

Crocodile Rehabilitation, Observance and Conservation (CROC) project

Final Report BP Conservation Top Follow-Up Award

The Mabuwaya Foundation Inc.

January 2005

Executive Summary

The Philippine crocodile (*Crocodylus mindorensis*) is small freshwater crocodile endemic to the Philippines. Hunting, unsustainable fishing and habitat loss have led to the disappearance of the species in most parts of the archipelago. The Philippine crocodile is now considered to be the most severely threatened crocodile species in the world. Previously thought to be extinct on Luzon, the rediscovery of *C. mindorensis* in the Northern Sierra Madre opened a window of opportunity for the conservation of the species in its natural habitat. Over the past two years the CROC project has taken the first steps, in cooperation with its partners, to protect the critically endangered Philippine crocodile in Northeast Luzon.

Socioeconomic and ecological scientific information was gathered and used to design conservation actions. Awareness of local people about the conservation status of the crocodile and the importance of protecting the species has significantly increased as a result of the Communication, Education and Public Awareness campaigns of the CROC Project. The people of San Mariano now support the *in situ* conservation of *C. mindorensis*, and take pride in the existence of the crocodiles in their municipality. This is a major step forward: three years ago the crocodiles were regarded as dangerous pests or as a delicious snack. A local protection force now protects the remaining crocodile populations. Conservation measures were designed with the local government unit and with rural communities living in and around crocodile habitat. A local foundation, the Mabuwaya Foundation, was established to secure the conservation of the species in Northern Luzon on the long term. This local foundation is run by young conservationists with the support of the main stakeholders in crocodile conservation in Northeast Luzon.

These efforts have not remained unnoticed: the conservation program for the Philippine crocodile in San Mariano received extensive media coverage in local, national and international media. The IUCN Crocodile Specialists Group has called the efforts of the CROC project “the best hope for survival of the species in the wild.” As a result of the conservation actions crocodiles are no longer killed in San Mariano (see figure 1), and a slow recovery of the species is taking place in this remote municipality in the Northern Sierra Madre (see figure 2). This shows that the approach of the CROC project is effective and deserves to be continued on a larger scale.

The Mabuwaya Foundation has secured additional funding from several donors (the Critical Ecosystem Partnership Fund, WWF-Philippines, the Netherlands Committee for IUCN, the Chicago Zoological Society and the Haribon Foundation) but the financial support of the BP Conservation Program remains essential for the continuity of crocodile conservation activities in the Northern Sierra Madre. Therefore, the Mabuwaya Foundation will submit a proposal for the BP Conservation Program Consolidation Award. The coming years will be decisive to safeguard the Philippine crocodile from extinction in Northeast Luzon. With the support of the BP Conservation Program we will prove that there is a future for the Philippine crocodile in its natural habitat.

Figure 1: the number of crocodiles reportedly killed in the municipality of San Mariano (or immediate vicinity)

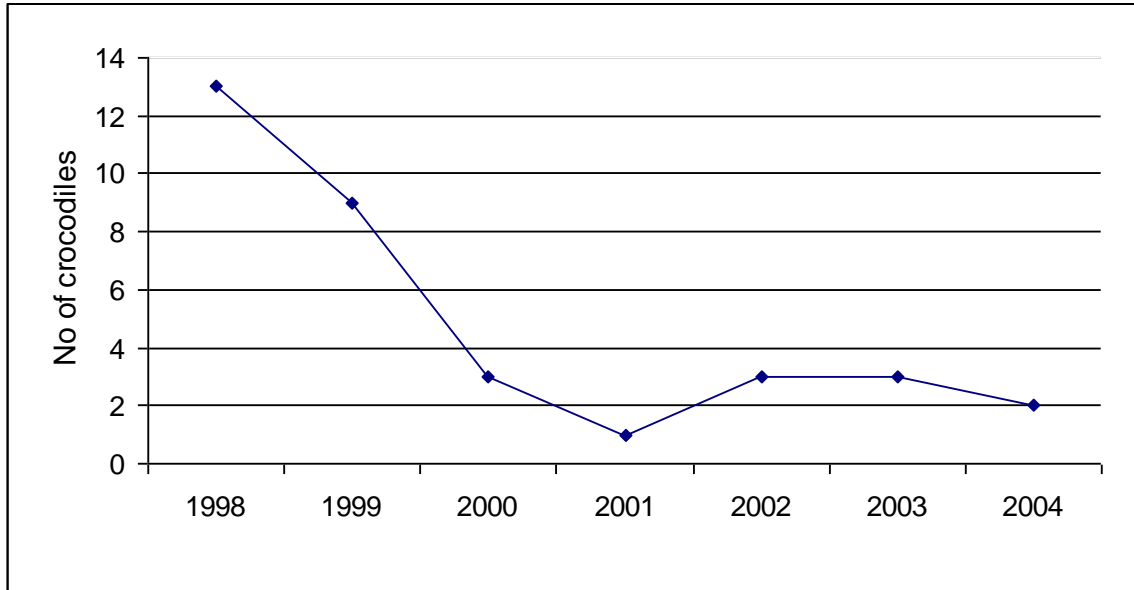


Figure 2: Annual monitoring results (1999-2004) in Disulap River, Dunoy Lake, Dinang Creek and Dungsog Lake in the municipality of San Mariano. Please note that these are absolute minimum counts. Sites in other municipalities are not included, nor are observations of free-roaming crocodiles.

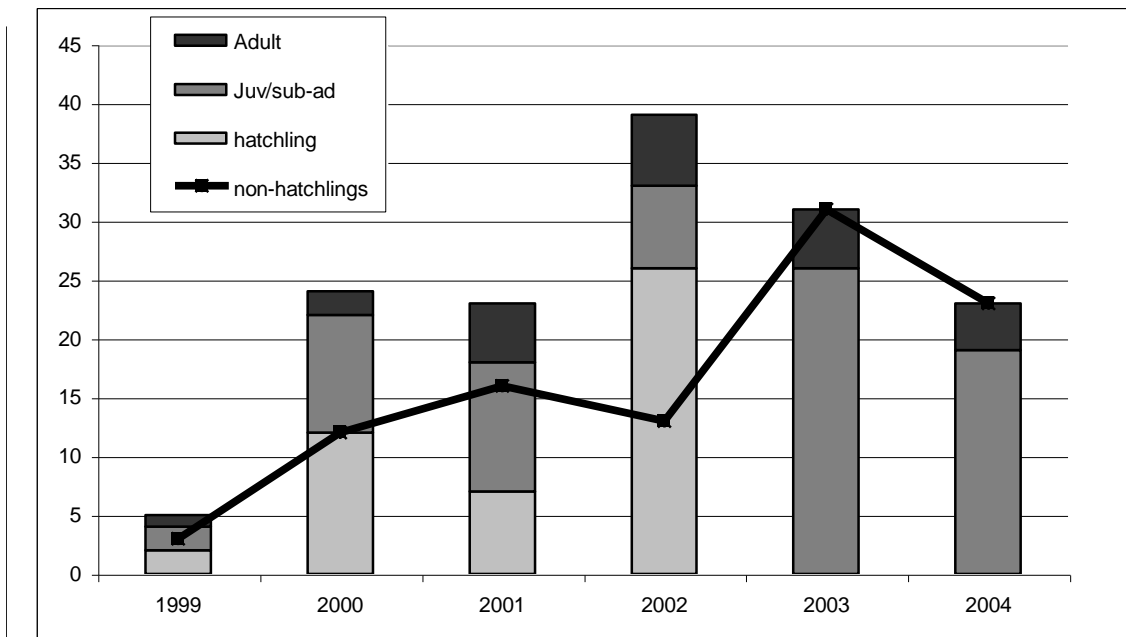


Table of Contents

Executive Summary	2
Table of Contents	4
Acknowledgements	5
Abbreviations	7
Introduction	9
Project Description.....	10
Activities	12
Sustainability.....	49
Conclusions and recommendations.....	52
Annex 1: Distribution of Estuarine crocodile (<i>C. porosus</i>) in the NSMNP	55

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Abbreviations

AFP	Armed Forces of the Philippines
ATI-RTC	Agricultural Training Institute – Regional Training Center
BFAR	Bureau of Fisheries and Aquatic Resources
BMS	Biodiversity Monitoring System
BPCP	BP Conservation Program
BS	Bachelor of Science
CADC	Certificate of Ancestral Domain Claim
CADT	Certificate of Ancestral Domain Title
CAVAPPED	Cagayan Valley Program for People Empowerment and Development
CBD	Convention on Biological Diversity
CBFM	Community Based Forest Management
CBRM	Community Based Resource Management
CDCAS	College of Development Arts and Communication
CENRO	Community Environment and Natural Resources
CEPA	Communication, Education and Public Awareness
CEPF	Critical Ecosystem Partnership Fund
CFEM	College of Forestry and Environmental Management
CFI	Crocodile Farming Institute
CI	Conservation International - Philippines
CML	Institute for Environmental Sciences of Leiden University
CLUP	Comprehensive Land Use Plan
CROC	Crocodile Rehabilitation, Observance and Conservation project
CVPED	Cagayan Valley Program on Environment and Development
CZS	Chicago Zoological Society
DAR	Department of Agrarian Reform
DAO	Department Administrative Order
DENR	Department of Environment and Natural Resources
DESAM	Department of Environmental Science and Management (CFEM)
DILG	Department of Internal and Local Government
DOT	Department of Tourism
EIA	Environmental Impact Assessment
EIC	Environmental Information Center
ES	Environmental Science
FFI	Flora and Fauna International
GMA	Gloria Macapagal Arroyo
GoP	Government of the Philippines
IEC	Information Education Communication
IP	Indigenous Peoples
IPRA	Indigenous Peoples' Rights Act
ISU	Isabela State University
IUCN	World Conservation Union
KKP	Kabang Kalikasan ng Pilipinas (WWF Philippines)
LGU	Local Government Unit

MoA	Memorandum of Agreement
MoU	Memorandum of Understanding
MPDO	Municipal Planning and Development Officer
MS	Master of Science
NAMRIA	National Mapping and Resource Information Authority
NCIP	National Commission on Indigenous People
NC-IUCN	Netherlands Committee of the World Conservation Union
NGO	Non Governmental Organization
NIPAS	National Integrated Protected Areas System
NORDECO	Nordic Agency for Development and Ecology
NPA	Nice People Around
NPCRT	National Philippine Crocodile Recovery Team
NSMNP	Northern Sierra Madre Natural Park
NSMNP-CP	Northern Sierra Madre Natural Park-Conservation Project (1 st phase implemented by Plan Philippines)
NSMNP-CDP	Northern Sierra Madre Natural Park-Conservation Project (2 nd phase implemented by WWF-Philippines)
NTC	National Telecommunication Commission
PAMB	Protected Area Management Board
PASu	Protected Area Superintendent
PATECO	Pacific Timber Export Corporation
PAWB	Protected Area Wildlife Bureau
PAWCZMS	Protected Area Wildlife and Coastal Zone Management Service
PENRO	Provincial Environment and Natural Resource Office
PhP.	Philippine Peso
PNB	Philippine National Bank
PNP	Philippine National Police
PO	People's Organization
PRA	Participatory Rural Appraisal
PSSD	Philippine Strategy for Sustainable Development
PWRCC	Palawan Wildlife Research and Conservation Center
RA	Republic Act
RCSD	Regional Committee for Sustainable Development
RED	Regional Executive Director
RNE	Royal Netherlands Embassy
RPCRT	Regional Philippine Crocodile Recovery Team
SB	Sangguniang Bayan (municipal council)
SWP	Small Wetland Program
TLA	Timber License Agreement
UNEP	United Nations Environment Program
WCSP	Wildlife Conservation Society of the Philippines
WCS	Wildlife Conservation Society
WWF	World Wildlife Funds - Philippines

Introduction

The Crocodile Rehabilitation Observance and Conservation (CROC) project won the BP Conservation Program Top Follow-Up Award in 2003. In this report we report on two years of conservation action for the critically endangered Philippine crocodile *Crocodylus mindorensis* in Northeast Luzon, the Philippines.

The goal of the CROC follow up project is to conserve and rehabilitate remaining Philippine crocodile populations in the wild in Northeast Luzon. In this report we assess the progress achieved by the end of the CROC project. We will report on the progress the CROC team has made on the five objectives that were formulated in the CROC Follow-Up Proposal that was submitted to the BP Conservation Program. The report will give a detailed description of the outputs and implementation process for every activity identified in the CROC Follow-Up proposal. It summarizes the progress made so far in safeguarding the Philippine crocodile from extinction in Luzon.

This report is primarily written for the BP Conservation Program to be eligible for applying for the BP Consolidation Award. Over the past years the CROC project has made substantial progress in creating the necessary conditions for the conservation of the Philippine crocodile in its natural habitat. The direct killing of crocodiles, the main threat for crocodiles, has largely stopped, and crocodile populations show a slow but promising recovery. However, the Philippine crocodile still stands on the brink of extinction. Therefore, conservation activities have to be sustained over the coming years. This report forms the basis of the CROC consolidating project proposal that will be submitted to the BP Conservation Program.

The report is structured as follows: first we give a short description of the CROC follow up project, second we give an overview of the activities that we've undertaken in the past two years, third we outline how the project can be sustained in the future, and finally we evaluate the overall impact of the CROC project and identify several recommendations. In the annex, we focus on the conservation status of the Estuarine crocodile (*Crocodylus porosus*), which is also severely threatened in the Philippines.

Project Description

Here we will give a short overview of the goals and objectives of the CROC follow up proposal. First, we sketch the background of the CROC follow up project. Second, we highlight the goals and objectives as identified in the CROC follow up proposal.

Background

The Philippine crocodile *Crocodylus mindorensis* is an endemic, freshwater, crocodylian. It is a small, shy and harmless animal that does not attack humans unless provoked. Previously widely distributed throughout the Philippine archipelago. *C. mindorensis* is listed in the IUCN Red List (IUCN 2005) as critically endangered. The IUCN Crocodile Specialist Group considers *C. mindorensis* to be the most severely threatened crocodile species in the world and placed the species on the top of the priority list of crocodiles needing conservation action (Ross 1998). The last population estimate (Ross 1998) put the total number of surviving non-hatchling Philippine crocodiles at 100. The main threats to the survival of *C. mindorensis* are habitat loss, pollution of rivers, and the killing of crocodiles for skins, meat and amulets, and out of fear or ignorance. Apart from a captive breeding program on the island of Palawan, which has so far not reintroduced crocodiles into the wild, no conservation projects existed for the species until 1999 (Banks 2000).

