Crocodile Rehabilitation, Observance and Conservation (CROC) project: the conservation of the critically endangered Philippine crocodile (*Crocodylus mindorensis*) in Northeast Luzon, the Philippines

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Final report of the BP Conservation Program Consolidation Award 2005

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Cover illustration: adult male Philippine crocodile in the Disulap River municipal Philippine crocodile sanctuary (van Weerd 2007)

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Summary

The Philippine crocodile (*Crocodylus mindorensis*) is a critically endangered species endemic to the Philippines. This report describes the results of the Crocodile Rehabilitation Observance and Conservation (CROC) project funded by the BP Conservation Program (Consolidation Award 2005). The aim of the CROC project was to conserve the Philippine crocodile population in the wild in the northern Sierra Madre on the island of Luzon. Project activities were concentrated on 3 breeding areas in the municipality of San Mariano: Disulap River, Dinang Creek and Dunoy Lake.

The CROC project generated scientific information on the Philippine crocodile that was used to design and evaluate the effectiveness of conservation interventions. The CROC project monitored crocodiles and made an inventory of threats in three breeding areas in the municipality of San Mariano on a quarterly basis. Other crocodile populations in North Luzon were monitored once a year. A public awareness campaign has mobilized public support for crocodile conservation in the wild. Posters, calendars, newsletters and comic books were distributed among rural communities. Mural painting and billboards informed the general public about crocodile conservation. A cultural show was performed during fiestas in eleven barangays in San Mariano. Students were brought to the field to see crocodiles and presentations were held in schools. Community dialogues were organized to discuss *in-situ* crocodile conservation with farmers and fishermen. Philippine crocodile nests were protected. The project enhanced the capacity of local law-enforcers to protect crocodiles and their freshwater habitat. As a result of these basic conservation actions, Philippine crocodiles are no longer killed purposively in San Mariano (see figure 1).

Another important objective of the CROC project was to strengthen the Mabuwaya Foundation to assure the continuity of Philippine crocodile conservation in North Luzon. With an investment of PhP. 4,819,360 (US$ 120,484) by the BP Conservation Program, the foundation was able to source an additional PhP. 7,783800 (US$ 194,595): a multiplying factor of 1.615.[1] These additional funds were used to set up a head-start program for the Philippine crocodile, restore habitat and support rural communities in the sustainable management of their wetland resources. The Mabuwaya Foundation created a supportive network from the local to the international level. The foundation now functions as a center of expertise on *in-situ* Philippine crocodile conservation. The community-based conservation strategy in the northern Sierra Madre is widely regarded as an innovative model for wildlife conservation.

The ultimate indicator for the success of the conservation project is the number of crocodiles surviving in the wild. Figure 2 gives an overview of the Philippine crocodile population in the three breeding sites in the municipality San Mariano based on the quarterly monitoring program of the Mabuwaya Foundation (absolute minimum counts). At present forty-six non-hatchling crocodiles survive in the wild, up from sixteen non-hatchling crocodiles in 2005. The Philippine crocodile population in San Mariano remains critically small. Sustained conservation action is needed to assure the recovery of the species. This offers a challenge as well as an opportunity. The challenge is to secure the financial continuity of crocodile conservation action in the northern Sierra Madre:

[1] Exchange rate US$:PHP = 1:40

PhP. 2,345,000 (US$ 58,625) per year is needed to run a basic conservation program. The Mabuwaya Foundation has proved that the Philippine crocodile can be conserved in the wild. This offers a major opportunity: the species can be brought back from the edge of extinction. In the northern Sierra Madre all components are in place to support a rapid recovery of the Philippine crocodile in the wild: a conservation strategy that has proven to be effective, broad public support at the grassroots, a supportive policy network and well-trained staff. We can save the Philippine crocodile from extinction.

Figure 1: Philippine crocodiles reportedly killed in the municipality of San Mariano

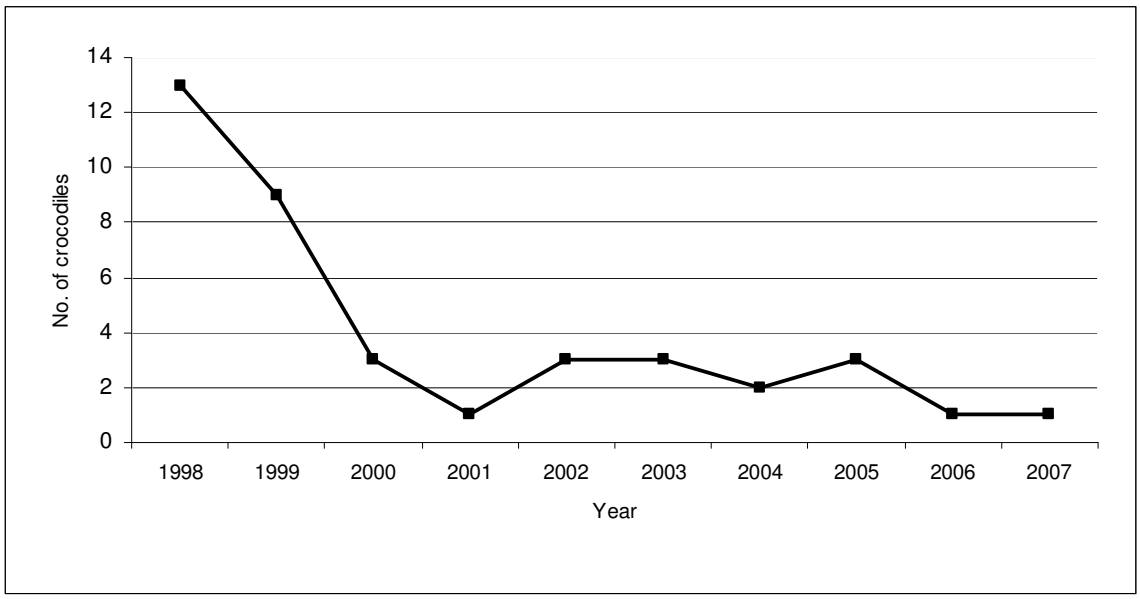
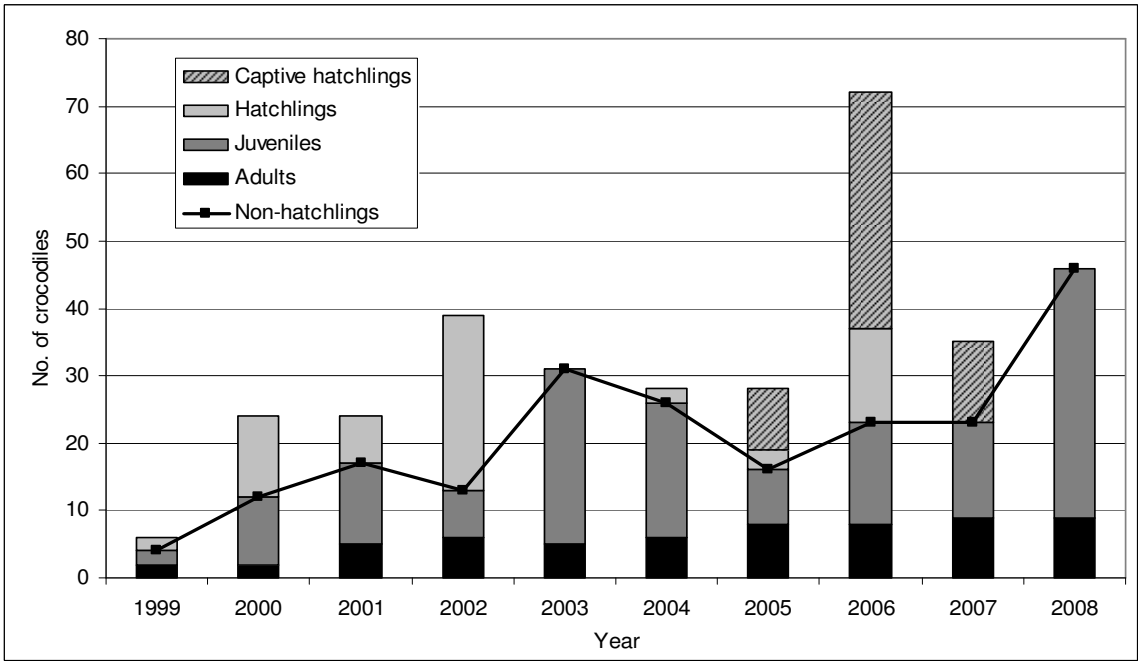


Figure 2: Philippine crocodile population (based on absolute minimum count) in Disulap River, Dunoy Lake and Dinang Creek in the municipality of San Mariano.



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Acknowledgements

This report is dedicated to Mario Soto and Jesus Miranda: two brave men who have contributed to the survival of the Philippine crocodile in the wild in the northern Sierra Madre.

The CROC project could not have succeeded without the hospitality and support of the communities of barangays Disulap, Cadsalan, San Jose and Dibuluan. The Local Government Unit (LGU) of San Mariano has played a pioneering role in the conservation of the Philippine crocodile and should be complimented on their on-going efforts to save the species in the wild. We acknowledge the efforts of the Protected Area Wildlife Service (PAWS) in Tuguegarao, the Protected Area and Wildlife Bureau in Manila and the Palawan Wildlife Rehabilitation and Conservation Center (PWRCC) of the Department of Environment and Natural Resources (DENR). The IUCN Crocodile Specialist Group and the Wildlife Conservation Society gave valuable suggestions and support at critical moments. Isabela State University provided the Mabuwaya Foundation an office space on the campus in Cabagan and encouraged faculty members and students to participate in the conservation project. We are particularly grateful to the College of Development Communications, Arts and Sciences (CDCAS) in Cabagan, and the Bitun Cultural Group in San Mariano. Administrative and logistical support was provided by the Cagayan Valley Program on Environment and Development (CVPED), the academic partnership of the College of Forestry and Environmental Management (CFEM) of Isabela State University in the Philippines and the Institute of Environmental Sciences (CML) of Leiden University in the Netherlands.

We are grateful for the generous financial support by the BP Conservation Program. The Chicago Zoological Society, Haribon Foundation, WWF-Philippines, Critical Ecosystem Partnership Fund (CEPF), Netherlands Committee for IUCN, Melbourne Zoo, Idea Wild, Van Tienhoven Foundation, Provincial Government of Isabela, IUCN-SSC Crocodile Specialist Group, American Zoo Association, Gladys Porter Zoo, and Cullen Vivarium provided additional financial support to the Mabuwaya Foundation.

