiles, and have enabled a few individuals to escape persecution.

The river forms the boundary between barangays San Jose and Disulap (figure 1.4). Approximately 3,500 people live in the area (NSBC 2007). There are several *sitios* (hamlets) located along the river, of which San Isidro is the largest. The Disulap Valley was deforested in the 1970s by commercial logging companies. San Isidro functioned as log pond and later as nursery for the reforestation efforts of several logging corporations. When logging was banned in 1992 many laborers settled in the area (Persoon & van der Ploeg 2003).[12] Nowadays most people in the valley are Ilocano. Several Agta communities live in temporary settlements along the forest frontier. Ifugao

migrants continue to settle in the area, particularly around *sitio* Diwagden. Over the past years land use has rapidly intensified: in 2000 the hilly landscape around San Isidro was characterized by banana plantations, grasslands and swiddens, but nowadays hybrid yellow corn is the dominant crop. Remnant forest is cleared for agricultural development.

The Northern Sierra Madre Natural Park Conservation Project spearheaded efforts to protect the Philippine crocodile in Disulap River. In 2001, after an intensive lobby, the *Sangguniang Bayan* (municipal council) of San Mariano proclaimed an 11 km stretch of the river, from the boundary of the Northern Sierra Madre Natural Park to *sitio* Singap, as the municipal Philippine crocodile sanctuary (van Weerd & General 2003). Municipal ordinance 2001-17 requires farmers to maintain a 10 m buffer zone along the Disulap River to protect crocodile nests and minimize erosion. Originally it was envisioned to create a 20 m buffer zone, but this was revised downwards after community consultations in San Isidro. Large billboards with information on the sanctuary were placed along roads and footpaths near the sanctuary. In 2004 the municipal mayor deputized six men from the area as *Bantay Sanktuwaryo* (sanctuary guards). These local wardens are responsible to monitor the sanctuary. They receive a small monthly incentive from the municipal government (PhP. 500) and a medical insurance. In 2006 the Mabuwaya Foundation demarcated the buffer zone with signposts.

Figure 1.4: Disulap River and Dunoy Lake

Site 2: Dunoy Lake

Dunoy Lake is a small shallow pond (0.5 ha) fed by two artesian springs. The lake is located on a fluvial terrace along the Catalangan River. The warm, stagnant lake provides optimal habitat for Philippine crocodile hatchlings. After two or three years the juveniles disperse along the Catalangan River. There are several adult crocodiles in the Catalangan River who use Dunoy Lake as a refuge during the rainy season (van Weerd *et al.* 2006).

The landscape around Dunoy Lake is characterized by degraded forest, grasslands and bamboo groves interspersed with corn and rice fields. The lake itself is located on the forest frontier: to the east are the forests of the Sierra Madre, to the west land use intensifies (figure 1.4). *Sitio* Villa Miranda, formerly known as Andarayan, is the main population center, and serves as a loading point for timber harvested in the forest. Administratively the area is part of barangay Dibuluan, which has around 1,250 inhabitants (NSBC 2007). Dibuluan and Villa Miranda have been inhabited for more than two hundred years. These settlements were stopovers on the trail to Palanan traversing the Sierra Madre mountain range. The Catalangan watershed is the ancestral land of the Kalinga, but nowadays most people are of Ilocano origin (Scott 1979; van der Ploeg & van Weerd 2005).

The Catalangan River forms the boundary of the Northern Sierra Madre Natural Park, the largest protected area of the Philippines. Dunoy Lake is located in the strict protection zone of the park. In theory all human activities are prohibited in this area with the exception of 'scientific studies and ceremonial use by indigenous cultural communities' (DENR 2001a: 6). In practice however farmers continue to expand their fields and intensively use the forest and rivers: most people in the area are not aware of the boundaries, zones or rules and regulations of the protected area. After several community consultations the Mabuwaya Foundation placed billboards around the lake. Captive-bred juvenile Philippine crocodiles are regularly released in the area to re-enforce the crocodile population (van de Ven *et al*. 2009).