A remnant population of Philippine crocodiles was discovered in Northeastern Luzon in 1999. This population is currently considered to offer the best prospects for *in situ* conservation of the species (Van Weerd 2000). A Philippine crocodile conservation program was set up, first under the auspices of the Dutch funded Northern Sierra Madre Natural Park – Conservation Project (NSMNP-CP), which was implemented by Plan International. When this project phased out, the implementers sought to continue Philippine crocodile conservation. Since 2002, the Crocodile Rehabilitation, Observance and Conservation (CROC) project is running the Philippine crocodile conservation program with funding from the British Petroleum (BP) Conservation Program: the CROC project won the Gold Award in 2002 and the Top Follow Up award in 2003. The CROC project is implemented under the umbrella of the Cagayan Valley Program on Environment and Development (CVPED), a joint research and education program of Isabela State University and Leiden University.

Goals and objectives

The rediscovery of the species in the Sierra Madre has renewed optimism about the future of the critically endangered Philippine crocodile. The overall goal of the CROC follow up project is: **to conserve and rehabilitate remaining Philippine crocodile populations in the wild in Northeast Luzon.**

The objectives of the CROC follow up project are:

1. Providing accurate data on *C. mindorensis* distribution, population size, population structure, and habitat requirements and life history parameters as an input to the design of conservation measures;
2. Providing accurate data on threats, people-crocodile interactions, perception of crocodiles, requirements for acceptance of co-habitation with crocodiles and possible benefits of crocodile conservation for local communities as an input to the design of conservation measures;
3. Enhancing knowledge on crocodiles, awareness of the need of conservation of crocodiles and their wetland habitats, and to increase local involvement in Philippine crocodile conservation;
4. Establishing crocodile reserves and/or other crocodile protection measures with full consent of local communities and local governments;
5. Enhancing co-operation between and capacities of local stakeholders in Philippine crocodile conservation with the aim of establishing a long-term sustainable effort to conserve and rehabilitate this critically endangered species.

In this final report we will assess the progress of the CROC project in attaining these objectives.

Activities

In this section we will systematically review the 14 activities that were formulated in the CROC project proposal. In addition we will also highlight progress made on other activities which were carried out within the framework of the CROC project but which were not identified in the original project proposal. Where possible we will use the verifiable indicators that were mentioned in the logical framework of the CROC follow up proposal

Objective 1: Providing accurate ecological data on *C. mindorensis* as an input to the design of conservation measures

Three activities were identified to attain this objective: (1) surveys in Northeast Luzon to provide data on historical and current distribution, (2) quarterly monitoring of Philippine crocodiles in San Mariano, (3) telemetry/behavior study.

Activity 1.1 Surveys

Several surveys were carried out from 2002 to 2004 to gain a better insight in historical crocodile distribution in Northern Luzon. Forty-five sites were surveyed. Information on habitat characteristics and possible causes of local crocodile extinctions was gathered.

Table 1 summarizes the localities that were surveyed by the CROC Team. The table shows that crocodiles were still common in Northeast Luzon until 1970. Hunting of crocodiles for amulets was commonly practiced in the Cordillera Mountain Range. But as commercial hunters from the south arrived in most parts of the island in the 1970s, the crocodile population started to decline. Destructive fishing method, killing out of fear or fun or for food, and habitat destruction further led to the rapid disappearance of crocodile populations in most parts of the island.

Surveys were carried out by the CROC team in cooperation with staff members of DENR. Local informants always join the survey. In specific cases support was given by staff members of LGUs, WWF-Philippines and the Palawan Wildlife Rescue and Conservation Center (PWRCC)

All information was presented in field reports which are submitted to the government line agencies (LGU and DENR), and was subsequently published in scientific journals (see under Activity 5.3). It can be concluded that the surveys have generated a substantial amount of information that is currently being used as an input for conservation action planning. The CROC project has by now a detailed impression of the status of *C. mindorensis* (and *C. porosus*: see Annex 1 for more information on the Estuarine crocodile) in Northeast Luzon (see map 1). Additional surveys are needed in the Province of Apayao and the Babuyan Islands.

Table 1: Distribution of crocodiles in Northeast Luzon (1960 - 2000) per locality. X = Philippine crocodile, P = Estuarine crocodile, ? = unidentified crocodile species

Locations	Year				
	1960s	1970s	1980s	1990s	2000
Sierra Madre Mountain Range					
Cagayan Province					
Barangay Bical	X	X	X	X	
Alitontong Lake	X	X	X	X	
Santa Margarita	X	X	X	X	
Isabela Province					
Abuan River	X	X	X	X	
Dikalao (Pinacanauan de Ilagan River)	X	X	X	X	X
Barangay Santo Domingo (Jones)	X	X	X		
Dunsog Lake	X	X	X	X	X
Dunoy Lake	X	X	X	X	X
Disulap River	X	X	X	X	X
Dinang Creek	X	X	X	X	X
Dibanuangan River					
Blos River	P	P	P	P	P
Dibol River	X	X	X	X	X
Dicatian Lake (formerly Oway River)	X	X	X	X	X
Dibino Creek	X	X	X	X	X
Dilakit Spring	P	P	P	P	P
Dipudo Island	P	P	P	P	P
Dimasalansan Island	P	P	P	P	P
Culasi Estuarine	P	P	P	P	P
Dibukarot Creek	X	X	X	X	X
Dicabulan Lake	?	?	?	?	?
Dimatatno River	?	?	?	?	?
Quirino Province					
Barangay Wasid					
Barangay Abbag					
Cordillera Mountain Range					
Mountain Province					
Siffu River	X	X	X	X	X
Tanudan River	X	X			
Luwap Lake	X	X			
Malkudyao Lake	X	X			
Tuboy	X	X	X		
Tocucan					
Lake Danum					
Amulung Creek	X	X	X	X	X
Kalinga Province					
Mallig River	X	X	X		
Viga River	X	X			
Naneng	X	X			
Bagumbayan	X	X			
Apayao Province					
Lucab	X	X	X		
Bulu	X	X	X		
Battung Lake	X	X			
Dagara River	X	X			
Matalag River	X	X			

Ferdinand	X	X	X		
Ninoy Aquino	X	X	X	X	X

Table 2 shows detailed information for 7 key sites of the CROC project. A total of 31 individuals have been sighted in seven distinct localities of which 6 are adults, 21 are juvenile/sub-adults and 3 are hatchlings. At another site, Dikabulan Lake in the municipality of Palanan near the Pacific Ocean, tracks were found but it is not known whether they belong to *C. mindorensis* or *porosus*. Disulap River (N 16°57'27"; E 122°09'40"), Dunoy Lake (N 16°59'51"; E 122°09'34"), Dungsog Lake (N 17°01'02"; E 122°11'31") and Dinang Creek (N 16°47'31"; E 122°02'31") are all found in the municipality of San Mariano. Dication Lake (N 17°20'26"; E 122°16'28") is found in the municipality of Divilacan at the Eastern side of the Sierra Madre Mountains. Dibukarot Creek is found in the municipality of Palanan, also at the Eastern side. Dunoy Lake, Dungsog Lake, Dication Lake and Dibukarot Creek are all situated within the Northern Sierra Madre Natural Park. Diamallig Creek was newly identified (Dec 2004), holding at least 1 Philippine crocodile. This creek is under the jurisdiction of Barangay Baliao, Benito Soliven.

Table 2: Current distribution and population size of *Crocodylus mindorensis*

No.	Location	Year	Month	Adult	Juv./sub-adult	Hatchling	Total
Confirmed sites							
1	Disulap River	2004	May	1	2		3
2	Dunoy lake	2004	May	1	7	3	11
3	Dungsog Lake	2004	May	1	1		2
4	Dinang Creek	2004	February	1	9		10
5	Dication Lake	2004	April	1	2		3
6	Dibukarot Creek	2004	April	1			1
7.	Diamallig Creek	2004	December		1		1
Total				6	22	3	31
Suspected Sites							
	Dicabulan Lake	2004	April				X
	Siffu River	2003	March				X
	Apayao River	2002	December				X
	Dimatatno River	2003	March				X
	Digoyo River	2004	September				X

Map 1: Distribution of the Philippine crocodile in the Northern Sierra Madre

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Activity 1.2 Quarterly monitoring

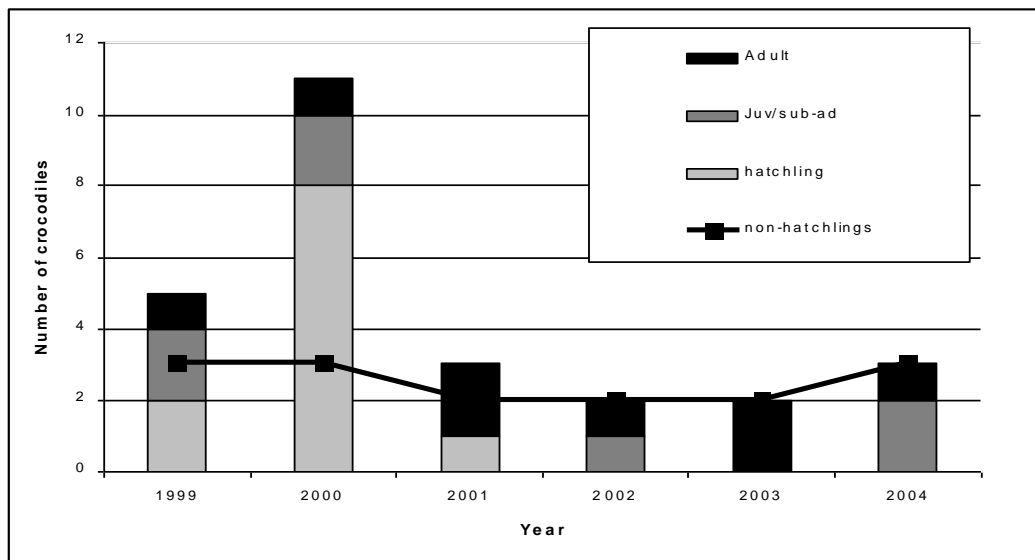
The CROC project conducted night surveys in four key sites in the municipality of San Mariano to provide updates on the crocodile population size. In addition, information is gathered on threats and land-use change and awareness of affected communities and neighboring communities in these localities. Quarterly monitoring now also includes Focus Group Discussions with the barangay officials and follow-ups with the Bantay Sanktuwaryo (see 4.2) regarding the conservation of the crocodiles. .

A protocol was developed for the gathering of secondary data from local fishermen and hunters. Past and recent sightings mentioned during interviews were checked, often by hiring the informant as a guide. Field surveys consisted of searching for crocodiles, tracks, basking areas or faeces at daytime, and spotlight surveys at night. Surveys were carried out on foot by slowly following riverbanks and lake edges with a maximum of four observers. Night surveys were usually carried out from 8 pm (about one hour after sunset) till midnight. In the case of positive sightings of tracks or crocodiles, spotlight surveys were repeatedly carried out during several nights. The maximum number of one count was taken as count result. Crocodile length was estimated and sizes were pooled in the following categories: (1) up to 0.3 m.: hatchling; (2) 0.3 – 1.5 m.: juvenile/sub-adult; (3) 1.5 m. and longer: adult. Identified crocodile localities were regularly revisited to monitor changes in population size and structure. Each year in May it was tried to survey identified localities for a minimum of three nights. The weather in May, the end of the drier season, is favorable for crocodile surveys as remote areas are better accessible and rivers are low enabling coverage of larger areas. Furthermore we experienced difficulties in observing crocodiles in the wetter months (June – February) because heavy rains at night often diminished visibility and the range of spotlights. The results presented below are mostly from May surveys.

The following three localities in San Mariano have been monitored since their identification in 1999 and 2000: Disulap River, Dunoy Lake and Dinang Creek. In all three, successful breeding events were recorded. The conservation program in San Mariano focuses on these three key sites: (1) Disulap River, (2) Dunoy Lake, and (3) Dinang Creek:

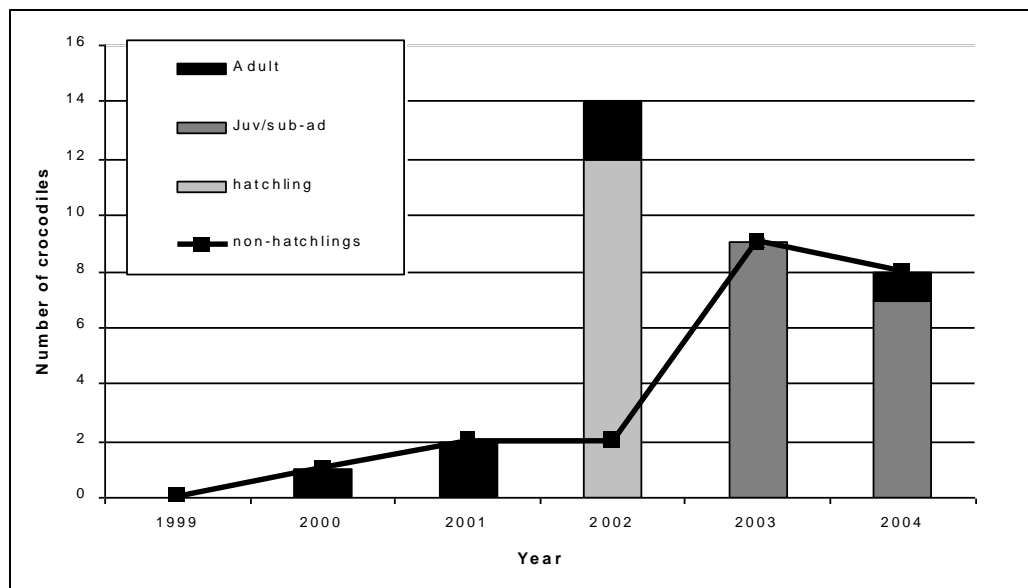
1. In Disulap River systematic surveys started in 1999 when 2 hatchlings, 2 juveniles and 1 adult were observed. Breeding must have taken place in early 1999 or late 1998 as hatchlings were still very small in March 1999. Breeding was observed in 2000, the nest with broken eggshells and eight very small hatchlings nearby in the river were found in August 2000. In 2001 only one hatchling remained, suggesting a hatchling survival rate of 12.5 %. No breeding has been observed since 2000 although 2 adults were present in 2003. In May 2004 two sub-adults and one adult were present. The number of non-hatchling crocodiles was three in 1999 and in 2004. We do not know where adults and sub-adult crocodiles move to when not observed, or whether we simply miss them during some surveys (see figure 3).

Figure 3: Annual monitoring results in Disulap River. The black line shows the total number of non-hatchlings over the years.