Mabuhay buwaya!

Introduction

The Philippine crocodile (*Crocodylus mindorensis*) is an endemic freshwater crocodilian now thought to be extremely limited in distribution and population size. It is classified as critically endangered (IUCN 2007). Intensive commercial hunting, unsustainable fishing, and habitat loss have decimated the population below critical threshold levels throughout the Philippine archipelago. With an estimated total population of less than 100 surviving non-hatchlings in the wild, the IUCN Crocodile Specialist Group has placed the species on top of the list of crocodiles needing conservation action (Ross 1998). The Philippine crocodile is listed on CITES Appendix I. The national recovery plan for the Philippine crocodile highlights the importance of conserving the species in the wild (Banks 2005). A captive breeding program has been established for the species in 1986: the Palawan Wildlife Rescue and Conservation Center (PWRCC). Unfortunately this program has not (yet) re-introduced animals to the wild (Ortega 1998).

The species was thought to be extirpated from Luzon (Ross and Alcala 1983) but a remnant Philippine crocodile population was rediscovered in the northern Sierra Madre in 1999 (van Weerd 2000). A Philippine crocodile conservation strategy was established as part of a larger conservation project in the Northern Sierra Madre Natural Park (van Weerd and General 2003). When this conservation project ended in 2002, Philippine crocodile conservation efforts were continued by the Crocodile Rehabilitation, Observance and Conservation (CROC) Project. The CROC project won the BP Conservation Program Gold Award in 2002, the Top Follow-Up Award in 2003 and the Consolidation Award in 2005. This report summarizes the activities that were undertaken from January 2005 to December 2007 as described in the CROC project consolidation proposal. We also aim to document the progress that has been made over the years in conserving the species in the wild. Conservation action funded by other donors is included in boxes.

The objectives of the CROC consolidation project were:

1. To provide basic data on Philippine crocodile distribution, population size, population structure and conservation issues to serve as an input to the design of conservation actions and as a tool to monitor and evaluate conservation success.

2. To design and implement awareness raising and information campaigns to enhance the local knowledge of crocodiles and the need for crocodile and wetland conservation and to increase local participation in and acceptance of Philippine crocodile conservation activities.

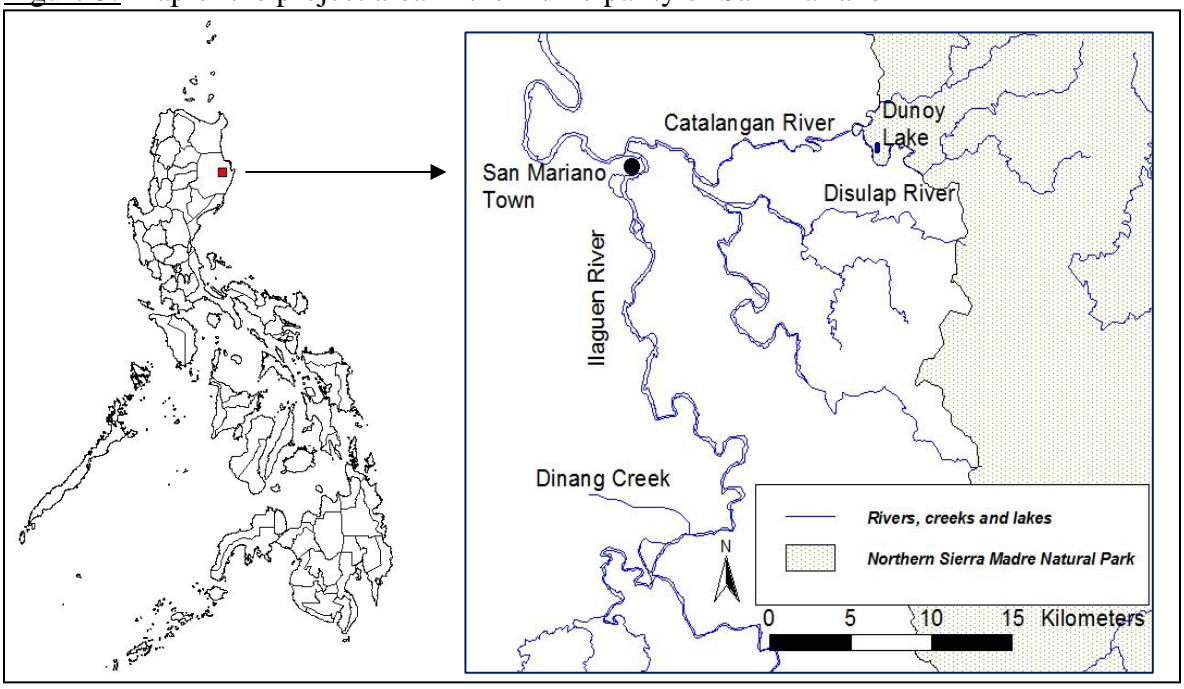
3. To implement basic crocodile protection activities

4. To consolidate the functioning of the Mabuwaya Foundation as a regional co-coordinator, implementer, body of expertise and fund raiser regarding Philippine crocodile conservation activities.

Ten activities were outlined in the CROC consolidation proposal. In this final report we will evaluate the results of 2 years conservation action at the grassroots level (chapter 1).

In chapter 2 we present an overview of the total costs of the CROC consolidation project. The funding of the BP Conservation Program enabled the Mabuwaya Foundation to source additional funds for the conservation of the Philippine crocodile (chapter 3). In paragraph 4 we will look to the future and discuss the possibilities to sustain conservation action for the critically endangered Philippine crocodile. In the final paragraph we draw lessons from the past two years and give practical recommendations for the coming years. We have also included an overview of the publications (annex 1) and the presentations (annex 2) of the CROC project. Annex 3 gives an overview of the press coverage that the CROC project received.

Figure 3: Map of the project area in the municipality of San Mariano



1. Conservation action

Activity 1.1. Quarterly monitoring of Philippine crocodile sub-populations

The Philippine crocodile population in San Mariano is monitored on a quarterly basis. Every 3 months the CROC team visits the 3 breeding areas: Disulap River, Dunoy Lake and Dinang Creek. Diamalig Creek in barangay Baliao was also included in the quarterly monitoring program. The quarterly monitoring program in San Mariano is now in its 9th year (see figure 2) and has proven a very effective tool in conservation planning and in monitoring the success of conservation interventions.[2] In the coastal area of the Northern Sierra Madre Natural Park (NSMNP) the CROC team can monitor only once a year. Table 1 gives an overview of the Philippine crocodile localities in Northeast Luzon.

Table 1: Philippine crocodile localities in Northeast Luzon[3]

No.	Location	Municipality	Barangay
Cagayan Valley			
1	Disulap River	San Mariano	Disulap & San Jose
2	Dunoy Lake (Catalangan River)	San Mariano	Dibuluan
3	Dungsod Lake	San Mariano	Dibuluan
4	Dinang Creek (Ilaguen River)	San Mariano	Cadsalan
5	Diamallig Creek	Benito Soliven	Baliao
6	NARRA Lake	San Mariano	Disulap
7	Dimadiget Creek	San Mariano	Ibujan
Pacific coast of the NSMNP			
8	Dicatian Lake	Divilacan	Dicatian
9	Po River	Maconacon	Aplaya
10	Dibukarot Creek	Palanan	Dialawyao
11	Dimatatno River	Dinapigue	Dimatatno
Babuyan Islands			
12	Caucauayan Creek	Dalupiri	Calayan

1.1.1 Disulap River

The Disulap River is a fast flowing river surrounded by limestone cliffs. Breeding was recorded in 2000, 2005, 2006 and 2007 (see table 2). The local government unit proclaimed an 11 km stretch of Disulap River as a municipal Philippine crocodile. Two adult crocodiles inhabit the core area of the municipal crocodile sanctuary. These adult crocodiles are extremely wary of people and make intensive use of underwater caves to hide.

In May 2006 the project constructed a small artificial pond adjacent to Disulap River: Diwagden Lake (see box 1). Four juveniles of the 2005 nest were released into

[2] During the monitoring survey the CROC team spends several days and nights at a locality and conducts day light crocodile and track searches and night time flashlight surveys in cooperation with the Bantay Sanktuwaryo. Crocodile eyes reflect flashlight strongly red at night. Night surveys are repeated over several nights to come up with a sound minimum population count. Crocodile sizes are estimated and pooled in the categories hatchling, juvenile/sub-adult and adult to determine population structure. Apart from counting crocodiles, habitat changes are monitored as well. Fixed points are used to take photographs of the same area each quarter to visualize changes.

[3] Estuarine crocodiles (*Crocodylus porosus*) were observed in Blos River in barangay Reina Mercedes, the mangroves in barangay Dimasalansan, and the Palanan River Estuary in barangay Culasi.

Diwagden Lake on 5 February 2007. At present (March 2008) all 4 juveniles are alive and seem to have adapted to the wild conditions.

Figure 4: two adult Philippine crocodiles in Disulap River (van Weerd 2007)

Table 2: summary of Philippine crocodile nests in San Mariano

Locality	**Hatching date**	**No. eggs**	**No. hatchlings**	**Hatchling survival**
Disulap	August 2000	25	8	1 observed after 1 year
Dunoy	August 2002	Unknown	12	9 observed after 1 year
Dunoy	August 2004	Unknown	2	2 observed after 1 year
Disulap	July 2005	23	19	10 killed by ants. 9 collected for head-start
Dunoy	August 2005	Unknown	3	2 observed after 1 year
Dinang	July 2005	16	0	Nest accidentally destroyed by farmer
Dunoy	June 2006	Unknown	22	2 killed by Rufous Night-Heron 17 collected for head-starting 3 left in the lake and observed after 1 year
Disulap	July 2006	26	23	18 collected for head-starting 5 died immediately after hatching
Dinang	July 2006	16	11	3 observed after 1 year
Dinang	June 2007	20	0	All eggs were stolen
Dinang	July 2007	16	12	12 collected for head-starting
Disulap	July 2007	Unknown	0	All eggs predated by rats and a monitor lizard

1.1.2 Dunoy Lake

Dunoy Lake is a small stagnant lake (approximately 0.5 hectare) with a reproducing Philippine crocodile population. Two adult Philippine crocodiles inhabit the lake. There seems to be a seasonal cycle in the presence of crocodiles in Dunoy Lake. In dry season (January-May), when the water level of Dunoy Lake drops, the adult crocodiles move to the adjacent Catalangan River (see also box 6). Breeding occurred in 2004, 2005, 2006 and (probably) 2007 (see table 2). Juveniles of different age classes (from hatchling to sub-adults) are observed in Dunoy Lake: 3 sub-adults, 2 juveniles (2004 nest), 3 small juveniles (2006 nest) and 1 hatchling (2007 nest). Juveniles leave Dunoy Lake and establish territories in Catalangan River.