Site 3: Dinang Creek

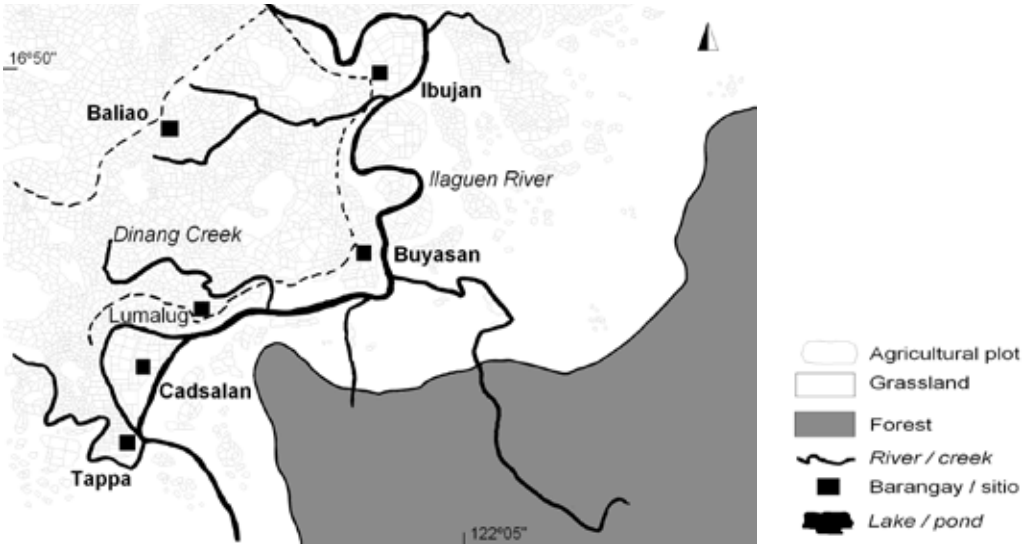
Dinang Creek is a small tributary of the Ilaguen River. The 11 kilometer-long creek meanders through sloping grasslands. Only a narrow strip on the banks of the creek remains forested. The water in the shallow creek is almost stagnant, and murky. Pools have formed in the bends of the creek. The creek drops with a steep waterfall into the Ilaguen River. In 2009 and 2012 three Philippine crocodile nests were recorded along the creek, making Dinang an important nesting site for the species.

A small *sitio*, Lumalug, is located adjacent to the creek. Dinang Creek is part of

barangay Cadsalan, which has around 1,200 inhabitants (NSBC 2007). Cadsalan itself lies on the confluence of Ilaguen River and Dicamay River (figure 1.5). The Kalinga still form a majority in barangays Cadsalan, Ibujan, Buyasan and Tappa, which are all located along the Ilaguen River. Land use along Ilaguen River is characterized by small agricultural plots: irrigated rice fields in the valleys, banana plantations on the steep slopes, and upland rice and yellow corn on the hill tops. The area was deforested in the early 1970s.

In 2003 the Mabuwaya Foundation and the LGU organized several meetings with the land claimants and barangay officials of Cadsalan with the intention to declare Dinang Creek as a crocodile sanctuary. At first, people in Lumalug were highly suspicious of the motives of the foundation: it was feared that crocodiles were a front for land grabbing (van der Ploeg & van Weerd 2005). But after several community consultations and meetings with the land claimants, the barangay council adopted a resolution declaring Dinang Creek a crocodile sanctuary with a five meter buffer zone in 2005. In practice the barangay ordinance is largely ignored: people fish, bath and shade livestock in the creek. People continue to cultivate their land up to the edge of the creek. Crocodile attacks on people and livestock pose a serious challenge to the conservation efforts in this densely populated area.

Figure 1.5: Dinang Creek



OUTLINE

> There was then seen a struggle such as was never before carried on under the skies of the Philippines: that of a poor Indian, ignorant and friendless, confiding in the justness and righteousness of his cause, fighting against a powerful corporation before which Justice bowed her head, while the judges let fall the scales and surrendered the sword. He fought as tenaciously as the ant which bites when it knows that it is going to be crushed, as does the fly which looks into space only through a pane of glass. Yet the clay jar defying the iron pot and smashing itself into a thousand pieces bad in it something impressive—it had the sublimeness of desperation! (Rizal 1891: 34)

The chapters of this thesis have been published in several scientific journals and newsletters. The format of these articles has been altered for the purpose of this thesis, but the content has remained largely unchanged. Inevitably the choice to write a PhD. dissertation based on articles implies some replication and overlap, for which I apologize to the reader. These articles were written in cooperation with several co-authors. Details about the specific roles of these co-authors in the research design, data collection, analysis and writing of the articles is provided in the first footnote of every chapter. To avoid unnecessary repetition I have combined the references into a single literature list at the end of the thesis.