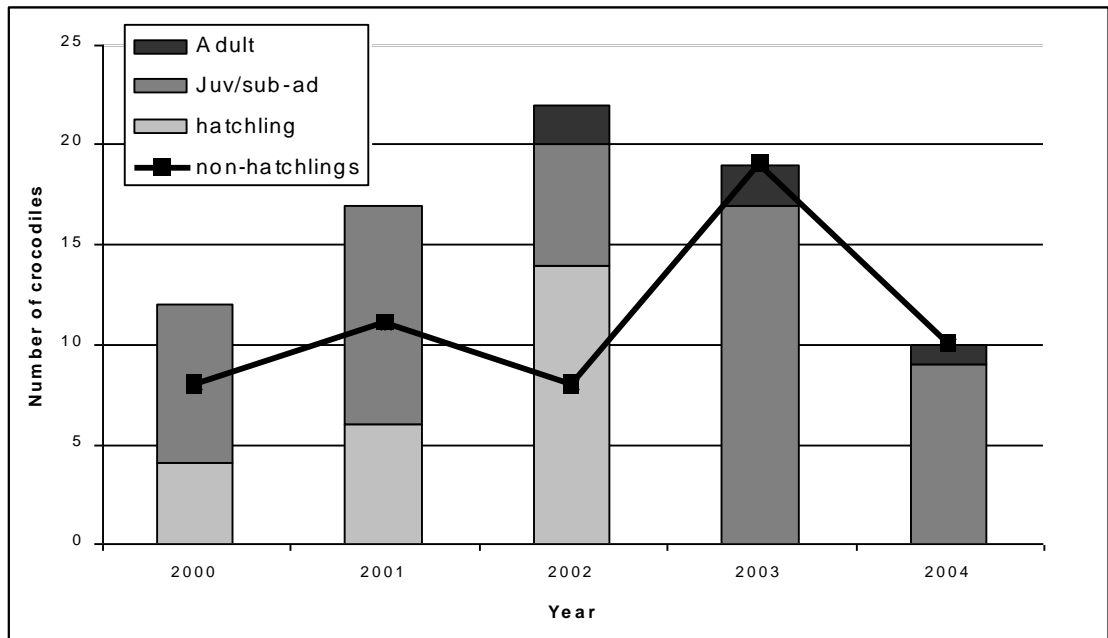
2. In Dunoy Lake surveys started in 1999 but no crocodiles were observed then. In 2000, the presence of an adult was confirmed followed by the observation of two adults in 2001. Breeding occurred early 2002, 12 hatchlings were observed in March that year. Nine juveniles were found in 2003, suggesting a hatchling survival rate of 75 %. In 2004 seven juveniles remained suggesting a juvenile survival rate of 78 % from 2003 – 2004. Although the juveniles always seem to remain in the lake, the adults are not always present. We assume that adult crocodiles sometimes move to nearby Catalangan River (ca. 200 m. from the lake). Breeding occurred again in 2004, three very recently hatched crocodiles were observed in September. The number of observed non-hatchling crocodiles increased from one in 2000 to eight in 2004 (see figure 4).

Figure 4: Annual monitoring results in Dunoy Lake.



3. Dinang Creek was identified in 2000 as an important Philippine crocodile site. At the end of that year, four hatchlings and eight juveniles were observed. The hatchlings observed in early 2001 are from the same nest as in 2000. Breeding must have occurred in the latter half of 2000. In 2002, new hatchlings were found indicating a second successful breeding event. That year we also observed two adults. In 2003, 17 juveniles were observed. Assuming all juveniles observed in 2002 survived in 2003, hatchling survival rate over 2002- 2003 was 79 %. A strong typhoon hit San Mariano in July 2003 causing massive flash floods, especially in denuded areas such as along Dinang Creek. In February 2004 only 10 crocodiles were found in the creek. Because of national election related violence in the area we were not able to survey the creek in May 2004. If really only 10 crocodiles survived, typhoon caused mortality could have been as high as 53 %. The number of non-hatchling crocodiles increased from seven in 2000 to 19 in 2003, possibly decreasing to 10 in 2004 (see figure 5).

Figure 5: Annual monitoring results in Dinang Creek.



Four students from the College of Development Arts & Sciences (CDCAS) of Isabela State University did their internship in the CROC project. The purpose for this internship was to create databases for the quarterly monitoring data of the project. The internship students were under the supervision of Mr. Marco Huigen. The students prepared a database for the CROC but this database needs further improvement of its operation.

Summarizing: the CROC follow up project has spend much time and energy in the monitoring of crocodile populations. Increasingly, these field visits incorporate a strong conservation focus. The monitoring has to be improved: more attention is needed

for monitoring fish stocks, land use and attitudes of local people. This information is needed to respond quickly to changing situations at the local level. The team has to be further trained in community organizing techniques and scientific data analysis. The difficult terrain, peace and order concerns and adverse weather conditions in the area always make monitoring difficult but scientific rigor has to be guaranteed.

Activity 1.3 Telemetry

Proposed under this activity was the catching and radio tagging of ten crocodiles to provide data on biometrics and stomach contents (captured crocodiles) and on life history traits such as crocodile movements, habitat use, behavior, territoriality, reproduction, mortality and prey choice (telemetry, released radio tagged crocodiles). These data were (and still are) thought to be crucial for the design of appropriate long-term Philippine crocodile conservation plans. Unfortunately it proved very difficult to organize the catch-and-tagging operation due to the lack of expertise (choice of equipment, catching of crocodiles, attachment of radio transmitters) and bureaucratic issues (permit to catch crocodiles, permit to possess and use radio equipment). In September 2004 all these issues were solved and an attempt was made to catch and tag crocodiles in co-operation with Dr. Brady Barr of National Geographic Television and representatives of the PWRCC and the DENR. Permits were secured from DENR and the National Telecommunication Commission (NTC). However, only a hatchling crocodile was caught, too small for a radio tag. Larger crocodiles were observed, and almost caught using a handheld snare trap, but in the end all attempts failed. It was decided to try again in November 2004, this time using passive baited snare traps, but a sequence of typhoons hitting northern Luzon made fieldwork during this period impossible. A third attempt has now been scheduled for May 2005 when weather conditions are usually good. Three radio transmitters, one receiver and an antenna are in the possession of the CROC Project and are ready for use should crocodiles finally be caught.

It was possible to design alternative studies to gain much of the information needed by observation only, though limited in area to one permanent CROC locality (Dunoy Lake) and without being able to recognize individual crocodiles. The patterns of crocodile movements in the target area remain a mystery which can hopefully be solved in 2005 and later years with the help of telemetry.

It should be noted here that the CROC project has been active in generating data on Philippine crocodile ecology. The IUCN/SSC Crocodile Specialist Group stated in the Crocodile Status Survey and Conservation Action Plan that only very little is known about the ecology of wild populations of *C. mindorensis* (Ross 1998). The CROC project developed a methodological protocol for the ecological study of *Crocodylus mindorensis*, and tested it in the field (van Gils, Tarun & Telan 2002).

The on-going study on the ecology and behavior of Philippine crocodile in the wild started in September 2004 through an additional research grant from the Haribon Foundation under the Haribon Foundation Threatened Species Program. The research grant (PhP 250,000) was approved in September 2004. The study is being conducted in Dunoy Lake (N 16 59' 50.6", E 122 09' 34.4") situated in barangay Dibuluan, San

Mariano, Isabela. Bernard Tarun and Ingeborg Schreuder are presently conducting the study.

The main objective of this research project is to gain knowledge on Philippine crocodile behavior and ecology in the wild. A sub-objective is to enhance the knowledge and capacities of Filipino crocodile researchers and conservationists to implement the Philippine crocodile conservation work in Northeast Luzon.

The research project is implemented mainly by observing crocodiles in Dunoy Lake from a hide on an observation tower. Time budgets, movements, micro-habitat use, prey choice and interactions between crocodiles or other wildlife is recorded, using structured time-interval scans. Behavior is documented with a video camera.

The results of this research project will be used to refine the Philippine crocodile conservation program in San Mariano. It will also benefit crocodile conservation activities elsewhere in the country. Scientific underpinning of this program is now limited to data on Philippine crocodile distribution and population size. Data on food choice, movements, micro-habitat use, possibly territorial behavior, home ranges and reproductive behavior and ecology would further strengthen the conservation approach. Further this study will be used as an input to information and awareness campaigns in Northeast Luzon and it will be disseminated to other stakeholders in crocodile conservation. The first results will be presented at the annual symposium of the Wildlife Conservation Society of the Philippines (WCSP) in April 2005.

Summarizing: important steps were taken to start with the telemetry study. Despite the presence of Dr. Brady Barr from National Geographic, the tagging operation in September 2004 failed to capture any large crocodiles. A new operation is now planned for May 2005. Important ecological information was gathered in the behavior study in Lake Dunoy, which received additional funding from the Haribon Foundation.

Objective 2: Providing accurate social economic data as an input to the design of conservation measures

Here, we will highlight the achievements of the CROC project in getting reliable information on (1) threats, (2) awareness, and (3) benefits for local communities. Section 5.3 gives an overview of the publications that were made on the basis of this information.

Activity 2.1: Threats

Information on threats was collected during the surveys and the quarterly monitoring activities. Student research also proved an important source of information. The following activities continue to threaten Philippine crocodiles (and Estuarine crocodiles) in different localities in Northeast Luzon:

1. **Direct killing:** Local inhabitants often fear that crocodiles pose a threat to people and livestock. This can be tackled by targeted CEPA campaigns. As a result of the campaigns by the CROC project the number of crocodiles killed has significantly declined. There are no confirmed reports of *C. mindorensis* attacking people in Region 02. Attacks of *C. porosus* have occurred in the coastal sites of Isabela but have not been fatal.

2. Catching of crocodiles: crocodiles are accidentally captured in fishing nets and wildlife traps. More disturbing, there are persistent rumors of crocodiles being captured for the pet trade,
3. Unsustainable fishing: Dynamite, cyanide and electro fishing are often used in the region, and pose a serious threat to crocodiles and people. Crocodiles could become the victim of fishing activities when dynamite is being used or when crocodiles would become entangled in nets or fish traps (smaller crocodiles).
4. Habitat conversion: Ongoing reclamation of freshwater wetlands for rice cultivation threatens the long term suitability of habitat for crocodiles. Illegal logging is a serious problem in the NSMNP. Mangrove cutting is threatening *C. porosus* habitat in the coastal site. This is largely fuelled by ongoing in-migration in the remote barangays in Isabela (and to a lesser extent population growth).
5. Destruction of nests: The collection of eggs and the destruction of nests pose a serious threat to the crocodiles.
6. Treasure hunting: in several sites heavily armed men are involved in treasure hunting in caves (f.e. Dikabulan in April 2004 and in Divinisa in October 2004) and this poses a serious threats to crocodiles, local people and the underground ecosystem of the NSMNP. Dynamite is often used to blow up cave systems, crocodiles use caves as an alternative for burrows in limestone areas. CROC always informs the government authorities (AFP, DENR, PASu, LGU, and PNP) when treasure hunters are encountered
7. Unsustainable farming practices: slash and burn agriculture is widely practiced in the remote upland areas in Region 02. This causes soil erosion and siltation of the creeks and rivers during heavy rains. One of the activities of the CROC project has been the NARRA project (see section 2.3). Pollution of creeks, rivers and lakes with farming chemicals also threatens the health of crocodiles and people.
8. Natural calamities: typhoons pose a heavy toll on crocodile populations. Typhoon Harurot in August 2003, for example, was very destructive for the crocodile population in Dinang Creek. The very low population size makes crocodiles extremely vulnerable to these stochastic natural disasters. .

Although the largest direct threats to the crocodiles in San Mariano have greatly diminished (killing of crocodiles, capturing live hatchlings for the illegal pet trade) and some of its core habitat is now officially protected by the local government unit of San Mariano, concerns remain about less direct threats that will hamper the successful recovery of the population. Fishing practices in the upland rivers of San Mariano are generally unsustainable: dynamite, electricity and chemicals are widely used. Also, less destructive methods are practiced such as the use of too small fishing net mesh sizes. Some rivers in San Mariano are now virtually empty of fish, not only decreasing the food

supply for crocodiles but also seriously affecting local fishermen's livelihoods, especially of poor upland farmers. The indigenous peoples of the Sierra Madre, the Agta and Kalinga, are also victims as these groups heavily depend on fish for food and income. The fishermen using destructive methods are often outsiders, wealthy enough to afford dynamite and chemicals. Other threats to crocodiles, upland farmers and indigenous peoples are the ongoing erosion of riverbanks caused by logging and slash-and-burn farming. Flashfloods often occur in denuded areas, carrying away crocodiles but also houses and farmland. Microclimate changes as a result of deforestation lower precipitation and water availability. The unrestricted use of farming chemicals pollutes rivers; potentially very harmful to people as river water is used for bathing, washing clothes and as the source of drinking water, especially by women. Without sufficient clean water, irrigation of rice and cultivation of other crops will not be possible. Without sufficient clean water with healthy fish populations there is no future for the crocodiles in San Mariano. Crocodile conservation and good sustainable wetland management are intrinsically linked.

Although most inhabitants of the Sierra Madre are aware of the deteriorating state of their wetland areas, not much is done about it. *Barangays* can enact ordinances to protect natural resources and are allowed to enforce these ordinances. The Municipal Council can do the same on a municipal level. National environmental programs and laws have to be implemented and enforced by the Department of Environment and Natural Resources (DENR), which has provincial and regional sub-offices. DENR, however, is a huge bureaucratic organization plagued by budget deficits, which hampers the operationalisation of most of its programs. Harmonization of *barangay*, municipal and national laws is desperately needed. *Barangay* councils and municipalities do often not have sufficient technical skills and knowledge to design and implement successful environmental programs. Law enforcement is weak as a result of the lack of coordination between stakeholders and a general fear of taking action against, possibly politically powerful, outsiders.

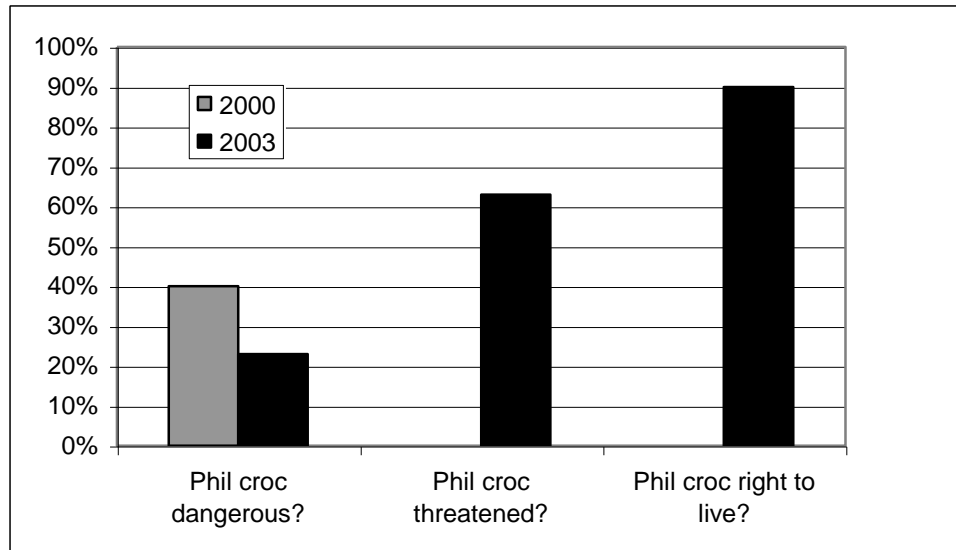
Indirect factors that threaten crocodiles and people in the Sierra Madre include: (1) a general lack of awareness of the importance of crocodile conservation, (2) disharmonized local, municipal and national laws that protect wildlife and wetlands, (3) the lack of coordinated action to enforce laws, and (4) the lack of local capacities and skills to design and implement crocodile conservation programs. As described below, the CROC project initiated activities to address these issues.