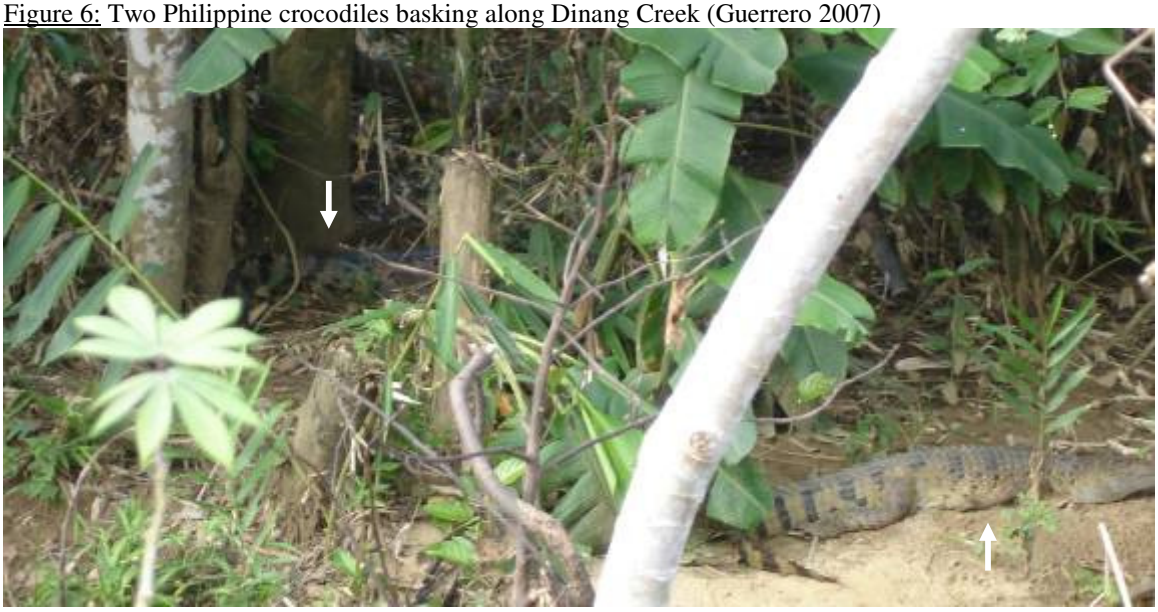
Over the past years extensive ecological fieldwork (behavior observations, telemetry and habitat characterization) was done in Dunoy Lake (van Weerd et al. 2006). In May 2007 a small artificial lake was constructed next to Dunoy Lake: Dunoy Lake 2. In August 2007 an adult Philippine crocodile, named Isabela, was released in the artificial lake in an effort to re-enforce the crocodile population (see box 7).

Figure 5: Adult female crocodile in Dunoy Lake (Janse 2006)

1.1.3 Dinang Creek

Dinang Creek is a narrow, shallow stream surrounded by grasslands and agricultural areas. The creek is intensively used by people for drinking water, cleaning and bathing carabaos. Breeding occurred in 2005, 2006 and 2007 (see table 2). In 2003 17 juveniles were observed in the creek. These animals have left the creek and have dispersed into Ilaguen River. Four adult Philippine crocodiles, 4 juveniles and 1 hatchling inhabit Dinang Creek at present. According to local informants, adult crocodiles move from neighboring Diamallig Creek to Dinang Creek and back.

Figure 6: Two Philippine crocodiles basking along Dinang Creek (Guerrero 2007)



1.1.4. Coastal area of the NSMNP

Philippine crocodiles also occur along the Pacific coast of the Northern Sierra Madre Natural Park. The project aimed to monitor Philippine crocodiles in Po River in barangay Aplaya (Maconacon), Dicatian Lake in barangay Dicatian (Divilacan), Dibukarot Creek in barangay Dialawyao (Palanan) and Dikabulan Lake in barangay Didadungan (Palanan). The project also aimed to monitor the estuarine crocodile (*Crocodylus porosu*s) population in the coastal area: Blos River in barangay Reina Mercedes (Maconacon), the mangroves in barangay Dimasalansan (Divilacan) and the estuary of Palanan River in barangay Culasi (Palanan).

Fieldwork costs in the coastal areas are vey high (transport by plane and boat, local guides, food, etc.). Therefore not all sites along the coastal areas where monitored every year. After the discovery of a Philippine crocodile population on Dalupiri Island, the CROC team also included this site in the annual monitoring program (see also paragraph 4.2.)

The CROC team conducted a crocodile survey from Maconacon to Dinapigue in February 2005. Crocodile localities in Divilacan and Maconacon were also monitored in May 2005 during the summer course (see paragraph 1.3.2). In March 2006 the CROC team did a biodiversity survey along the southern coast of Palanan and searched for potential crocodile locations (Dikabulan Lake, Magasinarao Cave, Diguyo River, Divinisa Swamp, and Dimatatno River). The crocodile localities in Maconacon and Divilacan where monitored in March 2006. No nests have been recorded in the coastal area.

Box 1: Habitat restoration

The conversion of suitable habitat is a major threat for the Philippine crocodile population in San Mariano. In the remote barangays along the forest frontier, population growth is high and pressure on land is increasing. Farmers are burning down secondary forest for the cultivation of corn. Swamps, ponds and shallow creeks are drained and used as rice fields. Especially this loss of shallow wetlands is affecting the Philippine crocodile population. Adult crocodiles can survive in the fast flowing rivers of San Mariano. But hatchlings need nursery pools, which offer suitable hiding places against predators and easy prey. Over the past twenty years these stagnant, vegetated and shallow pools have rapidly disappeared as farmers reclaimed wetland areas. As a result the natural recruitment of the Philippine crocodile population in San Mariano is minimal, and the crocodile population is not recovering.

To facilitate a recovery of the species the Mabuwaya Foundation is restoring critical nesting habitat. Two shallow pools have been created in existing breeding areas. These pools function as release areas for captive-raised juvenile crocodiles (see box 7). Juvenile crocodiles are (soft-)released in these relatively safe pools. Near Disulap River, a small pool (0.25 ha) was created: Diwagden Lake. Four juveniles of the head-start program were released in the pond in February 2006. After a year all juvenile crocodiles were still alive and have adapted well to wild conditions. In 2007 another nursery-pool (0.5 ha) was dug next to Dunoy Lake: Dunoy Lake 2.

By creating optimal habitat conditions for juvenile crocodiles in the existing well-protected breeding areas, the foundation aims to re-enforce the Philippine crocodile population in San Mariano. These efforts are closely monitored to determine their effectiveness. In the coming years we will find out whether this habitat restoration strategy offer possibilities for replication in other areas in the Philippines. The habitat restoration activities are funded by the Van Tienhoven Foundation (see paragraph 3).

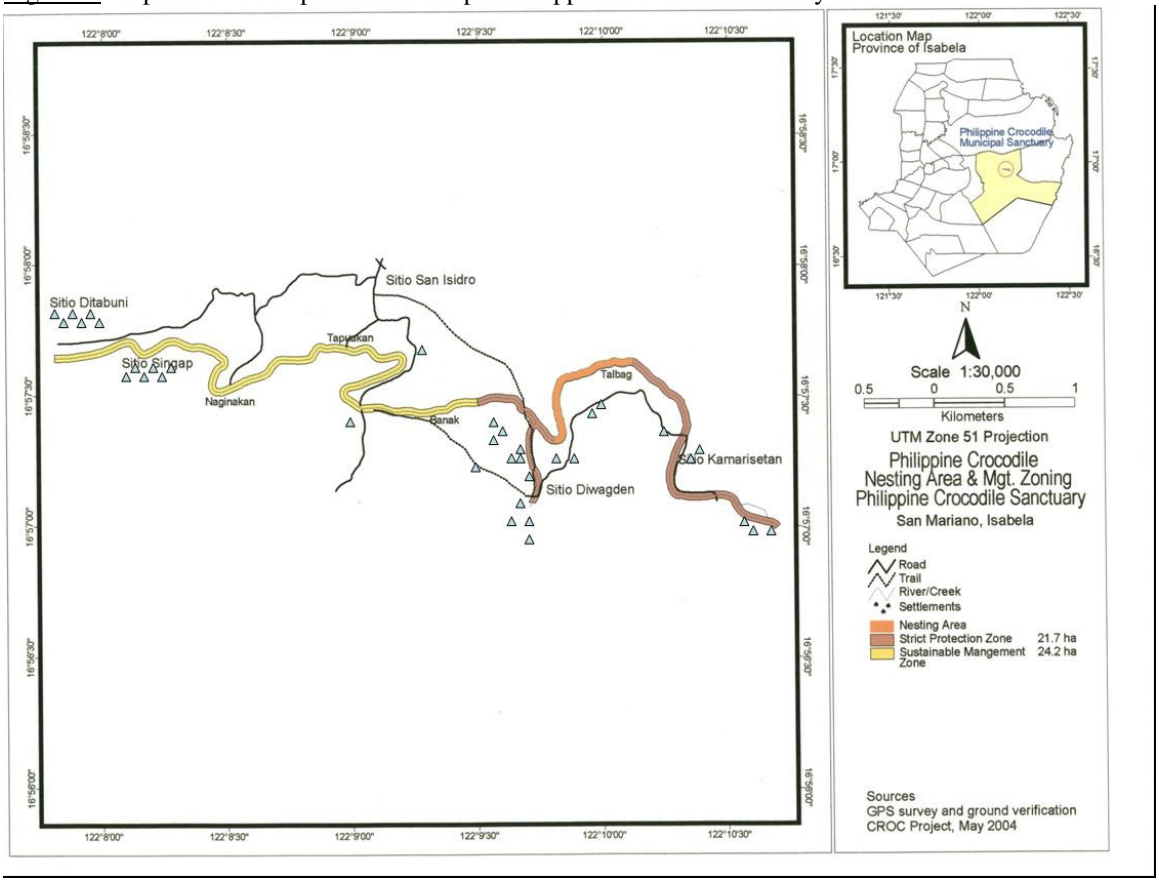
Activity 1.2. Quarterly monitoring of possible conservation issues regarding Philippine crocodile localities

The conservation efforts of the CROC project have concentrated mainly on three localities in the municipality of San Mariano: (1) Disulap River, (2) Dinang Creek, and (3) Dunoy Lake. Conservation efforts in the coastal municipalities were limited to a monitoring program and the distribution of CEPA materials.