Chapter 2 counters the popular notion that Philippine culture forms an obstacle for crocodile conservation. In the pre-colonial Philippines crocodiles were venerated as the embodiment of the ancestors. It enabled people to share the landscape with a potentially dangerous predator. These traditional beliefs and practices prove remarkably resilient, and may actually offer clues for conserving crocodiles in the twenty-first century. The chapter is based on an extensive literature review and ethnographic fieldwork in the northern Sierra Madre. It was published in *Environment & History* in 2011 (volume 17, number 2, pages 229-264).

Chapter 3 investigates the utilitarian logic that continues to underpin conservation policy in the Philippines, despite its evident failure to protect crocodiles and wetland habitat, and to improve the livelihoods of poor people living in crocodile habitat. Based on a qualitative case-study of the Palawan Wildlife Rehabilitation and Rescue Center (PWRCC) it is argued that that the conception of incentives purely in terms of economic benefits is too narrow and potentially counterproductive. The chapter was originally published in the *Journal of Environment and Development* in 2011 (volume 20, number 3, pages 308-328).

Chapter 4 consists of a detailed description of the community-based crocodile conservation program in San Mariano. The democratization and decentralization processes that are taking place in the Philippines since the fall of the Marcos dictatorship are often regarded as an obstacle for biodiversity conservation (*cf*. Lutz & Caldecott 1996). But in the northern Sierra Madre, the devolution of power and authority from the national government to local government units, rural communities and civil society

organizations has facilitated the design of municipal and barangay ordinances that protect crocodiles in the wild. These local agreements carry greater legitimacy and are therefore better enforced than national legislation such as the Wildlife Act. The chapter was published in the journal *Philippine Studies* in 2004 (volume 52, number 3, pages 346-383).

Conservationists are increasingly urged to engage in 'open dialogues' and 'concerted negotiations' with rural communities (Brechin *et al.* 2003: 21). But what such participatory processes look like in practice often remains unclear. Chapter 5 describes four community consultations in which villagers, local government officials and staff of the Mabuwaya Foundation discuss ways to conserve crocodiles. It shows how community participation facilitates information sharing, links environmental conservation to broader debates on rural development and social justice, and often leads to conservation action at the grassroots level. The chapter was published in 2009 in the *Crocodile Specialist Group Newsletter* (volume 28, number 3, pages 8-10).

Chapter 6 evaluates the public awareness campaign for the conservation of the Philippine crocodile in the northern Sierra Madre through a quantitative counterfactual comparison. It shows that disseminating information to rural communities is an essential first step for community-based conservation. The article 'Assessing the effectiveness of environmental education: mobilizing public support for Philippine crocodile conservation' was published in 2011 in the journal *Conservation Letters* (volume 4, number 4, pages 313-323).

Most people in the municipality of San Mariano now know that the Philippine crocodile is legally protected, and as a result the species is no longer purposively killed. But people often do not understand *why* crocodiles are protected. Chapter 7 argues that utilitarian reasons to justify in-situ Philippine crocodile conservation are often based on inaccuracies and flawed assumptions, and that cultural and intrinsic values offer a more realistic and honest argument to convince rural communities to protect crocodiles. The chapter was published in 2011 in the *Journal of Integrative Environmental Sciences* (volume 8, number 4, pages 287-298).

Chapter 8 documents two recent attacks of Philippine crocodiles on people in San Mariano. Such incidents quickly erode local support for in-situ conservation efforts. Simple precautionary measures can minimize human-crocodile conflict. But raising awareness, providing safe access to water or relocating problem-crocodiles can never completely assure human safety. Paradoxically, rural communities living in Philippine crocodile habitat seem more willing to accept this harsh reality than most outsiders can imagine. Traditional cultural values enable people to cope with the risk of living with a large predator. The chapter was published in 2012 in the *Crocodile Specialist Group Newsletter* (volume 31, number 2, pages 20-23).