Summarizing: The CROC project gained an in-depth understanding of the threats facing crocodiles in the Sierra Madre. Data was collected during quarterly monitoring, surveys, 2 summer classes, and the supervision of ISU students in the field. The challenge is to effectively address these threats at the local level.

Activity 2.2 Awareness

A comprehensive summary of changing attitudes of people as a result of the CEPA campaign of the CROC project was presented at the World Park Congress in Durban in 2003 (van Weerd, van Boven & van der Ploeg 2004). Figure 6 presents the changes that have occurred in the attitudes towards crocodiles of local people.

Figure 6: proportion of respondents answering yes to questions pertaining to the status and image of Philippine crocodile in San Mariano before (2000) and after (2003) the CROC CEPA campaigns.



Based on the results of the studies conducted by 4 BS Environmental Science undergraduate students and 2 summer classes (Gatan 2003; DESAM 2003; Guingab 2004; Acorda 2004; Garduque; Tarun 2004), the majority of the people living close to the habitat of the Philippine crocodiles accepts and is now aware of the need for crocodile conservation. Interestingly, people living far from crocodile areas are afraid of crocodiles, whereas local people living in or close to crocodile habitat do not fear them.. Having hands-on experience with these small and very shy crocodiles helps in keeping a favorable opinion on them whereas “the discovery channel effect” distorts original views and perceptions. The following student reports were prepared:

1. Josephine Guingab (2004) *Knowledge level of DENR officials towards Philippine crocodile conservation* ISU-CFEM BSES thesis, Cabagan.
2. Carlo M.B. Garduque (2004) *Knowledge level of local government unit (LGU) officials towards Philippine crocodile conservation.* ISU-CFEM BSES thesis, Cabagan.
3. Dexter M. Acorda (2004) *Knowledge level of barangay officials on crocodile conservation in the municipality of San Mariano.* ISU-CFEM BSES thesis, Cabagan.
4. Rhyan G. Tarun (2004) *Knowledge level of local communities and the conservation of the Philippine crocodile.* ISU-CFEM BSES thesis, Cabagan.

The results of these studies have been used in the design of posters and other CEPA materials. The students have graduated from ISU. We can conclude that we have

achieved the goals of this specific objective. Follow-up surveys on the awareness of people will generate valuable information.

Activity 2.3 Impact on livelihood

In the CROC project we've collected scientific information to be able to assess the impact of crocodile conservation on local communities. Four BSES students are currently conducting their thesis within the framework of the CROC project. They are supervised by Professors of CFEM of ISU and the team leaders of the CROC project

1. Rommel Fangonillo: *Crocodylus mindorensis attacks on humans in Cagayan Valley.*
2. Karen Soriano: *Crocodylus porosus attacks on humans in Northern Luzon*
3. Heidi Roldan: *Willingness to pay for crocodile conservation*
4. Erwin Tumaliuan: *Socioeconomic impact of the Philippine crocodile sanctuary in Dinang Creek*

Their reports have to be submitted to ISU before 1 March 2005. These reports will provide valuable insights on the socioeconomic context of crocodile conservation in Isabela. In addition to these student reports, the CROC project organized two summer classes in cooperation with CFEM and CDCAS. In 2003 13 graduate and undergraduate students of ISU joined the summer class in Dinang Creek (and 6 professors of ISU). In 2004, 34 students joined the summer class in Disulap River (with 7 professors). Two reports (DESAM 2003; DESAM 2004) summarize the main findings of these fieldtrips.

One of the verifiable indicators in the CROC follow up proposal has been to draft a proposal for alternative livelihood assistance. In January 2004, the CROC project drafted a proposal on the request of a local people's organization in San Mariano and the LGU. This project proposal was submitted to the WorldBank and was granted PhP. 1,000,000. See box 1 for more information on the NARRA project. Concluding: more quantifiable information is still needed to assess the economic effects of crocodile conservation.

Box 1: Protecting crocodiles and improving rural livelihoods: the NARRA Project

During the 1st innovative development marketplace in January 2004, the WorldBank granted 1 million peso to the NARRA project, a joint activity of the San Isidro Agroforestry Multipurpose Development Multipurpose Cooperation, WWF-Philippines NSMNP-CDP, the LGU of San Mariano, and the CROC project.

Rural poverty is leading to the rapid destruction of the natural habitat of Philippine crocodile; illegal logging, unsustainable land use and hunting are threatening the watersheds on which the crocodiles (and ultimately also the people) depend. Only by addressing the root cause of the problem, poverty, can the habitat of the critically endangered Philippine crocodile be protected. A conservation strategy for the Crocodile Management Zone will only succeed with the consent and support of the local people in the area. The goal of the Native Advocacy for Rural Reconstruction and Agro-forestry (NARRA) project is to create an innovative mechanism for sustainable development in the Crocodile Management Zone of the Northern Sierra Madre Natural Park (NSMNP). The members of the San Isidro Agro-forestry Developers Multi-Purpose Cooperative (SIAFDMPC) have defined the following interrelated objectives:

1. Reforestation of Philippine crocodile habitat. The Crocodile Management Zone of NSMNP consists largely of unproductive *Imperata* grasslands. Reforestation of the steep slopes will protect crocodile habitat and restore the ecological functions on which also the farmers ultimately depend. However, reforestation projects on public forestlands have generally yielded poor results. The NARRA Project uses an innovative approach, offering farmers to obtain formal land rights and develop their agroforestry farms and indigenous forest tree plantations.
2. Providing tenurial security. Land rights are crucial for the successful reforestation of the Crocodile Management Zone of NSMNP, and a priority for the farmers. It gives farmers a strong incentive to invest in soil and water conservation on their land. The development of agro-forestry farms and forest tree plantation offers a sustainable and profitable land-use strategy for upland farmers.
3. Development of alternative livelihood options for short-term cash needs. Illegal logging is for many people in the buffer zone of NSMNP the only source of short-term monetary benefits. However, logging in the protected area is illegal, and revenues are relatively low as middlemen and protectors skim off large percentages. Moreover, upland farmers realize that illegal logging is threatening the Philippine crocodile and jeopardizing their own future, and are looking for legal alternatives. The collection of wildlings will provide a sustainable alternative on the short term, and will tide the period until the agroforestry farms start producing. During the first years farmers can also cultivate cash crops in their agroforestry farms, which can be better marketed due to the rehabilitation and maintenance of the farm-to-market road network of the LGU.

The NARRA project offers an integrated solution to Philippine crocodile habitat destruction. It offers a short-term solution for the impoverished farmers in the Crocodile Management Zone of the NSMNP. Reforestation will rehabilitate the degraded watersheds and simultaneously provide livelihood opportunities for the rural communities. Agroforestry farms and forest tree plantations will reduce dependency on illegal logging in the protected area. The NARRA project thus creates a sustainable future for crocodiles and people in the NSMNP. The trees are now planted in the NARRA project reforestation site.

Objective 3: Communication Education and Public Awareness (CEPA) campaign

In this section we will describe the progress the CROC project has made in enhancing knowledge and awareness on crocodiles, and on the need of conservation of crocodiles and their wetland habitats. In the follow-up proposal the following activities were proposed: (1) establishment of 5 visitors and information centers, (2) involvement of local schools, (3) production of educational materials

Activity 3.1 Visitors Centers

The following five information displays were established during the CROC follow-up project:

1. LGU Town Hall: The municipal town of San Mariano serves as information center for crocodile conservation. Communication, Education and Public Awareness campaign materials were displayed at the ground floor of the building showing the background of crocodile conservation in the municipality. The CROC Project in collaboration with the LGU San Mariano initiated this to strengthen the conservation effort in informing the general public and to change the negative perception of local people towards crocodiles.
2. San Jose Crocodile Rescue Center: The Municipal Philippine crocodile rescue center (often called the holding pen) has been established by the Plan International/Northern Sierra Madre Natural Park - Conservation Project in 2001 upon the request of the Local Government Unit (LGU) of San Mariano (Municipal resolution No. 2000-133). Mr. Fernando Domingo, a community partner in crocodile conservation from the village of San Jose, agreed to host the holding pen on his land and was appointed caretaker. The holding pen serves as refugee for crocodiles that have been retrieved from captivity (pets) and crocodiles that have been caught by fishermen throughout the region and which cannot be released in the wild. In 2003, two crocodiles were kept in the holding pen in two separate enclosures with a bamboo wall. Earlier, the dividing wall had collapsed and it was time to upgrade the existing facilities. The upgrading of the crocodile holding pen was also supported by Melbourne Zoo, Australia, through Mr. Chris Banks. During his visit in May 2003 suggestions were forwarded to construct a concrete dividing wall between the two enclosures, canals and clean water supply. The upgrading of the holding pen, carried out during two weeks, included purchasing of materials. Gravel and sand were delivered by truck from Binatug River to San Jose. Members of the local community of San Jose headed by the caretaker Mr. Fernando Domingo were hired as laborers and supervised by one CROC staff member. Before the construction started, the animals were secured and placed in a temporary cage made up of indigenous materials (buho) with a length of 1 m. x 70cm. width in the first enclosure. Continues flow of water in the temporary cage was established to maintain the soil moisture. One animal was released when the first enclosure was ready and the cement residues were washed away with water to avoid poisoning of the animals. All burrows/tunnels made by the animals in two enclosures were filled with rocks and soil. The

ground surface in the first enclosure was concreted and covered with earth soil to become semi natural and to avoid burrowing of the animal. Two pools were constructed in two enclosures, with channel leading water from the first enclosure to the second where it exits the pen. An improved water system was established with a stainless steel water storage tank situated near Fernando's house and a concrete water catchment's tank at the water source. All water is now being channeled through PVC pipes that are dug to the ground to avoid burning incase of forest fire. A faucet for water outlet was constructed near Fernando's house for the family's use. Another pipe leads water to the first enclosure of the pen. Continuous water flow is now possible but the flow can also be interrupted manually. The excess materials were utilized to construct a comfort room adjacent to Fernando's house for the family and visitors. A donation box was placed at the house of the caretaker for visitors giving voluntary contributions for the maintenance and food of the crocodiles. A display board also serves to display posters, quarterly newsletters and crocodile magazines to let visitors read more about the Philippine crocodile. Five road signboards were newly constructed and will be placed in strategic places for easier access for the visitors who want to visit the municipal Philippine crocodile holding pen. One signboard was printed with the rules and regulations and will be placed in front of the holding pen. The CROC project provided a loan for the caretaker to install a small variety store (drinks etc.) for the visitors. The loan will be paid back within two years through their income in the variety store. He was appointed by the Local Government Unit of San Mariano as one of the twelve sanctuary guards (Bantay Sanktuwaryo) who were trained during the Second Philippine crocodile workshop last November 15-19, 2004 held at the ATI-RTC, ISU Campus, Cabagan in cooperation with Tanggol Kalikasan and DENR. The Local Government Unit of San Mariano provides a minimal honorarium per month to Bantay Sanktuwaryo members for their efforts.

3. Disulap River municipal Philippine crocodile center: No information shed was established in the municipal sanctuary. Instead the CROC project placed twelve billboards along the buffer zones of the Disulap River municipal Philippine crocodile sanctuary. These billboards were established to replace the former billboards that were destroyed after the typhoon Harurut. Billboards that were not completely destroyed were restored and erected again in the same place were they were formerly standing during the summer class in April 2004.
4. Observation tower in Dunoy Lake: A tower was constructed in Dunoy Lake to provide a better spatial overview for the CROC team during quarterly monitoring and for the school visits from various schools in Isabela. The observation tower was constructed in July 2003 with a hide, about five meters high. The observation tower was made up of bamboo (Bayog *Bambusa bluemei* and Kawayan tinik) which is locally available in the area. The roof was made of Cogon *Imperata cylindrica* to provide shelter. Nearby living Agta were hired as laborers during the construction of the tower.

5. Painting of school in Cadsalan: It was envisioned to construct a small information center in Dinang Creek in barangay Cadsalan to educate people about crocodile conservation. In summer 2002, the graduate and undergraduate students of ISU conducted the Environmental Impact Assessment (EIA) of the proposed Philippine crocodile municipal sanctuary in Dinang Creek. With the permission from the officials of the Barangay, the summer class stayed in the School. In July 2002, typhoon Harurut hit Northeast Luzon and severely damaged the school building. Instead of constructing an information shed, the CROC project donated PhP. 50,000 to restore and repair the damaged school. One wall of the restored building was decorated with informative paintings of crocodiles. Thus the school now serves as visitor's center for crocodile conservation. The teachers are actively involved in the crocodile conservation by incorporating the importance of crocodiles in their classes. Every day the school children see the crocodiles on their walls and have again a roof on their classroom.

Activity 2.3 Schools

The expected outputs for this component were: (1) school presentations in different schools in Region 02, and (2) 40 school visits to see the Philippine crocodile in the wild.

1. Lectures in schools: a total of eighty seven (87) schools were visited in Northeast Luzon. A ten minutes presentation about Philippine crocodile was given to students. After the presentation, a question and answer portion was carried out in order to encourage the students to share their ideas and perception on crocodiles.