1.2.1. Disulap River

In 2001 the LGU declared the Disulap River municipal Philippine crocodile sanctuary. A 10-meter strip on both sides (starting from the edge of the gorge of the river banks) functions as a buffer-zone. In 2006 the Mabuwaya Foundation delineated the entire buffer-zone with concrete monuments (every 50 meters) to create a visual boundary for the sanctuary. Billboards are placed on strategic locations along the river (see also paragraph 3.2)

Figure 7: Map of the Disulap River Municipal Philippine crocodile sanctuary



Six *Bantay Sanktuwaryo* (BS) members are assigned to guard the Disulap River municipal Philippine crocodile sanctuary.[4] During the quarterly monitoring the CROC

[4] In November 2004 the municipal Mayor of LGU San Mariano, Edgar T. Go, deputized 12 people living adjacent to the 3 breeding sites as the local protection group: the *Bantay Sanktuwaryo*. The *Bantay*

team has intensive contacts with the BS. Most BS members are pro-active but need further training and support. Mr. Mario Soto who took up a leading role in the BS, died on 13 December 2006. He has been replaced by his son June Soto. The CROC project provided field equipment to each BS members (flashlight and batteries, hammocks, boots and t-shirts). No crocodiles were lost in Disulap in the past years. Crocodile nests are permanently guarded by the BS.

A rapid land use transition is taking place in the area. Farmers have adopted profitable yellow corn varieties, and have abandoned their extensive shifting cultivation practices (upland rice and banana). Secondary forest and regenerating swiddens (*kaingin*) have been converted into permanent corn fields. What the consequences are for the crocodiles in the area, is yet unknown. Most farmers respect the 10-m buffer zone. However, the free-riding behavior of some farmers frustrates others. Therefore the BS and the CROC team has to continue following up these violations. Illegal fishing sometimes takes place but people are aware of the rules and regulations of the sanctuary, and steps are taken when violations occur. There have been 3 incidents in which the BS members and the barangay officials actually enforced the municipal ordinance[5]:

1. In February 2005 three local farmers were logging in the buffer zone. The BS reported the violation to the barangay captain of San Jose. The captain called the violators and fined them.
2. In April 2005 (during Holy Week) the BS members caught three fishermen who were fishing with pesticides in Diwagden Creek. These fishermen were also fined.
3. In February 2006 two barangay officials, the chairman of the *Sanggunian Kabataan* (SK) and one barangay Councilor were also using illegal fishing methods. This activity was brought to the office of the municipal Mayor. These two barangay officials were called by the mayor to report to his office. Both of them were scolded by the municipal Mayor and paid more than the amount indicated in the municipal ordinances.

Since these incidences, there were no reported violators within the sanctuary within barangay San Jose side. This illustrates that committed barangay officials can effectively enforce environmental legislation.[6]

The CROC project constructed a small house to facilitate the fieldwork of the CROC team and students working in the area. Over the past two years the CROC team has been very often on-site as a result of the telemetry study and the pilot reintroduction program. Two water pumps were constructed by the CROC project in *sitio* Singap and *sitio* Diwagden. The pumps assure safe drinking water for the communities. The pumps have generated much goodwill from the community.

Sanktuwaryo members are responsible to guard the crocodile sanctuaries. The *Bantay Sanktuwaryo* members submit a monthly report to the barangay captain (see box 3).

[5] In another incident the *Bantay Sanktuwaryo* intercepted an illegal timber transport over Disulap River. They informed the DENR and LGU but did not get any official response. The Bantay Sanktuwaryo members received death threats, and had to return the confiscated logs to the loggers.

[6] Although the river is not used for transporting logs, rampant illegal logging remains a big problem in the area. Local communities are paying the costs of the environmental destruction: directly as transport costs have become very high because logging trucks have destroyed most roads, and indirectly because of erosion, land slides and flooding. Very few local people benefit from the logging. Government is unable to address this threat, basically because high ranking officials are profiting from the logging. As a result trust in government agencies has become very low. This obviously influences conservation action.

Five community consultations were organized in the different villages along Disulap River: in *sitio* Diwagden in February 2005 and March 2007, in barangay Disulap in January 2008, in sitio San Isidro in February 2005, and in San Jose in February 2005. During these dialogues the CROC team informs the people about on-going conservation activities, reminds everybody about the regulations, answers questions and discusses possible solutions. A barangay official usually chairs the consultation. DENR staff is invited to give a lecture and talk with the community. Community consultations are a very effective way to disseminate information and address concerns in the community (for example land rights).

Figure 8: Community consultation in *sitio* Diwagden in the Disulap River municipal Philippine crocodile sanctuary (van der Ploeg 2007)

Communities along the Disulap River municipal crocodile sanctuary are well aware of and support the conservation of the Philippine crocodile. The BS is functioning and barangay officials in San Jose and Disulap are pro-active. Crocodiles are well protected.

1.2.2. Dunoy Lake

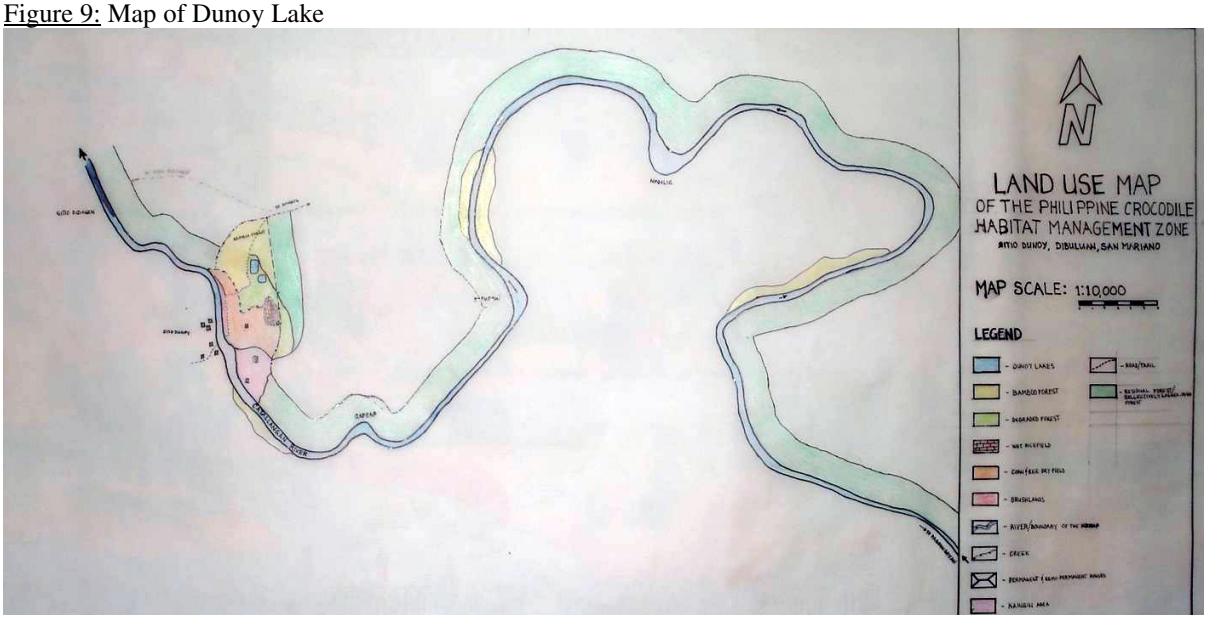
Dunoy Lake is the only crocodile area within the protected area the Northern Sierra Madre Natural Park (NSMNP). The NSMNP is the largest protected area in the Philippines. It is, however, seldom visited by the park rangers of the protected area (office of the PASu). Several students have conducted field work in Dunoy. The CROC team generally stays in the house of Mr. Victorino Montanes.

No crocodiles were killed in the area. In fact, crocodiles have been accidentally caught in fish traps but were immediately released by the fishermen. The main threat for Dunoy Lake is agriculture encroachment. The land around the lake is claimed by local farmers, despite the fact that Dunoy Lake is located in the strict protection zone of the

NSMNP. Illegal logging is rampant along Catalangan River. *Sitio* Dunoy is used by loggers as pick up point for the timber.[7]

Two villagers are deputized as BS. Billboards were placed in *sitio* Dunoy and near Dunoy Lake. A new observation tower was build. The vegetation in the lake is trimmed once a year in order to see crocodiles from the tower. To avoid the reclamation of Dunoy Lake the Mabuwaya Foundation organized community consultations in *sitio* Vila Miranda in February 2007 and in *sitio* Dunoy February 2005 and April 2007. It was agreed that the farmers would give up their land claims directly adjacent to Dunoy Lake in exchange for financial compensation (made possible by funding of Melbourne Zoo). A water pump was constructed in *sitio* Dunoy.

Figure 9: Map of Dunoy Lake



The regular presence of the CROC team assures that the site is well protected. The crocodile population in Dunoy Lake and Catalangan River is the best studied in the country and research has to continue. Searching for nests along Catalangan River has to be intensified.

1.2.3. Dinang Creek

Dinang Creek was declared as Philippine crocodile sanctuary on the 20 October 2005 by the barangay council of Cadsalan. A buffer zone of five meter on both side of the creek should be maintained. Three BS members are assigned to guard the sanctuary. Billboards are placed to inform everybody about the presence of crocodiles in the area.