This thesis challenges the common view that people will only conserve crocodiles when they profit financially from it. Its central argument is that conservationists should

stop pretending that Philippine crocodiles can generate tangible economic benefits for rural communities. Such an utilitarian approach inevitably leads to disappointments and conflicts, and risks overshadowing other arguments that can inspire conservation. Instead, it is vital to find ways to (re-)build cultural links between people and nature, and assure that conservation efforts reflect locally important issues and values (Adams 1997; Posey 1999; Infield 2001; Pilgrim & Pretty 2010). I think José Rizal would have agreed.

ENDNOTES

1. The order *Crocodylia* consists of three families: the *Gavialoidea* (the gharials), the *Crocodylia* (the crocodiles) and the *Alligatoridae* (the alligators and caimans). There are six caiman species, which are all restricted to the New World (Martin 2008).
2. Historical reports of 10 m long saltwater crocodiles are known to be in error (Whitaker & Whitaker 2008). The naturalist Guggisberg (1972: 39) reported an 8.80 m saltwater crocodile from northern Luzon, but thought it unlikely that 'monsters of such dimensions could still survive today.' In 2011 a 6.1 m saltwater crocodile was captured in the municipality of Bunawan on Mindanao. This crocodile, named 'Lolong', captured headlines around the world as the 'largest crocodile in captivity' (Britton 2012).
3. The maximum reported length of a museum specimen is 3 m (Hall 1989). The largest Philippine crocodile captured in the wild on Luzon measured 2.7 m (van Weerd 2010). Significantly, there are no reported fatal Philippine crocodile attacks on humans (van Weerd & van der Ploeg 2012). Juvenile Philippine crocodiles feed on shrimps, dragonflies, fish, frogs and snails, and adult crocodiles prey opportunistically on wild and domestic pigs, dogs, rats, snakes and water birds.
4. This is based on criteria A1c (an 80 percent observed decline in extent of occurrence in 3 generations) and C2a (less than 250 adults in the wild, and a highly fragmented and declining population) (IUCN 2010). The saltwater crocodile, is actually also severely threatened in the Philippines; but as populations have recovered in the wild in Papua New Guinea and northern Australia the species is not globally threatened (Webb *et al.* 2010; IUCN 2010).
5. Evidently, this is a reflection of the exceptional high rates of biodiversity loss in South and Southeast Asia (Hoffmann *et al.* 2010). The rich terrestrial, freshwater and marine ecosystems of tropical Asia are severely threatened by degradation, overexploitation, invasive species and pollution, driven by a rapidly growing human population and economic development (Ashton 2007; Woodruff 2010). Widespread rural poverty and weak governance further exacerbate what has been called 'the Asian biodiversity crisis' (Sodhi *et al.* 2004; McNeely *et al.* 2009). Particularly freshwater wetlands are experiencing a severe decline in biodiversity (Dudgeon 1992; Gopal 2005; Dudgeon *et al.* 2006). Nowhere is the situation as bad as in Philippines (Myers *et al*. 2000; Sodhi *et al*. 2010; Duckworth *et al*. 2012). The densely populated Philippine archipelago has lost most of its forest cover as a result of commercial logging and agricultural expansion (Kummer 1992; World Bank 2003). Freshwater wetlands are under even greater pressure from anthropogenic activities, but are poorly represented in the country's protected area system (DENR & UNEP 1997). As a result the Philippines has more threatened endemic species per km^2 than any other country in the world (Ong *et al.* 2002; Brooks *et al.* 2002).
6. The Philippine crocodile still occurs in the Northern Sierra Madre Natural Park on Luzon and the Liguasan Marsh Game Refuge on Mindanao (Mallari *et al.* 2001; Pomares *et al.* 2008). The species seems to be exterminated in the Naujan Lake National Park on Mindoro. Records from the Agusan

Marsh Wildlife Sanctuary are known to be in error (Pontillas 2000).