Table 3: List of schools visited by the CROC project

Names of Schools	Distribution of poster for Phil. crocodile			
	Ilocano	Tagalog	English	Total Received
Del Pilar Elementary School	3	3	3	9
Del Pilar Integrated High School	3	3	3	9
Daragutan East Elementary School	0	6	6	12
Daragutan West Elementary School	0	3	3	6
Villa Miranda Primary School	1	2	0	3
Dibuluan Primary School	0	2	0	2
Disulap Elementary School	1	3	0	4
San Isidro Elementary School	1	2	0	3
San Jose Elementary School	0	2	1	3
San Jose Integrated High School	0	2	1	3
Casala Elementary School	1	2	1	4
Minanga Central School	0	6	7	13
San Mariano High School	0	4	0	4
San Mariano Central School	0	4	2	6
Alibadabad High School	0	4	2	6

Buyasan Elementary School	0	2	1	3
Ibujan Primary School	0	2	0	2
Cataguing Primary School	1	2	1	4
Maranao Elementary School	0	1	3	4
Ueg Elementary School	0	5	0	5
Macayucayu Elementary School	3	2	0	5
San Mariano High School Annex (Ueg)	0	1	0	1
Gangalan Primary school	3	2	0	5
Panninan Primary School	5	1	0	6
Libertad Primary School	0	1	1	2
Dipusu Elementary School	0	2	1	3
San Pedro Elementary School	0	2	1	3
Alibadabad Elementary school	0	3	1	4
Disusuan Primary School	0	2	0	2
Villa Ancheta Primary School	0	2	0	2
Zamora Primary School	0	2	0	2
Caunayan Primary School	0	2	0	2
Old San Mariano Elementary School	0	5	1	6
Bitabian Elementary School	0	2	1	3
San Mariano High School Bitabian annex	0	2	1	3
Palutan Elementary School	0	2	1	3
San Pablo Elementary School	0	2	1	3
Santa Felomena Elementary School	0	1	2	3
Santa Felomena High school	0	0	1	1
ISU San Mariano	0	1	5	6
Dicamay Elementary School	3	2	1	6
Tappa Primary School	3	2	1	6
Masipi East Elementary School	0	3	1	4
Mabangug Ellementary School	0	2	1	3
Delfin Albano High School	0	2	1	3
Cabagan Central School	0	2	1	3
Union Primary School	0	2	0	2
Divisoria Primary School	0	2	0	2
Camasi Elementary School	4	2	1	7
Dy Abra Elementary School	0	2	1	3
Cumabao Elementary School	0	2	1	3
Namnama Elementary School	0	2	1	3
Antagan 1st Elementary School	0	2	1	3
Tumauni, National High School (Antagan Annex)	0	2	1	3
Sisim-Minanga Elementary	0	2	1	3
Caligayan Elementary School	0	2	1	3
Tumauni North Central School	0	2	1	3
Capellan Elementary School	0	4	3	7
Pasa Primary School	0	2	0	2
Santa Victoria Elementary School	0	2	1	3
Nanaguan Primary School	0	2	0	2
Isabela National High School (Rang - ayan Annex)	0	2	1	3
Batong labang Elementary School	0	2	1	3

Talaytay Primary School	0	1	0	1
Villa Imelda Primary School	0	1	0	1
Lupigue Elementary School	0	2	1	3
Sindon-Bayabo Elementary School	0	2	0	2
Sindon-Maride Elementary School	0	2	1	3
Limbauan Elementary School	0	2	1	3
San Pablo National High School	0	2	1	3
San Pablo Central School	0	2	1	3
Saint Paul Vocational and Industrial High School	0	2	1	3
San Vicente Elementary School	0	3	1	4
Dalena Elementary School	0	2	1	3
Simanu Sur Elementary School	0	2	1	3
Simanu Norte Elementary School	3	3	1	7
Reina Mercedes Elementary School	0	3	0	3
Maconacon Elementary School	1	3	0	4
Maconacon High School	0	2	4	6
Divilacan High School	0	4	1	5
Divilacan Elementary School	0	2	1	3
Dimasalansan Elementary School	0	2	1	3
Bicobian Elementary School	0	2	1	3
ISF Culasi	0	1	2	3
Palanan High School	0	1	2	3
ISF Palanan	0	1	2	3
16 Elementary School (C/O District Supervisor	0	23	18	41
Total	36	216	114	366

2. School visits: during a school visit students camp one night in Dunoy Lake (to see crocodiles in the wild) and visit the San Jose Municipal crocodile rescue center the following day. Conditions are sometimes harsh in these remote areas. Therefore no school visits can be conducted during rainy season. Unfortunately most schools are closed during the summer holidays, which is the best time to visit the field. Despite these problems, a total of 20 school visits have been carried out with a total of 269 students (see table 4). The school visits aim to inform the students about the conservation of the Philippine crocodile and to show them the behavior of crocodiles in their natural habitat.

Table 4: List of CROC project school visits (2003 – 2004)

No.	Name of Schools/Organization	Number of Participants	Date
1.	CDCAS (DEVCOM)	17	January 22, 2003
2.	DESAM (EIA)	10	July 2003
3.	Youth Ecological Society (YES)	21	November 8-9, 2003
4.	CFEM (FPU)	22	January 29 – 31, 2004
5.	CFEM (DESAM – YES)	24	February 21 – 22, 2004
6.	Kalinga State College	29	February 26 – 28, 2004
7.	CFEM (DESAM)	16	April 26 – May 5, 2004
8.	CDCAS (AB Socio)	10	April 26 – May 5, 2004

9.	CDCAS (BS Bio)	6	April 26 – May 5, 2004
10.	ISU Instructor	8	April 26 – May 5, 2004
11.	DENR (PENRO)	6	April 26 – May 5, 2004
12.	CDCAS (IT Internship)	6	March 28 – 30, 2004
13.	ISU San Mariano (Socio cultural)	13	August 9 – 10, 2004
14.	CFEM (Wildlife)	14	August 9 – 10, 2004
15.	ISU San Mariano (Dendrology)	14	August 19 – 20 2004
16.	CFEM (Dendrology)	11	August 19 – 20, 2004
17.	DEVCOM (ISU Cabagan)	17	September 24 – 25, 2004
18.	St Montessori School	12	October 16 – 17, 2004
19.	CENRO Naguilian	3	October 17 – 18, 2004
20.	Youth Ecological Society (YES) ISU	20	October 23 – 24, 2004
TOTAL		269	

Concluding: the CROC project achieved only half of the school visits it aimed to organize. It appears that school visits are a highly productive way of creating awareness. Organizational and logistical problems have delayed the organization of more school visits. Also presentations in schools are an effective way to get the message across. We strongly recommend to continue these activities.

Activity 3.3 CEPA Materials

The CROC project produced several education materials to include in the CEPA campaigns. The cooperation with the DEVCOM department of CDCAS assures the quality of the material and integrates the design in the curriculum of ISU. The CROC project aimed to make (1) a booklet on the Philippine crocodile, (2) produce radio plugs, encourage the participation of DEVCOM students in community consultations, (4) produce other materials.

The booklet and the radio plugs did not materialize. The CROC project thought that other materials (the information kit and the calendars) proved to be more effective. Students of DEVCOM made several fieldtrips to the CROC project sites to evaluate the materials they produced. The following CEPA materials were produced.

1. Posters: students of DEVCOM designed a “No to crocodile hunting poster” The CROC project printed 1000 copies of the poster. Posters were printed in Ilocano and English and highlight the penalties in the Wildlife Act and the San Mariano Municipal Ordinances (see figure 7). At present a new class of students, under the supervision of Dr. Myrna Cureg is designing a Wetland Conservation Poster to highlight the importance of freshwater wetlands for the survival of people and crocodiles.


Figure 7: No-to-crocodile-hunting posters designed by DEVCOM students highlight the penalties of the Wildlife Act and the Municipal Ordinances.

<<<<<INSERT POSTERS>>>>>>>

2. Information kit: the CROC project produced an information kit which summarizes information on the project for policy makers and journalists (see box 2). The information kit also includes a flyer of the CROC project. A total of 137 copies of information kit and flyers of the project were distributed to government agencies, communities, local government units and schools in Northern Luzon.
3. Calendar: the CROC project designed a calendar for 2004 and for 2005. It is commonplace in the Philippines to give your relations a calendar in the new year. Local people really need a calendar and find the CROC Calendar highly valuable. The calendars are often displayed prominently in the house throughout the year. One thousand CROC calendars for 2004 were distributed to the community, government offices and schools within the Northern Sierra Madre Natural Park. Currently the CROC calendar 2005 is printed and will be distributed to local communities.

The distribution of CEPA materials is an expensive and time consuming activity. Materials have to be carried to the remote barangays in the uplands of Sierra Madre. More money should be allocated for the distribution process in subsequent activities of the CROC project. Summarizing: too many activities were changed or realigned in this component of the project. A comprehensive CEPA strategy for the CROC project is urgently needed to rationalize and streamline activities. The CROC project has to scale up the CEPA activities. More materials should be produced and distributed on a larger scale. It is recommended to include a CEPA specialist in the CROC team. The CEPA campaigns of the CROC project prove to be effective (see under objective 2). CEPA campaigns have established a great sense of pride of local people in sharing their wetlands with the last Philippine crocodiles of the country.

Box 2: The CROC project fact sheet in the CROC project information kit

	<p style="text-align: center;">CROC Project FACTSHEET Philippine crocodile <i>Crocodylus mindorensis</i></p>
<p>Crocodiles in the Philippines: There are two crocodylian species found in the Philippines: the Estuarine crocodile <i>Crocodylus porosus</i> and the Philippine crocodile <i>Crocodylus mindorensis</i>. The Estuarine crocodile occurs widely from India to Australia along coastal areas and in the sea. The Philippine crocodile is an endemic, freshwater crocodile generally restricted to inland wetlands. The Philippine crocodile is a small (max. length 2.5 m.), shy and harmless animal that does not attack people unless provoked.</p>	<p>Threats: The Philippine crocodile population has been decimated by widespread hunting and killing of the species. In addition, suitable habitat such as lakes and marshes have been converted into agricultural areas whereas rivers are increasingly polluted and silted. Crocodile food supplies have greatly diminished because of the widespread use of unsustainable fishery methods. Crocodiles in general have a bad reputation, which is undeserved in the case of <i>C. mindorensis</i>. The lack of awareness about this species unique to the Philippines which is on the brink of extinction hampers support to its conservation.</p>
<p>Conservation Status: Formerly widely distributed throughout the Philippines, the Philippine crocodile is now thought to be restricted to a few remote areas in Mindanao, Negros and Luzon. The Philippine crocodile was first discovered on the island of Mindoro and described as a new species in 1935, hence the name <i>C. mindorensis</i>, but no crocodiles have recently been seen on Mindoro. The total surviving population is widely believed to number less than 100 individuals. <i>Crocodylus mindorensis</i> is listed by the IUCN (the World Conservation Union) as critically endangered and is considered to be the most severely threatened crocodile species in the world. International trade of Philippine crocodiles, or crocodile products, is banned by the Convention on International Trade of Endangered Species (CITES). Nationally, Philippine crocodiles are totally protected under the Wildlife Act of 2001 which carries heavy penalties on harming the species. The Philippine crocodile was rediscovered in the municipality of San Mariano, Isabela Province in 1999. Currently, six sub-populations have been identified. Successful breeding, following conservation actions, has occurred in the past years increasing the non-hatchling population from 12 in 2000 to 27 in 2004. Additional sub-populations have recently been discovered in the municipalities of Divilacan and Palanan in Isabela Province and in the Cordillera Mountains in Abra Province. Although these populations are very small it reinforces hope that other remote areas also still hold crocodiles.</p>	<p>Conservation: The Protected Area and Wildlife Bureau (PAWB) of the Department of Environment and Natural Resources (DENR) is the mandated government agency to implement conservation measures for the Philippine crocodile. A Philippine Crocodile Recovery Team, consisting of representatives from various stakeholders, is assisting PAWB with this difficult task. A National Recovery Plan was published in 2001. The Palawan Wildlife Rescue and Conservation Centre (PWRCC), a government institution also under the DENR, has successfully bred <i>C. mindorensis</i> in captivity which could lead to reintroduction of crocodiles to the wild in the future. The Crocodile Rehabilitation, Observance and Conservation (CROC) project in Isabela Province is currently the only program which focuses on conservation of remnant Philippine crocodile sub-populations in the wild. This project is implemented by the Mabuwaya Foundation, a Philippine NGO, under the framework of the Cagayan Valley Program on Environment and Development (CVPED) of Isabela State University and Leiden University (the Netherlands) in cooperation with the DENR, local governments and local communities. As a result, the Local Government Unit of San Mariano has declared the Philippine crocodile their flagship species and established a municipal crocodile sanctuary in Disulap River. Here local people are protecting the Philippine crocodile in its natural habitat. This is widely considered to offer the best hope for the survival of the most endangered crocodile species in the world.</p>

Objective 4: Crocodile protection

The CROC follow up project aimed to establish crocodile reserves and/or other crocodile protection measures with full consent of local communities and local governments. The Philippine crocodiles in San Mariano are mainly found in the foothills of Sierra Madre, sharing creeks, rivers and lakes with upland farmers and the indigenous peoples of the area: the Agta and the Kalinga. The Local Government Unit (LGU) of San Mariano has declared the Philippine crocodile the flagship species of the municipality, enacted local ordinances that protect the crocodiles and established the very first Philippine crocodile sanctuary of the country in Disulap River. The process to declare a second sanctuary in Dinang Creek is under way. The sanctuaries are co-managed by local communities. The conservation program is entirely community-based; without full local consent the LGU of San Mariano cannot declare any sanctuaries. In the follow-up proposal the following activities were listed: (1) community consultations leading to the design of site-specific conservation action plans with the participation of LGU officials and local communities, and (2) the creation of a local protection group and the demarcation of crocodile sanctuaries. These activities can be considered as the core focus of the project.

4.1 Participatory design of site-specific action plans

The CROC project aims to mobilize local support for crocodile conservation. During community consultations the goals and objectives are presented and discussed with the local people. During these meetings the views and ideas of the community become clear and are used as an input for conservation action. The difficulties the DENR and LGU have in enforcing the law forces us to design community based conservation measures that are supported by the people based on self-imposed control. Table 5 presents an overview of the community consultations conducted by the CROC project. Equally important for mobilizing support of local people have been informal discussions with people in the field.