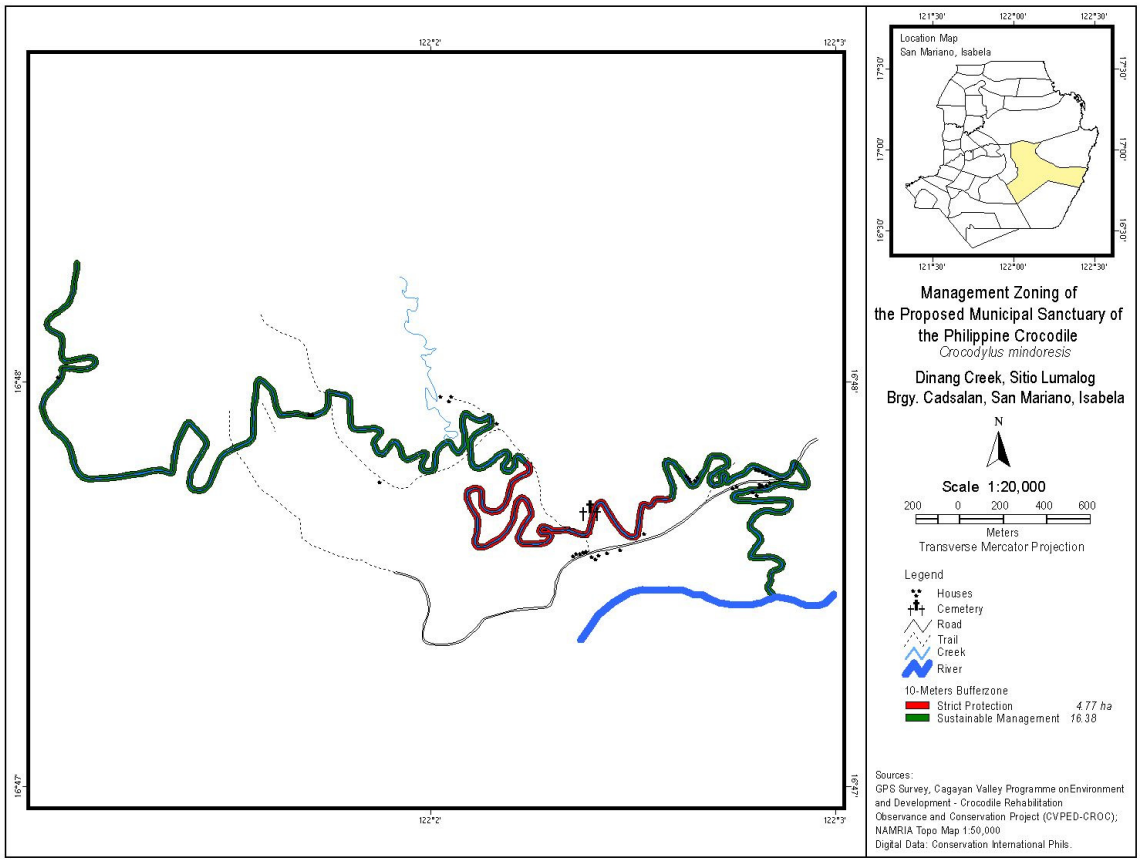
The majority of the people living in the area are Kalinga, an ethnic minority in the Northern Sierra Madre. For the Kalinga it's a taboo to kill a crocodile. As a result crocodiles have survived in this densely populated landscape. However, the traditional belief system of the Kalinga is changing as people are increasingly assimilated in

[7] Illegal roads are constructed by loggers inside the strict protection zone of the Northern Sierra Madre Natural Park to transport the timber out. This poses a serious threat to Dungsod Lake, where crocodiles are occasionally observed.

mainstream Filipino society and many migrants settle in the area. The NPA has a strong presence in this remote area. There are frequent encounters between NPA and AFP, which makes working in the area difficult (see also van der Ploeg & van Weerd 2005).

Breeding occurred here in 2006 and 2007. In 2006 the nest was guarded by the BS members. In 2007 a nest was plundered (presumably by a schoolboy who ate the eggs as a snack). Another nest also hatched in July 2007. Twelve hatchlings were taken to the rearing stations but only 2 survived. One adult male Philippine crocodile was killed in July 2005. The crocodile was shot and was noticed only when it floated above the water. Another sub-adult was accidentally trapped downstream of Dinang Creek in Ilaguen River in barangay Buyasan (see figure 26). In January 2008 another adult crocodile was captured in Ilaguen River. Luckily this crocodile could be released (see box 4). The 5-meter buffer zone is at present not respected by farmers. However, the creek remains heavily vegetated and farmers often leave their fields fallow along the creek.

Figure 10: Map of Dinang Creek crocodile sanctuary



Crocodile livestock conflicts can become an issue in Dinang Creek. *Sitio* Lumalug, the small village directly adjacent to Dinang Creek, is rapidly growing (from 35 households in 2003 to 42 in 2007). People from barangay Cadsalan are moving to the *sitio* because of flooding risks in the barangay and better accessibility. As a result more people and livestock are using the creek. The pig of Mr. Gilbert Rabago was attacked by an adult crocodile in 2006 and again in 2007. The pig was tied about 150 m away from

the creek. At present people accept the consequences of living in close proximity of crocodiles. But a workable solution has to be found before a serious problem occurs.

Dinang Creek is an important site but conservation action remains difficult here (due to the civil insurgency, the remote location, and the cultural barrier). Communication with residents, the BS and the barangay officials has been difficult but has slowly improved over the years.[8] The CROC project financially supported the construction of 3 water pumps in *sitio* Lumalug. Over the past year, the CROC team has won the trust of officials and the community. The BS and barangay officials need to be educated, empowered and supported.

1.2.4. Coastal sites

Hunting, habitat loss and the use of illegal fishing methods (mainly fishing with electricity) are the main threats for crocodiles in the coastal areas of the NSMNP. In 2005 a farmer killed 2 estuarine crocodiles (*C. porosus*) in Bicobian with the explicit permission of the barangay officials. The DENR did not respond to the violation. Mangrove forests, peat swamps and shallow lakes are converted to rice fields. Local governments in the NSMNP subsidize the cultivation of rice. Barangay officials often tolerate the use of destructive fishing methods.

A partnership with the Northern Sierra Madre Wilderness Foundation based in Maconacon has facilitated conservation efforts along the coast (see paragraph 4.2). CEPA materials (posters, calendars and newsletters) were distributed in the municipalities of Maconacon, Divilacan and Palanan. NSMWF and the LGU Maconacon have declared a crocodile sanctuary in Blos River. Barangay Dialawyao has declared Dibukarot Creek a crocodile sanctuary. Barangay Didadungan created a crocodile sanctuary in Dikabulan Lake (van der Ploeg & van Weerd 2006). The most important crocodile site is Dicatian Lake in the municipality of Divilacan. The CROC project and ISU organized a summer course to gather information on this site (see paragraph 1.3). To thank the community for their support, the CROC project painted a large crocodile on the barangay hall.

Box 2: Adopting an ecosystem approach for Philippine crocodile conservation

Over the past years the Mabuwaya Foundation has developed a comprehensive wetland conservation strategy in San Mariano. The foundation aims to strengthen sustainable wetland management at the grassroots level. Rural communities heavily depend on freshwater wetlands for their livelihoods. Wetlands provide a variety of environmental services. Communities are empowered to conserve wetland resources. The foundation is building the capacity of community leaders and barangay officials through training and workshops. As a result, nine fish sanctuaries were enacted by barangay councils. Strategic partnerships with government institutions (LGU, BFAR and DENR) assure institutional support for community-based wetland conservation. The Philippine crocodile is the living symbol for community-based wetland management in San Mariano, representing local environmental stewardship and care. The wetland conservation strategy is funded by the Ecosystem Grant Program of IUCN-NL (see also van Weerd & van der Ploeg 2006). The coming years, the foundation will continue to link crocodile conservation with sustainable rural development.

[8] More in general, the interpersonal contacts that the CROC team has developed over the past years with many people in San Mariano are invaluable for the effective conservation of the Philippine crocodile.

Activity 1.3. Involvement of students in crocodile research activities

The project aimed to stimulate the involvement of students in crocodile conservation. Very little is known about the ecology of the Philippine crocodile and the conditions in which it survived. We intended to set up a research program to gather scientific information on the species. Involving ISU students, and their supervisors, will lead to a strong integration of crocodile research and conservation activities within the local academe. The target was to financially support eight ISU students in their research activities. In addition, the project aimed to organize a yearly summer class.

1.3.1. Research

Twenty-three students (see annex 1 for their scientific output) conducted fieldwork for their thesis in the framework of the CROC project. CROC project staff assisted the students in the field. The CROC project financially supported ISU students (PhP. 12,500 for fieldwork costs). Dutch students pay their own research costs.

Most students worked on the ecology and behavior of the Philippine crocodile: Ingeborg Schreuder, Jan de Jonge, Krista-Lize Janse, Kyra Hoevenaars, Nicolas Tubbs and Zeno Wijtten (all biology students at Leiden University). These graduate students generally conduct 4 months fieldwork in San Mariano, and write their thesis in the Netherlands under the supervision of Dr. Hans de Iongh. Their reports have greatly enhanced our understanding of the ecology of *C. mindorensis*. We intend to publish the findings in a scientific journal.

Students also worked on other topics of importance for the conservation of the species. Four undergraduate botany students of CDCAS (Jerome Allam, Renato Tagao, Maria Kristine Tagarao and Jenneth Tumaliuan) made an inventory of the vegetation in the buffer zone of the Disulap River sanctuary in 2005. They were supervised by Prof. Joyce Taguinod. Mary-Lou Arandia, a graduate student environmental science at ISU, conducted a study on the water quality. She was supervised by Dr. Marino Romero and Dr. Dante Aquino. Tessa Budde, a graduate biology student of Nijmegen University in the Netherlands, interviewed people on local ecological knowledge. She was supervised by Dr. Rob Lenders. Erwin Tumaliuan, an undergraduate forestry student of ISU supervised by Dr. Mariano Romero, wrote a report on the socioeconomic costs of the establishment of the crocodile sanctuary in Dinang Creek. Paul van der Aa, an undergraduate student at Breda University of Applied Sciences, investigated the possibility of setting up an ecotourism project. He was supervised by Jos van der Sterren and Dr. Denyse Snelder.

Dr. Myrna Cauilan-Cureg supervised several students who worked in a research project to assess the impact of the public awareness campaign in San Mariano. Christopher Cauan, an undergraduate development communication student of ISU, wrote a report on the awareness of local people in 2006. Five students are currently working on their thesis and hope to graduate in March 2008: Randolph Binag, Mary Rico, Rubilyn Subia, Shylla Alejandro, Ryan Telan, Christopher Telan and Sanny-Boy Malayao. These students interviewed 550 people in San Mariano on their attitudes towards crocodiles.