7. In 1975 *Crocodylus mindorensis* was listed on the CITES Appendix I, banning all international trade in the species (UNEP-WCMC 2003). But the Philippine crocodile continued to be pursued for food, out of fear and to meet the domestic demand for 'traditional' medicines, exotic pets and exclusive souvenirs (WSCP 1997).
8. The Philippine crocodile conservation project of the Mabuwaya Foundation is financially supported by the following donors: Conservation Leadership Program (CLP), Critical Ecosystem Partnership Fund (CEPF), Haribon Foundation, WWF-Philippines, van Tienhoven Foundation, Netherlands Committee for IUCN, Provincial Government of Isabela, WWF-Netherlands, Prince Bernhard Fund for Nature, Hong Kong Ocean Park Conservation Foundation, People's Trust for Endangered Species (PTES), Crocodylus Porosus Philippines Inc (CPPI), IUCN/SSC Crocodile Specialist Group, US Fish and Wildlife Service (USFWS), Rufford Foundation, Disney Worldwide Conservation Fund, USAID, Foundation for the Philippine Environment (FPE), Philippine Tropical Forest Conservation Foundation (PTFCF), UNDP and Lacoste through the Save your Logo program. Additional support was provided by Melbourne Zoo, Gladys Porter Zoo, Chicago Zoological Society, Taronga Zoo, Cleveland Metroparks Zoo and Cleveland Zoological Society, Lowry Park Zoo, Naples Zoo, Oregon Foundation, Pittsburgh Zoo & Aquarium, Henry Doorly Zoo, St Augustine Alligator Farm, The Phoenix Zoo Conservation and Science Grant Program, Woodland Park Zoological Society, Danish Crocodile Zoo, Boise Zoo, Sea World Busch Garden, Chester Zoo, Bergen Aquarium, Zurich Zoo, Köln Zoo and London Zoo.
9. Little is known about the ecology and behavior of the Philippine crocodile. Most ecological information on the species was based on observations in captivity in the 1990s (Alcala 1997; Ortega 1998). Recent studies by the Mabuwaya Foundation have generated important new insights on population dynamics; behavior, reproduction, home ranges, movements, growth rates of Philippine crocodiles in the wild. See for example: van Weerd & van der Ploeg 2004; Tarun *et al.* 2004; van Weerd *et al.* 2006; van Weerd & van der Ploeg 2008; van de Ven *et al.* 2009; van Weerd 2010; van Weerd & van der Ploeg 2012).
10. A few prominent families dominate local politics through patronage networks and the threat of violence, and control the local economy (*cf.* Kerkvliet 1990; Borras 2001). Most farmers do not formally own the land they cultivate: 86 percent of the municipality remains classified as forest land (Local government of San Mariano 2010).
11. Most people fish for subsistence. A few commercial fishers sell fish and shrimps on the market in San Mariano town. Rivers and creeks are generally regarded as open-access resources. In most areas there are no rules limiting access or prohibiting specific fishing methods: fishers can catch anything, anywhere, and as much as they like. Giant tilapia (Nile tilapia *Oreochromis niloticus*), *siling* (Java barb *Barbonymus gonionotus*), *hito* (Bangkok catfish *Clarias batrachus*) and *imelda* (Russian carp *Carassius carassius*) are the most commonly caught species. These four fish species have been introduced to the Philippines in the 1950s, an indication of the unprecedented changes in freshwater ecosystems that have occurred over the past sixty years. People use a great variety of fishing methods: spears (*pana*), nets (*tabukol* or *sigay*), traps (*bubu)*, fykes (*bukatot*), draining (*makkammil*), and hooks (*banit*). Electricity fishing (*kuryente*) is often tolerated by village officials. In some villages dynamite fishing is banned, except for specific occasions when much fish is needed such as funerals, feasts or Holy Week.
12. In the 1970s San Mariano was one of the centers of the corporate logging industry in the Sierra Madre (van den Top 1998). In 1992 the Aquino administration imposed a logging moratorium in San Mariano, and in 2001 the remaining forests of the municipality were included in Northern Sierra Madre Natural Park, the largest protected area of the Philippines. Logging is by definition illegal in the park, but people continue to harvest and sell timber (van der Ploeg *et al*. 2011e). Timber harvesting remains one of the most profitable income-generating activities for rural households along the forest frontier.