Table 5: List and methods of community consultations of the CROC project

Date	Activity	Methods
27 April 2003	Public consultations in Cadsalan	Semi-formal, open forum Composite team, LGU, ISU & CROC Introduction on the purpose of the summer class
6 May 2003	Public consultations in Cadsalan	Semi-formal Presentation of the draft output of EIA
31 July – 1 August 2003	Public consultations in Cadsalan	Semi-formal interview Composite team, DENR, LGU, CROC Presentation of the proposed sanctuary
17 February 2003	Meeting with the barangay Officials of Cadsalan	In-formal CROC & Barangay Officials of Cadsalan Discuss about the purpose of the field trip and crocodile conservation activities
3 October 2004	Emergency meeting in Cadsalan	Semi-formal Open discussion/forum Future activities in the proposed crocodile sanctuary

		Future activities after the land survey Presentation of CROC project and invitation of representatives for the 2 nd Philippine crocodile workshop
23 April 2004	Public consultation in San Isidro	Introduction of the summer class
5 May 2004	Public consultations in San Isidro	Presentation of the draft output of EIA Open forum
3 March 2004	Municipal Hall San Mariano	Formal Presentation of the CROC project

The outputs of these community consultations were used as an input for the design of conservation action plans. These action plans were refined during the 2nd crocodile conservation workshop in ISU in November 2004, which was funded by the NSMNP-CDP of WWF-Philippines, the Small Wetlands Program of NC-IUCN and the CEPF. During this workshop, barangay officials came up with their own solutions to protect crocodiles. Site specific action plans were prepared for the following sites:

1. Barangay San Jose (Disulap River)
2. Barangay Disulap (Disulap River)
3. Barangay Dibuluan (Dunoy Lake)
4. Barangay Cadsalan (Dinang Creek)
5. Barangay Tappa (all wetlands)
6. Barangay Dicamay (all wetlands)
7. Barangay Gangalan (all wetlands)
8. Barangay Del Pilar (all wetlands)
9. Barangay Macayucayu (all wetlands including barangays Ibulan and Buyasan)
10. Barangay Reina Mercedes (Blos River Estuary)
11. Barangay Diana (Dibol River)
12. Dicatian (Dicatian Lake)
13. Dilakit (Dilakit Springs and Dibino Creek)
14. Dipudo (Dipudo Island)
15. Dimasalansan (Dimasalansan Cove and Mangroves)
16. Culasi (Culasi Estuary)
17. Dialawyao (Dibukarot Creek)
18. Didadungan (Dicabulan Lake)

The action plans are summarized in the Crocodile Conservation Action Plan for the Northern Sierra Madre Natural Park (Mabuwaya Foundation 2004), and in the proceedings of the 2nd crocodile conservation workshop that are currently being prepared by the faculty of CDCAS. Concluding: the participatory action plans as specified in the CROC follow up proposal have all materialized. In preparation of the workshop, the CROC team gave presentations for the barangay council were given in twenty barangays in the Northern Sierra Madre Natural Park using a simple flip-over chart. During these presentations two representatives were invited for the 2nd crocodile conservation workshop at ISU Cabagan.

4.2. Bantay Sanktuwaryo

The CROC project aimed to establish local protection groups (*Bantay Sanktuwaryo*) to monitor the crocodile sanctuaries and implement the community-based rules and regulations in the following sites:

1. Disulap River: the declaration of the municipal Philippine crocodile sanctuary in Disulap River in September 2001 was a major step for the protection of the critically endangered Philippine crocodile in the wild. Municipal ordinance 2001-17 created a 10m buffer zone on both sides of the river, strictly prohibited destructive fishing methods, and identified the need for a *Bantay Sanktuwaryo*. It was envisioned that this *Bantay Sanktuwaryo* would be responsible for the protection of the sanctuary. In general, the ordinance is very well respected in barangays Disulap and San Jose. However, deforestation continues in some parts of the buffer zones of the sanctuary (especially in Kamaresitan), and unsustainable fishing methods are still sporadically used by outsiders. In addition, the crocodile nesting sites are still frequently disturbed, which could explain the absence of breeding since 2000. Despite community-consultations and a continuous public awareness campaign (posters, calendars and newsletters were distributed in the area, and accompanied with informal dialogues on the importance of crocodile conservation), the rules and regulations of the sanctuary are not strictly followed by some people, which threatens the survival of crocodiles in the sanctuary. The lack of effective law enforcement mechanisms is one of the causes of this problem.
2. Dunoy Lake is located in the Northern Sierra Madre Natural Park, and enjoys strict protection under the NIPAS Act. However, there is an urgent need to strengthen the protection of the lake and to involve the local community in crocodile conservation. Assigning two people as *Bantay Sanktuwaryo* in Dunoy would be a significant step in securing this unique breeding site for the Philippine crocodile.
3. Dinang Creek: since 2003, the local government unit of San Mariano is negotiating with the local community and the barangay council of Cadsalan to declare Dinang Creek as municipal Philippine crocodile sanctuary. A land survey was carried out that will assure the ancestral land rights of the indigenous community living around the crocodile habitat. In contrast with the other breeding sites, there are many people living adjacent to the creek. Over the past years, the local community has actively protected the crocodiles. However, they are helpless if powerful outsiders kill crocodiles, as happened in November 2002. The creation of a *Bantay Sanktuwaryo* will strengthen the conservation efforts of the community, and will create a direct benefit of crocodile conservation for this marginal and remote community.

The CROC project succeeded in assigning, training and deputizing 12 community members in these three sites as *Bantay Sanktuwaryo*. To assure the sustainability of the protection of the municipal sanctuary the LGU of San Mariano allocates a yearly budget for the honorarium and insurance of the *Bantay Sanktuwaryo*. The *Bantay Sanktuwaryo*

can only be effective if it's an integral part of, and supported by, the LGU of San Mariano. The Bantay Sanktuwaryo will be placed directly under the office of the municipal Mayor. The *Bantay Sanktuwaryo* will have the same arrangement regarding insurance as regular barangay *tanods* (community policemen). This is a crucial step for the protection of the Philippine crocodiles in Luzon. The commitment of the LGU should be applauded. Although the LGU is now the leading agency for the Bantay Sanktuwaryo, the CROC project still has to give technical support in the monitoring of crocodiles and writing reports. It is crucial that these local protection activities will be continued with the support of the CROC team.

The CROC follow up project also specifies the need to demarcate the crocodile sanctuaries. See section 3.1. for a detailed account of the demarcation of the municipal Philippine crocodile sanctuary in Disulap River. No additional bill boards were placed in Dinang Creek. A signboard was erected in Dunoy Lake informing visitors (and hunters that often pass on the trail) about the crocodiles and the penalties specified in the municipal ordinances. Here we conclude that much more effort should have been put in the demarcation (and the zoning) of the crocodile sanctuaries. This has a very direct (and visual) impact on the conservation of the species. Experimenting with creative and innovative approaches (such as a reward scheme for the protection of nests) would be beneficial for the project.

Objective 5. Cooperation of stakeholders

The CROC project aimed to enhance co-operation between and capacities of local stakeholders in Philippine crocodile conservation with the aim of establishing a long-term sustainable effort to conserve and rehabilitate this critically endangered species. Fragmented efforts and bad communication between stakeholders at different levels have hampered crocodile conservation in the Philippines. The CROC project undertook the following activities to address this issue: (1) the creation of a local foundation; (2) organization of the 2nd crocodile workshop, and (3) set up a communication system

Activity 5.1: Creation of local foundation:

One of the long-term goals of the CROC project is to establish a local foundation. The need for a local group of well-trained conservationists emerged during the 1st Philippine crocodile workshop held by the 1st phase of the NSMNP-CP in Cabagan in May 2002 (Lazaro 2002). Therefore the CROC Follow-Up proposal aimed to establish a local foundation, and enhance its capacity to design and implement a regional Philippine crocodile conservation action plan.

On 2 July 2003, the Articles of Incorporation and By-laws of the Mabuwaya Foundation Inc. were duly approved by the Securities and Exchange Commission under company registration no. CN200314661 as a non-stock and non-profit organization under the laws of the Republic of the Philippines. The CROC Project is now an officially registered Philippine NGO: the Mabuwaya Foundation. (Mabuwaya is a contraction of the Filipino words *Mabuhay*, welcome or long live, and *Buwaya*, crocodile). It is envisioned that this foundation will function as joint management mechanism for the

conservation of the Philippine crocodile in Northeast Luzon by mainstreaming and coordinating all conservation activities of the stakeholders. All stakeholders in crocodile conservation in the Sierra Madre are jointly managing the Mabuwaya Foundation through the Board of Trustees. Representatives of ISU (Prof. Jouel Taggug), CVPED (Dr. Andres Masipiqueña), LGU the San Mariano (SB Jerome Miranda), CML (Drs. Merlijn van Weerd), Philippine Crocodile Recovery Team (Mr. Chris Banks), CI (Dr Artemio Antolin), and DENR-PAWCZM (Dr. Restituta Antolin) are sitting on the Board of Trustees. The first Board Meeting was held on 16 November 2004. Currently, Dr. Andres B. Masipiqueña is the President of the Mabuwaya Foundation.

The creation of the Mabuwaya Foundation Inc. is a vital step to secure the sustainability of the CROC project activities, especially finances. The Mabuwaya Foundation was able to secure funds from: (1) Chicago Zoological Society (CSZ), CEPF, WWF-Philippines, Haribon Foundation, the Small Wetland Program of NC-IUCN (see also paragraph on sustainability).

Obviously, to make the foundation more than a paper crocodile it has to become a functional unit. Table 6 shows the field and office equipment that was purchased through the funding of the CROC follow-up project, or that was donated by other groups. This facilitates field and office work by the CROC Team.

Table 6: Equipment of the Mabuwaya Foundation

No.	Unit	Qty.	Specification	Model
1.	2	Pcs.	Flash light	Princeton Tec 4000 & TEC 400
2.	1	Pc.	Pelican case	1200
3.	1	pc	Video cam with complete set	700X – digital Zoom
4.	1	Pc	Map tube	MH-WAY
5.	6	pcs	PETZIL bulb	2.5 v
6.	6	Pcs.	MAG – LITE	(LR14 and LR40)
7.	1	pc	Sack type tent	Green
8.	2	pc	Scoop	
9.	1	pc	Cooking pan (Small)	
10.	1	pc	12 Channels GPS	Garmin
11.	3	Pcs	Sleeping bags	2 (basalu) 1 Coleman
12.	4	Pairs	Hammock	2 plain
13.	1	Pc.	Two burner cooking stove	
14.	4	Pcs.	Crocodile traps	
15.	4	pcs	Spoon	
16.	1	pcs	Cooking pan (big)	
17.	6	pcs	Assorted plates	
18.	2	pcs	Frying pan	
19.	1	pairs	Hiking shoes	BOSTON
20.	6	pcs.	Water proof Flashlight	Coleman (5 yellow, 1 black)
21.	1	pc	Tent (sleeps 2)	Coleman
22.	2	Pcs.	Waterproof Flashlight	Maglite
23.	1	Pc.	Spotting Scope	Binolyt 10x500
24.	1	Pc	Binocular	Binolyt 10x50

25.	1	Set	Water Measuring Device	Eijkelkamp
26.	1	Pair	Rain Boots	
27.	1	Unit	Binocular	Prismatic Seefeld 8x40
28.	1	Unit	Binocular	Minolta 20x50
29.	1	pc	Weighing scale	Bathroom scale BR-2011
30.	15	pcs	snare traps	
31.	2	pcs	crocodile net	
32.	4	pcs	crocodile tape	
33.	1	set	12x12 Battery & lightings	Motolite

The CROC Project of the Mabuwaya Foundation is currently working under the frame work of the Cagayan Valley Program on Environment and Development (CVPED). In January 2005, the CROC Project/Mabuwaya Foundation transferred to its new office at the EIC building of the Isabela State University in Cabagan. The Isabela State University committed one room to the CROC project, as the University considers the CROC project an important extension activity. In the CROC follow-up proposal we budgeted hiring two people to work in the foundation. However, to ensure that the project would be fully implemented we hired four staff members who work for a minimal allowance: PhP 8,000 per month (US\$ 145) Currently, the following people work in the Mabuwaya Foundation (in alphabetical order):

- Bernard A. Tarun (31): Forester, graduate student of ISU, currently MSc student at ISU and focus on the ecological research on *C. mindorensis*.
- Dominic Rodriguez (30): Forester, graduate student of ISU, currently MSc student at ISU and CROC team member. One of the "discoverers" of the Philippine crocodile in NE Luzon. Has been involved in the Philippine crocodile research and conservation work from the start in 1999. Focus on public relations (especially with the LGU of San Mariano) and community organizing and livelihood assistance
- Jessie Guerrero (31): Forester, graduate of ISU, currently MSc student at ISU and CROC team member. Focus on surveys and conservation action in the coastal areas of the NSMNP.
- Sammy Telan (29): Undergraduate student of CFEM and CROC team member. Focus on awareness raising campaigns (especially school visits and presentations).

Jan van der Ploeg (27), anthropologist, and Merlijn van Weerd (34) wildlife biologist, are leading the team. Jan and Merlijn work for the Institute of Environmental Sciences, Leiden University, the Netherlands. Jan is based in the Philippines and manages the daily activities of the project. Merlijn is in charge of the international network, and overall supervision and project development. Merlijn is a member of the IUCN Crocodile Specialist Group.

Concluding: the Mabuwaya Foundation has been established and is now implementing the CROC project. Internal reports are made every quarter to monitor project implementation. It has been a good start but there are still concerns about the long term viability of the foundation. The Mabuwaya Foundation needs an additional staff member for CEPA campaigns. The leadership of the foundation also remains an issue. There is a need for a senior (Filipino) project manager who can take over tasks in the near future. The involvement of Jan and Merlijn is expected to decrease in the coming year. Additional funding was secured but these are relatively small grants. The writing of proposals and reports takes relatively much time. Core funding from BPCP remains necessary for the coming two or three years. The government line agencies have recognized the foundation and good relations are being built with DENR and LGU. There is a need to strengthen the capacities of the CROC team, especially in crocodile handling, community organizing, and writing skills.

Activity 5.2: Training

From 15 to 19 November the CROC Project organized the 2nd Philippine crocodile workshop with the theme “*Strengthening sustainable management of wetlands for the benefits of people and crocodiles in the Sierra Madre*”. The workshop was attended by 141 participants and aimed to formulate local ordinances for the protection of crocodiles and their wetland habitat (see section 4.1). Representatives from the remote barangays of Sierra Madre which harbor crocodiles attended the workshop and prepared their action plans. DENR and LGU representatives, as well as officials from DILG and BFAR attended the workshop. Environmental lawyers of Tanggol Kalikasan, an NGO specialized on environmental law enforcement in the Philippines, gave trainings. PWRCC also provided inputs for the design of site specific action plans. The venue was at the ATI-RTC of ISU Cabagan. As a result, 12 persons were deputized as *Bantay Sanktuwaryo* by the Local Government Unit of San Mariano. These persons are responsible for the enforcement of laws and protection of the crocodile sanctuaries in the municipality of San Mariano (see section 4.2). Faculty members of CDCAS are currently working on the proceedings of this workshop. The organization of the workshop was a success according to the participants. It has trained local people and barangay officials in *in-situ* crocodile conservation.

Activity 5.3 Communication system:

To improve communication between the stakeholders, and mobilize public support in Philippine society for crocodile conservation, we envisioned the following activities in the CROC follow-up project proposal: (1) creation of a CROC website, (2) establishment of an CROC email group, (3) publication of quarterly newsletters, (4) dissemination of CROC reports to local partners, (5) publication of data in scientific journals, (6) presentation of research findings at seminars (although no budget was included here), (7) create media coverage.