Sanne Wagenaar, a visual anthropology student at Leiden University, is currently working on a documentary of the CROC project. She conducted interviews in July and August 2007 and will return to the Philippines to film in April 2008. Sanne is supervised

by Dr. Metje Postma and Dr. Gerard Persoon. Homer Roldan, a CFEM undergraduate student supervised by Marino Romero, is currently working on his thesis on the historical distribution of *Crocodylus porosus* in the Cagayan Valley.

1.3.2. Summer class

In 2005 the Mabuwaya Foundation organized in cooperation with ISU a 2 week summer class in Divilacan. Twenty students from CFEM and the College of Engineering joined the summer course. The course was supervised by Dr. Marino Romero, Prof. Jouel Taggueg and Prof. Lito Guzman. The course focused on the conservation of the Philippine crocodile population in Dicatian Lake. The students made an environmental impact assessment of two water infrastructure projects: the micro-hydro project in barangay Dicaruyan and the irrigation facilities in barangay Dicatian.

Figure 11: CROC Summer class students (van der Ploeg 2005)

In 2006 and 2007 it turned out to be difficult to organize a 2-week intensive summer class. ISU students are required to do an on-the-job training in summer (April and May) and the 2 weeks summer class was too short to be included in the curriculum. Therefore the CROC project facilitated the on-the-job-training of ISU students in summer.

The CROC project facilitated the on-the-job-training of 6 CFEM students in April and May 2006 (Xyris Ballesteros, Celestino Reyes, Mario Pedrablanca, Jay-Mark Telan, Shelimar Telan and Oscar Gadayos). The students worked at the NARRA reforestation site under the supervision of Dr. Nelson Yañez (cutting grass, constructing fire lines, planting trees, etc.). In addition they assisted the CROC team in the delineation of the Disulap River municipal Philippine crocodile sanctuary. The students stayed 6 weeks in the field. The project provided a living allowance for the students.

In 2007, five CFEM students (Mario Pedrablanca, Celestino Reyes, Mark Anthony Tuliao, Jay-Mark Telan and Ann Corpuz) worked 6 weeks in the NARRA project (see box 8). The Dean of the CFEM, Dr. Tomas Reyes, personally visited the students.

Figure 12: Forestry students during their internship at the NARRA project (van der Ploeg 2006)

Every year a 4th year development communication student assists the CROC team with the public awareness campaign (especially with the CROC newsletter; see 2.1.3). In 2005, Christopher Cauan did a 3-month internship. In 2006 Herminia Zalun assisted the CROC team in the design of CEPA materials. She joined the team to the national forum on crocodiles in the Philippines. And in 2007, Ryan Telan started his on-the-job training at the Mabuwaya Foundation. The students are supervised by Dr. Myrna Cauilan-Cureg.

In 2007 the CROC project also facilitated the on-the-job-training of 7 biology students of ISU Cabagan (Jennifer Gatan, Cynthia Malayao, Flor Bayug, Charita

Appaccag, Bryan Pascua, Emily Cammayo and Norma Datul). The students were supervised by Prof. Miladis Affichao and Prof. Joyce Taguinod of CDCAS. The students were asked to conduct food experiments at the rearing station in Minanga to determine food preferences and optimal feeding strategies for captive Philippine crocodiles (see box 7). In addition the students joined the CROC team to the field and assisted in the telemetry study.

Figure 13: Biology students during their internship at the rearing station (van der Ploeg 2007)

The partnership with ISU has been instrumental to gather scientific information on the Philippine crocodile. Students and faculty members from different colleges of the University participated in the research activities of project. This has generated scientific output (see annex 1) and has raised awareness of future leaders in Isabela. Students of ISU were also involved in conservation action and the design of CEPA materials (see activity 2.1). The Mabuwaya Foundation intends to continue the research on the Philippine crocodile (behavior, telemetry, changes in land use and peoples' perceptions, evaluation the effectiveness of conservation interventions, etc.). The foundation will continue to work closely with ISU and involve graduate and undergraduate students in the research activities.

Box 3: Protecting crocodiles in the wild: the *Bantay Sanktuwaryo*

The Local Government of San Mariano adopted local legislation protecting the crocodiles. It has established the first Philippine crocodile sanctuary in the country A local protection group, the *Bantay Sanktuwaryo*, has been established and is protecting the three breeding sites in the municiality. The members receive a modest compensation (PhP. 500 per month) from the Local Government of San Mariano. The members, in most cases farmers living immediately adjacent to the crocodile sanctuaries, are deputized by the municipal mayor. The *Bantay Sanktuwaryo* members regularly patrol the sanctuaries, guard the crocodile nests and assist in the quarterly monitoring program. They also play an instrumental role in disseminating information to the rural communities.

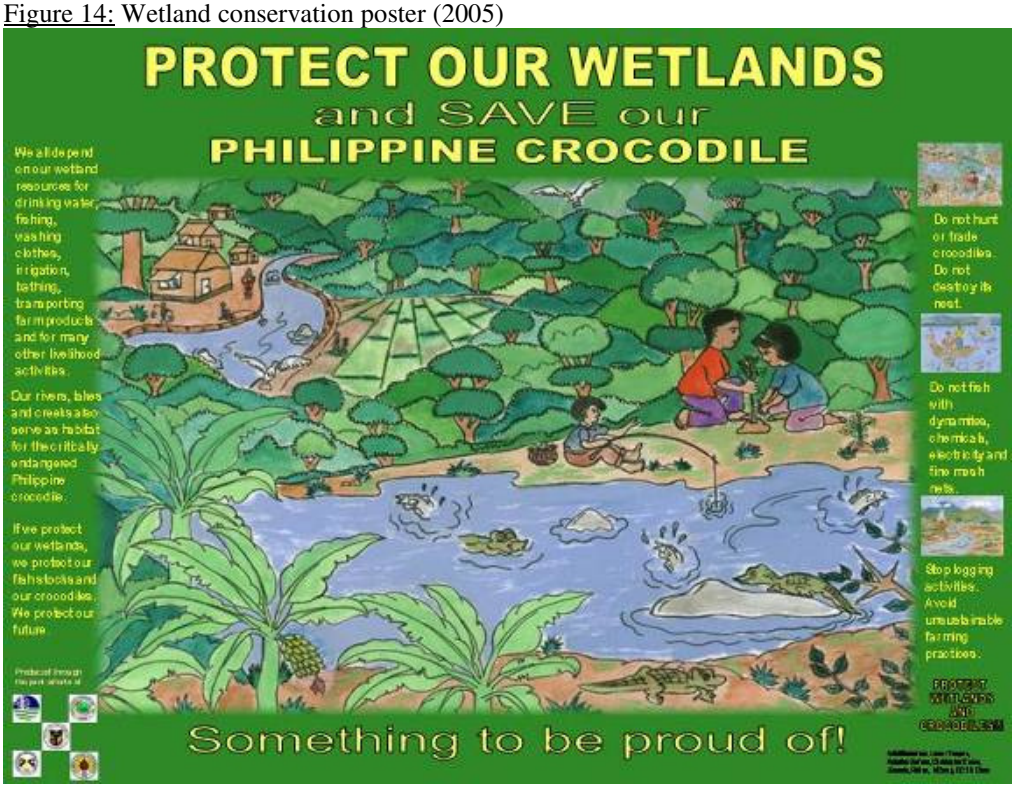
Activity 2.1. Design and production of Communication, Education and Public Awareness (CEPA) materials

Over the past 2 years the Mabuwaya Foundation and the department of development communication (DEVCOM) of CDCAS have closely worked together in the design, production and distribution of CEPA materials (see also Activity 2.1). ISU students record radio plugs, paint murals, and perform their puppet show. [9] The CEPA campaign of the CROC project aims to mobilize local support for crocodile conservation. Activities are specifically targeted at the remote barangays in San Mariano where crocodile occur.

2.1.1. Posters

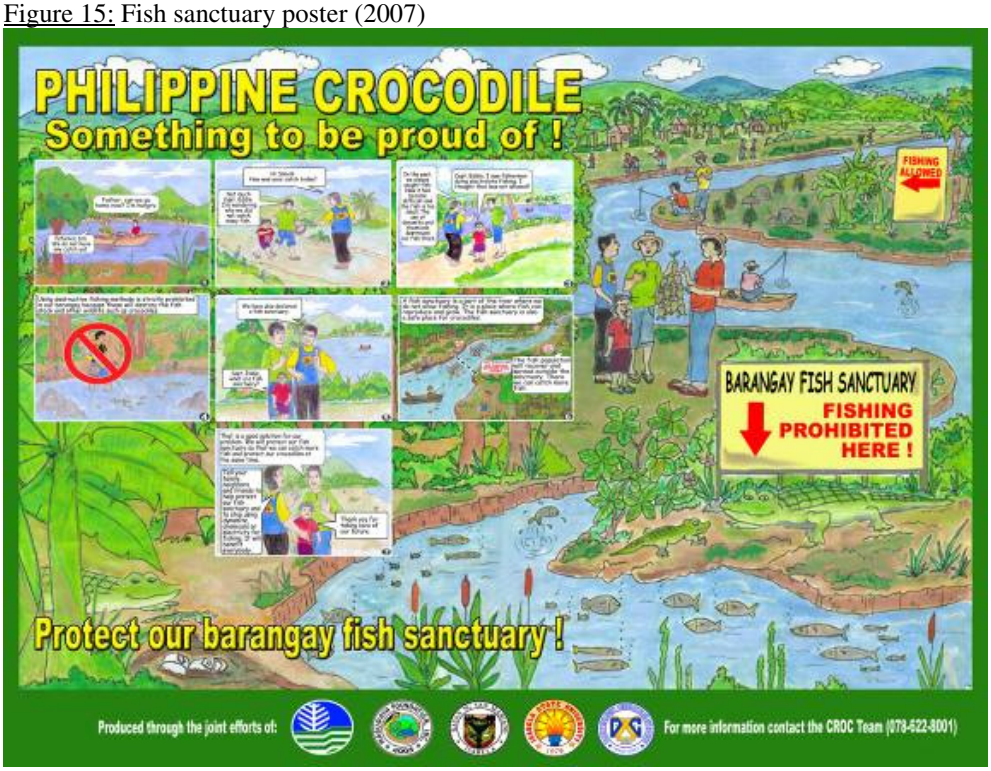
Every year development communication students of ISU are designing a poster for the CROC team. In 2005 the students made a poster on the benefits of wetland conservation (figure 14): 2000 copies. In 2006 the students designed a poster to inform communities on the need to conserve crocodile nests (figure 21): 2000 copies. And in 2007 the students made a poster explaining the spill-over effect of a fish sanctuary (figure 15): 2000 copies. The design of the poster has become part of the DEVCOM curriculum. The CROC team gives an assignment to the students. The best design is pre-tested in the field and printed. All posters have an Ilocano and English version. The posters are distributed to the villagers in the target barangays in San Mariano and given to partners and stakeholders.

Figure 14: Wetland conservation poster (2005)



[9] DEVCOM students also made 2 different radio plugs that were aired on local radio to inform people in San Mariano on upcoming activities (such as the booklet launching in September 2006 and the crocodile releases in August 2006 and August 2007).

Figure 15: Fish sanctuary poster (2007)



2.1.2. Calendar

The project made a calendar for the years 2006 and 2007. The calendar contains nice pictures of crocodiles and information on the conservation of the species. For people in the barangay the calendar is a useful tool for planning activities. The calendar is often displayed prominently in the houses. Every day people are reminded of crocodiles. In 2006 the project made a calendar with 6 pages (2000 copies). In 2007 we opted for a cheaper single page calendar (4000 copies).

2.1.3. CROC Newsletter

The CROC project makes a newsletter to update partners, stakeholders and the communities on the activities of the project. The project produced 8 issues (a total of 5650 copies were distributed in the barangays). The target of 10 issues was not met: it costs a lot of effort of the team to make a newsletter issue.

2.1.4. Comic book

The CROC project also produced an informative and colorful comic book on crocodile conservation (Cauilan-Cureg, van der Ploeg, van Weerd & Utdo 2006). The pictures were made by ISU students (see figure 27). Six thousand copies were made and distributed to schoolchildren in San Mariano (and other selected schools in Isabela).

The book was officially launched in San Mariano in the presence of *Sanguniang Bayan* member Jerome Miranda, the President of ISU Dr. Romeo Quilang and the Executive Director of ISU Cabagan, Dr. Richard Ramirez in September 2006.

2.1.5 Mural paintings

CDCAS students made informative mural paintings on the wall of the central school in San Mariano facing the market (May 2005). The murals tell the story of the Philippine crocodile in San Mariano. A large crocodile and the slogan of the public awareness campaign, "*the Philippine crocodile: something to be proud of*!", was also painted on the water tank of the market, which can be seen from far.

Figure 16: ISU students painting the wall of the central school in San Mariano (van der Ploeg 2005)

In 2007 we assessed the impact of the CROC public awareness campaign (van der Ploeg, Cauilan-Cureg & van Weerd 2008). Most people in San Mariano now know that the Philippine crocodile is officially protected. But it is of crucial importance to continue the dissemination of information: the message has to be repeated constantly. Posters and calendars have a large outreach and people display them prominently in their houses. The project will continue with producing calendars and posters in partnership with CDCAS. Wall paintings and billboards (see 3.2.) are also valuable communication tools. Many people see and appreciate them. The project will continue to place billboards on strategic locations in San Mariano and the aim is to have a crocodile painted on every school in the municipality. Newsletters are less effective: few people in the barangay actually read the newsletters (but for partners, donors, government agencies, and other stakeholders it can be very informative). The Mabuwaya Foundation has to find alternative (cheaper and less time-consuming) ways to communicate with these stakeholders.

Activity 2.2: Interactive communication and participation activities

The CROC project tries to assure that the CEPA materials reach the people in the villages. In general people sincerely appreciate the posters, newsletters, comic books and calendars. However, these methods often generate a lot of questions: Are crocodiles dangerous for children? What will happen if the crocodile population increases? Will crocodile conservation affect the land rights of farmers? To address these questions, the CROC project also organizes more interactive activities to mobilize public support for crocodile conservation.

2.2.1. Puppet show

ISU students performed an educational puppet show in seven different schools in San Mariano. The puppet shows got a lot of attention and the children enjoyed it. A trial puppet show was held in Cabagan. The students also performed during the launching of the comic book in *centro* San Mariano.

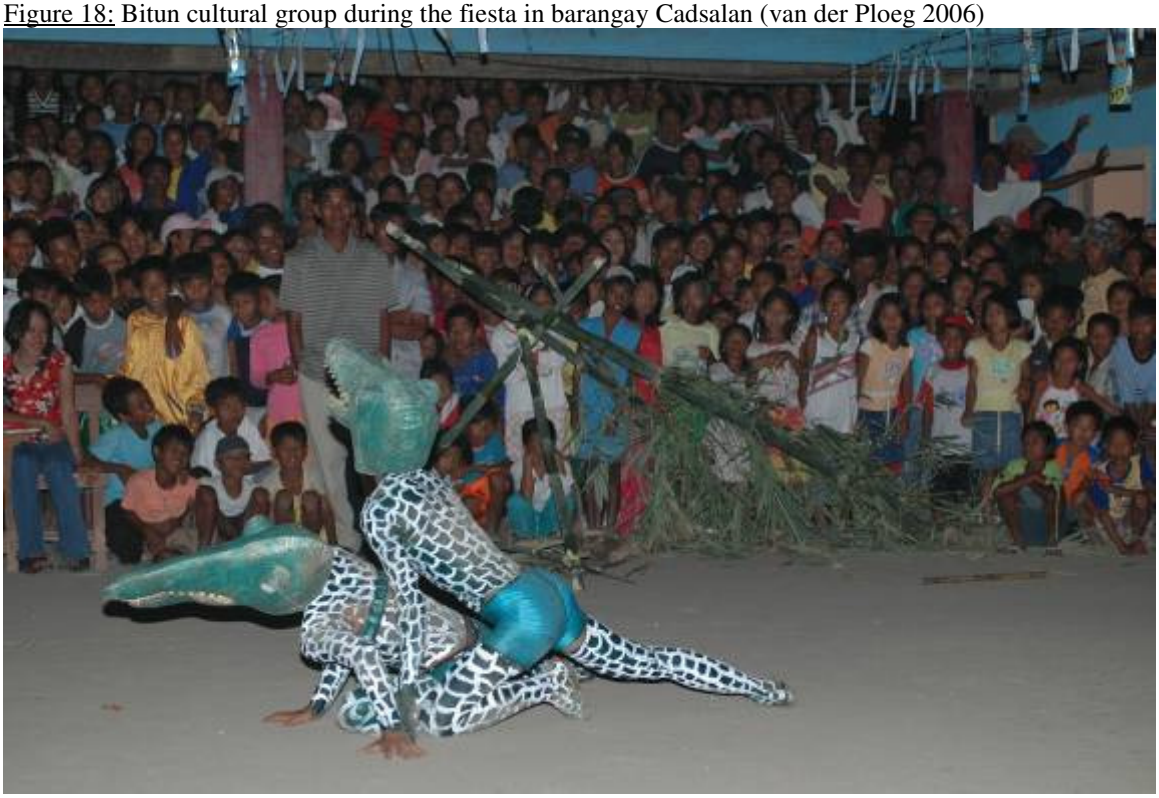
Figure 17: ISU students conducted puppet shows in San Mariano (Cauilan-Cureg 2006)

2.2.2. Cultural show

In addition the CROC project aimed to organize cultural shows during the barangay fiesta. The Bitun cultural group of ISU San Mariano made a dance show featuring Philippine crocodiles. The goal of this show is to inform the people about the history of the Philippine crocodile in the municipality of San Mariano, the reason why the population rapidly declined and what people should do to conserve the remaining crocodiles. The students performed in 11 barangays: Cadsalan (April 2006), Libertad (March 2006), Macayucayu (July 2006), Disulap (July 2006), Cataguing (August 2006), Lucban (May 2006), Del Pilar (May 2006), Dibuluan (April 2007), San Pablo (May 2007), San Mateo, Quirino, (April 2007) and San Antonio, Ilagan (August 2007).

During the fiesta the cultural show draws large crowds. The Bitun cultural group also performed at the National Forum on Crocodiles in the Philippines at National Museum of the Philippine Peoples (February 2007), at the WCSP in Tuguegarao (April 2005), at the CVPED Agta training (August 2005), at the CVPED Summer course (July 2006), and at the law enforcement training at the ATI-RTC (March 2006).

Figure 18: Bitun cultural group during the fiesta in barangay Cadsalan (van der Ploeg 2006)



2.2.3 School visits

The CROC project aims to bring high school students to Dunoy Lake. Many children have never been to the remote areas or the forest. The school visit offers student a chance of seeing a Philippine crocodile in the wild. This trip often fundamentally changes the way they think about crocodiles. During the school visit they learn about crocodile conservation, the management of the Northern Sierra Madre Natural Park, and the lifestyle and rights of indigenous communities (the Agta and Kalinga). The CROC project pays the truck from San Mariano to Dunoy. The students have to pay the transport

to San Mariano and their food. Before the trip the CROC team explains the school children what they will do and see and highlights the do's and don'ts. A school visit generally takes 2 days. The high school students visit the rearing station in Minanga to see captive crocodiles. Then they proceed to Dunoy where they camp. At night the children visit the lake. The following day the students visit the NARRA project to plant trees.

The CROC project organized 17 school visits (see table 3). The target was 25 school visits (68 %). Many schools are hesitant to send their students to the remote barangays. (concerns about the safety of the students). Also the finances are a barrier for some schools. Not all schools in Isabela are informed about the possibility of doing a school visit to Dunoy.

Table 3: School visits to Dunoy Lake

School	**No of students**	**Date**
San Mariano National High school	37	May 19-20, 2005
CFEM (FPU) & ISU San Mariano	37	July 25-26, 2005
CFEM (DESAM – YES)	39	August 6-7, 2005
Cadsalan	38	August 18-19, 2005
DEVCOM Students (ISU Cabagan)	20	September 2-3, 2005
Cauayan National High School	20	March 18-19, 2006
Cauayan National High School	19	March 23 – 24, 2006
CVPED Summer Course 2006	30	August , 2006
CFEM (FPU) & ISU San Mariano	26	September 11-13, 2006
Biology students (ISU Cabagan)	22	February 26 – 27, 2007
CFEM students (4F members)	20	March 30-31, 2007
USM Visit & Biology Students	11	May 17 – 19, 2007
LGU Maconacon	22	May 28 – 30, 2007
CVPED Summer Course 2007	36	June 30 & July 01, 2007
ILAW Inc.	8	July 7 – 8, 2007
DEVCOM Students	20	August 6 -2007
YES students	22	August 25, 26, 2007
TOTAL	**427**	

School visits are an effective way to raise awareness. For many students it's the first time to be in the forest and see crocodiles in the wild: a once-in-a-lifetime experience. The foundation aims to continue with the school visits in the coming years.