The CROC project undertook the following activities:

1. Website: the following websites feature the CROC project:

www.cvped.org.ph/croc and
www.leidenuniv.nl/cml/pmo/projects/Crocodile.html

2. Yahoo group: A Yahoo email group has been established and used for some time. It turned out that only CROC team members used the group, especially to distribute the quarterly CROC newsletter. Distributing the newsletter to the group proved to be technically complicated and since the use of the email group was so limited its service has been discontinued. The newsletter is now being e-mailed to interested persons who can technically receive it and send by normal mail to those who can not. Of course, by far the largest number of newsletters produced is hand delivered in the field by the CROC team. Regular email contact is kept with various donors and supporters, notably the donors: BPCP, Conservation International/Critical Ecosystem Partnership Fund (CI/CEPF) Philippines, WWF Philippines, the Haribon Foundation, the Chicago Zoological Society and the Netherlands Committee for IUCN and the supporters: Melbourne Zoo, the IUCN Crocodile Specialist Group, Flora and Fauna International (FFI), the Wildlife Conservation Society (WCS) and interested journalists, scientists and other conservationists. All CROC team members have an email address and regularly use it. Internet access is being provided by the CVPED.
3. Quarterly Newsletter: the newsletter of the CROC Project is being published on a quarterly basis. So far 5 issues were published. A total of 200 copies (in English and Tagalog) of the quarterly newsletter are distributed to communities, government agencies, and key stake holder in crocodile conservation, non-government organizations, and schools in Northern Luzon.
4. CROC reports: all CROC outputs are reproduced and distributed to the (1) LGU of San Mariano, (2) DENR-PAWCZM Region 02, (3) CVPED library, (4) CML library. A copy is also kept in the CROC office. Other stakeholders, such as PWRCC, CI, WWF Philippines, NC-IUCN, etc., receive copies if relevant.
5. Scientific publications: Since 2002 (the start of the CROC Project) the following scientific publications have been published (or are in press) which deal partly or entirely with the Philippine crocodile or the CROC Project. In chronological order:
 - Van Weerd, M. 2002. The status and conservation of the Philippine crocodile *Crocodylus mindorensis* in the Northern Sierra Madre, Luzon, the Philippines. In: *Crocodiles. Proceedings of the 16th working meeting of the Crocodile Specialist Group*. IUCN-the World Conservation Union, Gland, Switzerland and Cambridge, UK, pp. 97-107.
 - Van Weerd, M., J. van der Ploeg, C. Banks and A. General. 2003. Report on Philippine crocodile developments in Northern Philippines. In: *Crocodile Specialist Group Newsletter* Vol. 22 (1): 8 - 11.

- Van Weerd, M. and A.A.G. General. 2003. Conserving the Philippine crocodile in the Northern Sierra Madre: the results of three years research and conservation action. In: Van der Ploeg, J., E.C. Bernardo and A.B. Masipiqueña (eds.), *The Sierra Madre mountain range: global relevance, local realities. Papers presented at the 4th Regional Conference on Environment and Development*. CVPED, pp. 17-33.
 - Van Weerd, M. and J. van der Ploeg. 2004. A new future for the Philippine crocodile. *Sylvatrop, the technical journal of the Philippine Ecosystems and Natural Resources* 13 (1&2): 31-50.
 - Van Weerd, M., G. van Boven and J. van der Ploeg. 2004. Using communication to involve local communities and local governments in protected area management: two related cases from Northeastern Luzon, Philippines. In: Hamú, D., Auchincloss, E. and W. Goldstein (eds.). *Communicating protected areas*. Commission on Education and Communication, IUCN, Gland, Switzerland and Cambridge, UK, pp. 139-154.
 - Tarun, B., J. Guerrero, D. Rodriguez, S. Telan, M. van Weerd and J. van der Ploeg. 2004. The current distribution and population size of the Philippine crocodile and Estuarine crocodile in Northeast Luzon, the Philippines. In: *Crocodiles*. Proceedings of the 17th working meeting of the Crocodile Specialist Group, IUCN- the World Conservation Union, pp. 166-173.
 - Van Weerd, M. and J. van der Ploeg. 2004. Conservation of the Philippine crocodile *Crocodylus mindorensis* in NE Luzon, the Philippines. An update. In: *Crocodiles*. Proceedings of the 17th working meeting of the Crocodile Specialist Group, IUCN- the World Conservation Union, pp. 277-283.
 - Miranda, J.S.Q., M. van Weerd and J. van der Ploeg. 2004. Devolving Crocodile Conservation to the Local Level: the Case of Philippine Crocodile Conservation in the Municipality of San Mariano, Northeast Luzon, the Philippines. In: *Crocodiles*. Proceedings of the 17th working meeting of the Crocodile Specialist Group, IUCN- the World Conservation Union, pp. 309-316.
 - Van der Ploeg, J. and M. van Weerd. (in press). Devolution of natural resource management and crocodile conservation in San Mariano. In: *Philippine Studies*.
6. Presentations: Since the start of the CROC Project in 2002 the following presentations have been given on the Philippine crocodile or the CROC Project (in chronological order):

- General, A. May 2002. *Philippine crocodile conservation in San Mariano*. Presentation at the regional conference on Environment and Development at Isabela State University, Cabagan, the Philippines.
- Van Weerd, M. May 2002. *Philippine crocodile *Crocodylus mindorensis* conservation, distribution, population size, population structure, habitat and prey population availability in the Northern Sierra Madre, Luzon, the Philippines*. Presentation at the regional conference on Environment and Development at Isabela State University, Cabagan, the Philippines.
- Van Weerd, M. October 2002. *The status and conservation of the Philippine crocodile *Crocodylus mindorensis* in the Northern Sierra Madre, Luzon, the Philippines*. Presentation at the 16th meeting of the IUCN Crocodile Specialist Group at Gainesville, Florida, USA.
- Van der Ploeg, J. *Luha ng Buwaya*. Key note speech at the Regional Conference for student leaders. Madella Quirino. February 2003
- Van der Ploeg, J. and M. van Weerd. April 2003. *Integrating rural development and crocodile conservation: the case of the Disulap River municipal crocodile sanctuary*. Presentation at the annual meeting of the Wildlife Conservation Society of the Philippines. Bacolod, the Philippines.
- Van Weerd, M. and J. van der Ploeg. April 2003. *A new future for the Philippine crocodile*. Poster presentation at the annual meeting of the Wildlife Conservation Society of the Philippines. Bacolod, the Philippines.
- Rodriguez, D. *The importance of crocodiles*. Presentation during environmental month of DESAM- CFEM on 18 June 2003
- Van der Ploeg, J. *In situ crocodile conservation in the Northern Sierra Madre*. Presentation at CVPED research seminar at ISU Cabagan on 23 June 2003
- Van Weerd, M. September 2003. *Using communication to involve local communities and local governments in protected area management: two related cases from northeast Luzon, Philippines*. Presentation at the World Park's Congress, Durban, South Africa.
- Van der Ploeg, J. *The Crocodile Research, Observance and Conservation (CROC) Project: a research conservation and education project for the Philippine crocodile in Northeast Luzon*. Presentation at CML, Leiden University on 22 September 2003

- Rodriguez, D. *The CROC project*. Presentation at CI Sierra Madre Biodiversity Corridor multi-stakeholder conference in Baguio on 8-10 October 2003
- Rodriguez, D. *The CROC project*. Presentation to the PAMB of NSMNP in April 2004
- Telan, S. and J. Guerrero. *One hundred-and-one heartbeats away from extinction*. Poster presentation at the Wildlife Conservation Society of the Philippines in April 2004 in Antipolo.
- Van Weerd, M. May 2004. *Philippine crocodile conservation in NE Luzon, Philippines. An update*. Presentation at the 17th meeting of the IUCN Crocodile Specialist Group. Darwin, Australia.
- Tarun, B. May 2004. *The current distribution and population size of the Philippine crocodile and Estuarine crocodile in Northeast Luzon, the Philippines*. Presentation at the 17th meeting of the IUCN Crocodile Specialist Group. Darwin, Australia.
- Miranda, J. May 2004. *Devolving Crocodile Conservation to the Local Level: the Case of Philippine Crocodile Conservation in the Municipality of San Mariano, Northeast Luzon, the Philippines*. Presentation at the 17th meeting of the IUCN Crocodile Specialist Group. Darwin, Australia.
- Van der Ploeg, J. and M. van Weerd. *We must view the world as it is not as we would like it to be: but not for the CROC project*. Presentation at Junior Expert Seminar, CML, Leiden University June 2004.
- Van der Ploeg, J. *Contested crocodiles? Philippine crocodile conservation, rural development and indigenous people's rights in the Northern Sierra Madre*. Presentation at the 7th International Conference on Philippine Studies, Leiden, the Netherlands. June 2004
- Van der Ploeg J. *Conservation Status of the Philippine crocodile in Northeast Luzon*. Presentation at CVARRD Regional Sectoral R& D review in Echague, Isabela on 27 July 2004 at ISU Cabagan
- Van Weerd, M. *The CROC project*. Presentation at the CROC press conference in Hotel Roma, Tuguegarao on 10 September 2004
- Van der Ploeg, J. *An update of the CROC project*. Presentation at CFEM Echo seminar. 25 October 2004.

- Van der Ploeg, J. *First Annual Report of the Mabuwaya Foundation*. Presentation at the board meeting of the Mabuwaya Foundation at the ATI-RTC on 16 November 2004
7. Media coverage: Over the past two years the CROC project received substantial press coverage in local, national and international media. Three TV documentaries were made about the Philippine crocodile in San Mariano
- Magandang Gabi Bayan (MGB) ABS-CBN. Prime time show hosted by vice president Noli de Castro
 - I-witness GMA 7 Long documentary about crocodile conservation in the Philippines.
 - National Geographic Channel: CROC Chronicles hosted by Dr. Brady Barr. The visit of Dr. Barr proved to be a huge media event. The CROC project organized a press conference to accommodate a group of journalists from Philippines, Taiwan, and Thailand who wanted to learn more about Dr. Brady Barr and the conservation of the Philippine crocodile (in that order). 6 newspaper articles in national newspaper in the Philippines were the result, prominently featuring the conservation activities in San Mariano for the Philippine crocodile.

In addition, the CROC project featured several times on the regional radio channel (BOMBO Radyo). The following articles have been published in popular magazines (in the Philippines and the Netherlands in chronological order):

- Van der Ploeg, J. and M. van Weerd. 2003. Last stronghold of the Philippine Crocodile. *Haring Ibon*, 1st quarter 2003, pp. 31-34.
 - Van Weerd, M. and G. van Boven. 2003. Mens en krokodil leven samen op de Filippijnen (in Dutch. Man and crocodile share habitats in the Philippines) . *Ecologie en Ontwikkeling* 11, no.2/3, pp.15-17.
 - Van Weerd, M. 2004. Het monster van de Sierra Madre (in Dutch: The monster of the Sierra Madre). *KIJK* April (4) 2004: pp. 62-64.
 - Bajarias, A. (pictures by D. Rodriguez and M. van Weerd). 2004. The crocodile tracker. *Haring Ibon*. 3rd quarter 2004, issue no 18, pp. 32-35.
8. Regional Philippine crocodile Recovery Team Meeting: The Regional Philippine crocodile Recovery Team is a multi-stakeholder body to improve communication. RPCRT meets every half year to discuss updates of activities and planning in crocodile conservation by the different key stake holder. The following

institutions are members: (1) the DENR, (2) LGU San Mariano, (3) CI, (4) WWF-Philippines, (5) ISU, and (6) the Mabuwaya Foundation.

9. **Network:** The CROC maintains a national and international network to improve crocodile conservation. A trip to Palawan Wildlife Research & Rescue Center (PWRRC) was made in August 2004 to coordinate crocodile conservation activities. The meeting was intended to discuss future cooperation in relation to crocodile catching and handling for the telemetry study. The staff of PWRRC are experts in crocodile catching and handling in the Philippines and have the authority in dealing with crocodiles. The PWRCC has been involved in crocodile conservation in Northern Luzon after the discovery of the crocodiles in San Mariano. Regular contact is kept with various international supporters who are provided with a regular update on the project. Technical advise and support to funding applications has been given on an ad hoc basis by the IUCN Crocodile Specialist Group network, notably Perran Ross, Grahame Webb, Harry Messel and by Chris Banks of Melbourne Zoo who is the international co-ordinator of the Philippine crocodile recovery team. Several Zoos in the USA and Europe (Gladys Porter Zoo, Danish Crocodile Exhibition) have expressed interest to raise funding for *in situ* conservation activities but so far no funding has been received. Additional advise is being given by John Thorbjarnarson of the Wildlife Conservation Society and by Jon Hutton, William Oliver and Jenny Daltry of Fauna and Flora International (FFI). Contacts have further been established with Conservation International (USA) and with the Netherlands Committee for IUCN as well as the IUCN Species Survival Commission and the Commission on Education and Communication. The CROC Project has been well presented at scientific and conservation meetings such as the last two meetings of the IUCN Crocodile Specialist Group (Florida 2002 and Darwin 2004), the World Park's Congress in Durban of 2003 and the international conference on Philippine studies (ICOPHIL) in Leiden of June 2004 where presentations were given. The international network is very important in securing additional funding and in obtaining technical advise. A possible concern that this network depends too much on the contacts of the Dutch team leaders is being taken very serious, efforts are taken to transfer and expand the network to all team members.

Concluding: cooperation between stakeholders in crocodile conservation in Northeast Luzon has significantly improved over the past years. It has become clear that the Mabuwaya Foundation is taking the lead role in crocodile conservation in the Region. The CROC project has invested a lot in communication. The BP Conservation Program supported additional activities (for example the attendance of Bernard Tarun and Merlijn van Weerd at the CSG meeting in Darwin in May 2004) that have greatly contributed to the international network. As a result the CROC project has an excellent network with partners at the local, regional and international level. More problematic are the relations at the national level. More attention is needed to mobilize support from key actors at the national level. Stronger relations are needed with the DENR (especially PAWB). In a follow up phase of the CROC project, we have to build even stronger links with DENR. The CROC project has to invest in this, as the support of the DENR is a prerequisite of

successful crocodile conservation in the Philippines. Media coverage turns out to be an excellent method to reach large audiences (the ABS-CBN show was watched by approximately 10 million Filipinos). It is recommended that in a follow up phase more attention is given to media exposure.

Sustainability

This final report would not be complete without addressing three fundamental questions: (1) what is the long term impact of the CROC project and how can conservation actions be sustained in the future? (2) who is going to take over the conservation work after the phase out of the CROC follow-up project? and (3) what are the financial requirements to continue the work?

First, what to do after the phase out of the CROC follow up project? Over the past two years the CROC follow-up project has taken the first steps, in cooperation with its partners, to protect the Philippine crocodile in the wild. Substantial amounts of socioeconomic and ecological scientific information have been gathered and are used to design conservation actions, in close cooperation with local governments and local communities. Awareness of local people about the conservation status of the crocodile and the importance of protecting the species has significantly increased. The people of San Mariano now support the conservation program for *Crocodylus mindorensis*, and even take pride in the existence of the crocodiles in their municipality. This is a major step forward: three years ago the crocodiles were regarded as dangerous pests or as a delicious snack. A local protection force monitors the crocodile localities. Conservation measures have been designed with the local government unit and with rural communities living in and around crocodile habitat. These efforts have not remained unnoticed. The conservation program for *Crocodylus mindorensis* in San Mariano received intensive media coverage in local, national and international media. A local foundation, the Mabuwaya Foundation, was established to play a leading role in the conservation of the species in Northern Luzon on the long term. This local foundation is run by young conservationists with the support of the main stakeholders in crocodile conservation in Northeast Luzon. The IUCN Crocodile Specialists Group have called the efforts of the CROC project “the best hope for survival of the species in the wild.” In San Mariano crocodiles are no longer killed, and a slow recovery of the species is taking place. It shows that the approach of the CROC project is working and deserves to be continued. The coming years will be decisive to safeguard the Philippine crocodile from extinction in Northeast Luzon.

That brings us to the second question: who is eventually going to take over the project? the long term goal of the CROC project is to safeguard the Philippine crocodile from extinction in the wild. Such an ambitious goal can only be achieved with the support of several actors in the Sierra Madre. It is envisioned that the following actors will be involved in or take over several core tasks of the Mabuwaya Foundation, and institutionalize crocodile conservation in Northeast Luzon:

1. DENR: the CROC project has cooperated closely with the DENR. DENR officials are always invited to join field work activities. The creation of a Regional Philippine crocodile coordinating team within the DENR has greatly facilitated this (DENR Regional Special Order 422 of 18 November 2003). The DENR is the government line agency responsible for the enforcement of environmental laws, and as such plays a leading role in the protection of the Philippine crocodile. Several problems remain (see for example van der Ploeg & van Weerd in press) and the CROC project has to intensify its efforts to work with the DENR.

Trainings of DENR personal and more frequent interaction between the CROC and DENR officials are necessary steps for the future.

2. LGU: the success of the CROC project is largely due to its excellent relationships with the LGU of San Mariano. In December 2003 the LGU awarded the Salamat Po (in Tagalog Thank you very much) Award to the CROC project. In San Mariano the LGU has created a Philippine crocodile sanctuary and has deputized a local protection group. This has become a model in the Philippines on how to devolve authority to the LGUs on wildlife conservation and natural resource management. Increasingly CROC works with barangay officials: during the 2nd Philippine crocodile workshop, for example, barangay officials designed their own policies to protect crocodiles and wetlands in their jurisdiction. The key to sustainability lies in capacitating the LGU officials and cooperating closely with them.
3. Local communities: the conservation measures designed by the CROC project largely depend on self-imposed control of local communities. This can only be achieved through a long and sustained dialogue with those communities living closest to the crocodiles. The CROC follow up project has succeeded in creating a sense of pride in local communities of their crocodiles. A small anecdote will perhaps clarify this. In San Mariano, a former logging town, children usually played with model logging trucks. In their games they simulated the logging operations that have destroyed the forest resources of the municipality. Recently the CROC team encountered a new toy: instead of a logging truck a boy had a crocodile on wheels! This change in community attitudes offers the best hope for the survival of the crocodiles in Northeast Luzon.
4. ISU: Research and the development of EIC materials in the CROC project are incorporated in the educational curriculum of the Isabela State University, ensuring the continuity of the activities. Several Professors of ISU play a leading role in the project (among others Dr. Andres Masipiqueña Dr. Dante Aquino, Dr. Myrna Cureg, Prof Jouel Taggueg, and Prof. Myrna Ramos). This ensures that these activities will be continued after the phase out of the project (although financial constraints hamper the research, education and extension capacity of this State University). The CROC project has worked intensively with ISU students. They are the future community workers, conservationists, CEPA specialists, decision-makers and government officials of the region. Enhancing their capacity is the best investment for a sustainable future for people and crocodiles in the Cagayan Valley.
5. Regional NGOs: the CROC Project is working closely together with other conservationists in the Sierra Madre, especially WWF-Philippines (although the NSMNP-CDP will be phased-out in April 2005) and CI. There are regular informal contacts with other NGOs in the region (for example CAVAPPED, etc.)

Working in partnership with these people, institutions and government agencies (other important partners of the Philippine Government are BFAR, DAR, NCIP, NEDA) will ensure that crocodile conservation will be institutionalized (in daily life, and in the design and implementation of policies and programs). This strategy will create the necessary conditions for the crocodiles to survive in the Sierra Madre. The key task for the CROC project/Mabuwaya Foundation is to engage other actors in crocodile conservation and support them when and where it is necessary. Yet the Mabuwaya Foundation will still have important tasks, especially in encouraging partners to take proactive steps (advocacy) and to develop new approaches (and materials) that will safeguard the Philippine crocodile from extinction. As long as the crocodiles are threatened, the Mabuwaya Foundation with its exclusive focus on crocodiles has to be there.

What financial resources are needed to achieve the continuity of the Mabuwaya Foundation? The Mabuwaya Foundation has worked hard to secure funding to continue its conservation activities for the Philippine crocodile. The CEPF granted US\$ 13,000 to the Mabuwaya Foundation to scale-up conservation activities to the whole Sierra Madre Biodiversity Corridor. WWF-Philippines supported the conservation actions of the foundation in the coastal municipalities of the NSMNP with a grant of PhP. 434,000 (US\$ 7,890). The Small Wetland Program of NC-IUCN allocated € 10,000 (US\$ 13,000) to develop a more in-depth conservation approach in the municipality of San Mariano based on the principles of the ecosystem approach. The Chicago Zoological Society granted US\$ 4,000 to the Mabuwaya Foundation to support the integrated conservation and development strategy in Dinang Creek. And the Haribon Foundation donated PhP. 250,000 (US\$ 4,545) for a behavior study of *Crocodylus mindorensis*. All these activities were for new activities not covered in the CROC follow-up proposal. Obviously, they have contributed to the success of the CROC project. This additional funding clearly shows the broad support the Mabuwaya Foundation has within the international, as well as the national, conservation movement. More importantly it shows the confidence and trust placed in the Mabuwaya Foundation to effectively address this global conservation priority at the local level. However, the Mabuwaya Foundation/CROC project still copes with budget shortages, especially to finance its day-to-day operations. It proves hard to include local salaries and administrative costs (although minimal) in project proposals. The BP-Conservation Program remains the financial cornerstone of the Mabuwaya Foundation/CROC project. Therefore, a proposal will be submitted for the BP Conservation Program for a Consolidation Award that will include these basic costs for the Mabuwaya Foundation. The Mabuwaya Foundation proposes to the BP Conservation Program to continue with the activities that have proved to be successful. With the continued support of the BP Conservation Program the CROC project will prove that there is a future for the Philippine crocodile in its natural habitat.

Conclusions and recommendations

In this final report we have summarized the activities undertaken by the CROC follow-up project. The CROC follow-up project proposal specified 44 expected outputs. After almost two years of project implementation, 39 activities were successfully completed (88%). Several activities were delayed or were re-interpreted (see below). Two activities (the production of radio plugs and information booklet) were completely cancelled.

Intensive surveys provided information on the current and historical distribution of *C. mindorensis* in Northeast Luzon. The quarterly monitoring program yielded detailed information about population size and structure. An in-depth ecological study of the crocodiles in Dunoy Lake, which can be observed during daytime, generated valuable information on the ecology of the Philippine crocodile (micro-habitat use, territoriality, etc.). The CROC project identified the main reasons for the decline of *C. mindorensis* in the wild. Hunting and habitat loss are often cited as the main reasons for the disappearance of the species in most parts the Philippines, but it turns out that unsustainable fishing practices also pose a heavy toll on the remaining crocodile populations. Two summer classes made specific threat analyses in two important breeding areas in the municipality of San Mariano. Students of ISU collected socioeconomic information on local perceptions, awareness and knowledge levels, and the impact of conservation on local livelihoods. Socioeconomic profiles were made of all communities in crocodile habitat. This information was used in the design of site specific conservation action plans and to evaluate the impact of conservation interventions. Necessary permits were secured for the telemetry study. Despite technical support from PWRCC and Dr. Brady Barr from National Geographic Channel, the CROC project could not capture and tag crocodiles. A new tagging operation is planned for April 2005. No base line information on fish stocks was gathered to monitor the effectiveness of crocodile sanctuaries; the administrative procedures of ISU make it difficult for students and faculty to spend long periods in the field.

Changing local attitudes towards crocodiles has been an important objective of the CROC project. Information centers were established in the municipal town hall of San Mariano and at the municipal crocodile rescue center in San Jose. A viewing deck was constructed in Lake Dunoy. Informative billboards were placed in the municipal crocodile sanctuary in Disulap River. The school in barangay Cadsalan, which was destroyed during typhoon Harurot in August 2003 was re-constructed and now also serves as information center. Twenty school visits were organized to Lake Dunoy: for 269 school children it was the first time of their life to see a crocodile in the wild. The CROC project gave presentations in 87 schools in the region about the conservation status of the Philippine crocodile. The CROC calendar proved to be very successful in mobilizing support for crocodile conservation. A no-to-hunting poster, designed by students of ISU, informed the public about the penalties for killing crocodiles. No booklet or radio plugs were produced. More attention should be given to the creative and professional design of CEPA materials.

The CROC project aims to establish community-based crocodile sanctuaries where the remaining Philippine crocodiles are effectively protected in the wild. Community consultations in the three breeding sites in San Mariano (Dunoy Lake, Dinang Creek, and Disulap River) were conducted to mobilize support for crocodile

conservation. The DENR and LGU of San Mariano played a leading role in these consultations. During the 2nd crocodile conservation workshop in ISU Cabagan site specific action plans were drafted by the barangay representatives for 18 localities in the Northern Sierra Madre. The LGU of San Mariano assigned, trained and deputized a local protection group (the Bantay Sanktuwaryo). Local ordinances are now enforced on the ground; a very important step for crocodile conservation in the Philippines.

The Mabuwaya Foundation has to guarantee the continuity of crocodile conservation activities in the Philippines. The foundation now permanently employs four students of Isabela State University. The foundation is going through a phase of sustained growth (in funding, and scale and scope of the conservation activities), but core funding has to be secured from the BP Conservation Program through a Consolidation Award. The CROC follow up project has greatly enhanced the capacities of the Mabuwaya Foundation. Information on the CROC project can be found on the websites, in the quarterly newsletters (5 issues), and in the 9 scientific publications the project has generated. All CROC field reports are made available to the major stakeholders. The CROC project was presented in various local, national, and international forums (22 presentations) and received extensive media coverage.

The CROC project is the only *in-situ* conservation initiative for the species. The project will officially end in June 2005. The future of *Crocodylus mindorensis* lies in our hands. Based on the above mentioned activities, the CROC follow-up project can be considered a success. Major steps have been made to create the necessary conditions for survival of the species in the wild. But it is only a beginning. The CROC follow-up project made it clear that our conservation strategy works. Now we have to build on the foundations laid by the CROC follow up project: activities that have proved to be successful have to be continued. These include:

1. Quarterly monitoring of crocodile populations. The monitoring has to include changes in land use, fish stocks and community attitudes towards crocodiles and wetland management. Focus group discussions have proved to be very effective (not only to get information but also to mobilize support for crocodile conservation).
2. Participation of ISU students in the project to generate necessary information, and produce CEPA materials. The CROC project has strong ties with ISU. ISU has committed an office space for the CROC project. Student research generates important findings and educates the coming generation about the importance of crocodile conservation.
3. CEPA campaigns. More emphasis should be given to the creative design and implementation of CEPA campaigns. The CROC follow-up project did a lot but campaigns should intensify and become more interactive.
4. Community consultations prove to be very valuable to discuss specific conservation activities with the local community. They are essential for the success of the community based conservation strategy which largely depends on self imposed control.

5. Strengthening the Mabuwaya Foundation. The capacities of the core staff should be enhanced. Successful communication tools (the Regional Philippine crocodile recovery team meetings, the quarterly newsletter, etc.) have to be continued.

In the proposal for the BP Conservation Program Consolidation Award the Mabuwaya Foundation will focus on several new aims (for example nest protection, and closer cooperation with and support to DENR) but the greatest challenge for the coming year is to sustain the existing activities. With the continued support of the BP Conservation Program we can save the Philippine crocodile from extinction.

Annex 1: Distribution of Estuarine crocodile (*C. porosus*) in the NSMNP

The Estuarine crocodile *C. porosus* has been sighted in the Eastern part of the Northern Sierra Madre Natural Park. Although this species is threatened in the Philippines, this crocodile is still widely distributed in India, Sri Lanka, and Australia. The Estuarine crocodile and Philippine crocodile are both present in the park and sometimes thrive in the same habitat. Philippine Law protects these two crocodile species. Direct killing, habitat destruction, and the use of illegal fishing methods are the main reason why crocodile populations declined rapidly in their natural habitat.

During a survey along the Pacific coast of the Northern Sierra Madre Natural Park in March 2004, an attempt was made to survey *C. porosus* in addition to *C. mindorensis*. Interviews among the fishermen and other local inhabitants identified six suspected sites. In two sites, the Blos River Estuary in Reina Mercedes and the mangroves of Culasi (Municipality of Palanan), Estuarine crocodile presence could be confirmed and documented (see table 7). Both individuals were an estimated 3.5 – 4 meters long. Allan Alipio of WWF-Philippines later documented an Estuarine crocodile in Diana.

Table 7: Distribution and population size of Estuarine crocodile *Crocodylus porosus* in Northeast Luzon.

Number	Location	Year	Month	Adult	Juv./sub-adult	Hatchling	Total
Confirmed sites							
1	Reina Mercedes	2004	March	1			1
2	Culasi	2004	March	1			1
3	Dibol, Diana	2004	November	1			1
Total				3			3
Suspected sites							
1	Dilakit	2004	March	X			
2	Dimasalansan	2004	March	X			
3	Dimatatno	2004	June	X			1
Total				3			3

In 2004, three Estuarine crocodile were observed along the Pacific coast of the Northern Sierra Madre Natural Park. In addition, four *C. porosus* are known to be held in captivity in the region. Two *C. porosus* were found in two different privately owned collections, they were brought to Luzon from Dumaguete City (Negros Island) when still small. Two additional *C. porosus* are kept in a mini-zoo near Tuguegarao city (Cagayan Province), the origin of these animals is not clear. Although not globally endangered, the Estuarine crocodile is possibly even more threatened in the Philippines than the Philippine crocodile. The team decided to include *C. porosus* in our conservation efforts.

Map 2: Distribution of the Estuarine crocodile in the Northern Sierra Madre

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