2.2.4. School presentations

The CROC team visits schools in San Mariano to give a presentation on the Philippine crocodile and the conservation of the species in the municipality. During these lectures CEPA materials are distributed to the students. The presentations are adjusted to the audience, which varies from 6 year old elementary school children to 16 year old high school students. When possible the CROC team shows TV documentaries that were made on the crocodiles in San Mariano (ABS-CBN and GMA7). The CROC team gave a presentation on the Philippine crocodile in 18 schools in 2005-2007. The target in the BPCP consolidation proposal (62 presentations in schools) was too ambitious.

Figure 19: Barangay captain Wanol gives a welcome message during the school presentation in barangay Del Pilar (Gatan-Balbas 2006)

2.2.5. Presentations

The CROC team gave presentations about crocodile conservation during community consultations (see paragraph 1.2) and during barangay council meetings in 13 barangay in San Mariano and 8 barangays in the coastal area (van Weerd & van der Ploeg 2006; van der Ploeg & van Weerd 2006). Presentations about crocodile conservation were also given during special events in San Mariano, for example during the book launching in San Mariano and the release in August 2006. Annex 2 gives an overview of other presentation about the CROC project given by the CROC team.

2.2.6. Mascot

The CROC project aimed to organize a mobile exposition. It turned out to be logistically difficult to make a specific information booth for crocodile conservation during the barangay fiestas. Instead we focused on the cultural show (see 2.2.2). The CROC project assisted the LGU to make an information booth featuring crocodiles during Isabela Day (11 May 2006). The CROC project and CDCAS also made an information booth for the ISU foundation day (2 September 2007). A crocodile mascot was made in 2007 by specialist in Manila. A person has to wear the suit. Children are either in love with it or are terrified by it. The CROC project is using the mascot during community consultations and other events in San Mariano.

Figure 20: the CROC mascot during a community consultation in barangay Disulap (van Weerd 2008)

The CROC team has placed a lot of attention and effort in educating schoolchildren on crocodiles and mobilizing public support for crocodile conservation in San Mariano. The partnership with the department of development communication of ISU has been very productive. With the exception of the information booth all activities described in the CROC consolidation proposal have taken place. The Mabuwaya Foundation will continue with the CEPA campaign in the coming years.

Box 4: Rescue operations

Incidents with crocodiles in the northern Sierra Madre are nowadays immediately reported to the Mabuwaya Foundation. In areas where crocodiles occur, people contact the Mabuwaya Foundation when something goes wrong. This has led to the rescue of three Philippine crocodiles that were accidentally captured by fishermen. In January 2006 an adult Philippine crocodile was captured in barangay Aplaya in Maconacon. The animal was released unharmed in cooperation with the barangay officials of Aplaya, the DENR and the Northern Sierra Madre Wilderness Foundation. In January 2008 an adult male crocodile was captured in Ibujan in San Mariano (Ilaguen River). The Mabuwaya Foundation immediately went to the site and could tag and release the crocodile. This is a major step forward. In previous years several crocodiles died after they had been accidentally captured. In June 2001 fishermen in Divilacan captured an adult Philippine crocodile. The animal was tied and died after several days. In 2004 a crocodile was caught in Baliao, Benito Soliven. Before the team had arrived on site the crocodile had died. And in March 2006 a sub-adult was accidentally captured in Buyasan (see figure 26). People tied the crocodile placed it in a water tank where it drowned. The Mabuwaya Foundation is developing an emergency response system for these situations.

Activity 3.1: Establishment of a reward scheme for successful Philippine crocodile breeding

Although crocodiles are protected in San Mariano, the population is not yet rapidly recovering. This is a mainly due to the fact that there is little recruitment. Philippine crocodile nests (large mounds of grass, sand and vegetation) are vulnerable to predators (rats, monitor-lizards, ants, humans and floods).[10] The results of the quarterly monitoring program show that hatchling mortality is very high. Hatchlings are eaten (for example by night herons) or cannot survive in rapidly flowing rivers (such as Disulap River). Most suitable breeding and hatching areas for the Philippine crocodile (shallow ponds, marshes and stagnant creeks) have been converted into rice fields. This underscores the importance of the 3 breeding areas in the densely populated landscape of San Mariano. Table three summarizes the number of breeding events recorded in San Mariano.

There is an urgent need to protect crocodile nests and assure the survival of Philippine crocodile hatchlings. To address this problem we established a reward scheme for Philippine crocodile breeding. The reward consists of PhP. 500 per observed hatchling in the wild (to be confirmed by CROC team members) for the barangay fund and PhP. 500 for the finder of the nest. The finder of the nest should immediately inform the barangay officials or the *Bantay Sanktuwaryo* without disturbing the nest. The CROC team immediately validates the reported sightings. If a nest is found, the *Bantay Sanktuwaryo* will permanently guard the nest. Sign posts are placed to inform people that the area is off-limit.

A poster was designed by DEVCOM students of ISU under supervision of Dr. Myrna Cureg to inform communities about the breeding reward (see figure 21). In addition, the CROC team explains the reward scheme during the community meetings. This scheme was also published in the CROC newsletter (see paragraph 2.1) which is distributed in the barangays in San Mariano.

In July 2005 a nest was discovered in the Disulap River municipal Philippine crocodile sanctuary.[11] The breeding reward was divided between barangay San Jose and barangay Disulap. In July 2006, nests were found in Disulap River, in Dunoy Lake and in Dinang Creek (see table 2). The reward was given to the barangays. The money is used by the barangay council for community activities. In barangay Dibuluan (Dunoy Lake) the reward (PhP 8,500) was used to restore the barangay hall that was destroyed by a typhoon. In barangay Disulap, the reward (PhP 4,500) was used for the improvement of the stage of the barangay hall. The community painted a large crocodile on the stage. In barangay San Jose, the reward (PhP 4,500) was used to in purchase plastic chairs for the

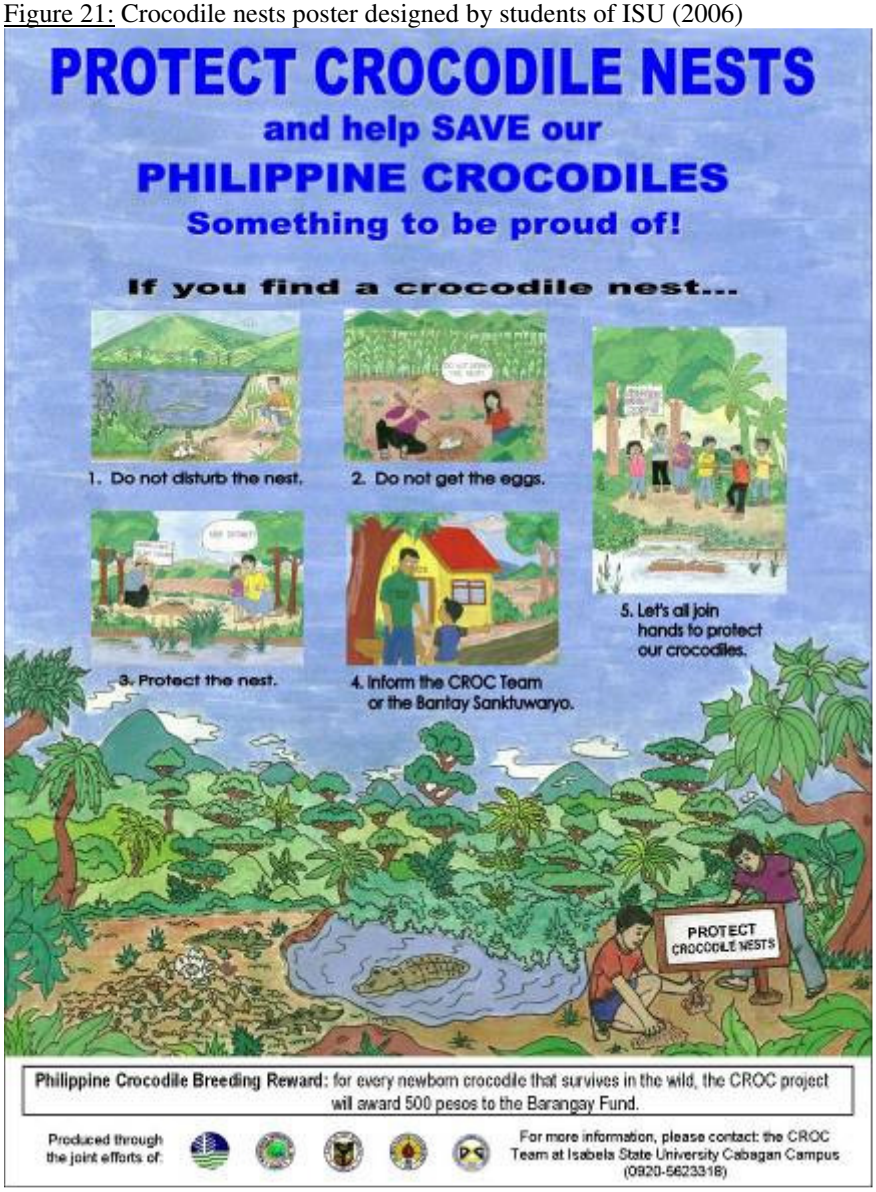
[10] Take note that at the start of the project Philippine crocodile nests were not described. It was not known whether the Philippine crocodile was a mound- or a hole-nester. The CROC project has collected important information on the ecology of the species that can serve as an input for conservation action (see also box 6). The Philippine crocodile constructs a mound nest.

[11] Unfortunately during the hatching of the nets, ants killed several hatchlings. The guards rescued 9 hatchlings and decided to bring them to San Mariano. This turned out to be the start of head-start program for the species. With funding of CEPF and several zoos (see also table 6), the Mabuwaya Foundation and the LGU set up a basic facility to raise juvenile crocodiles (see also van der Ploeg & van Weerd 2007). Four juveniles from the 2005 nests were released back to the wild in February 2007.

barangay office. In barangay Cadsalan, people decided to use their reward (PhP 5,500) to purchase kitchen materials for the barangay office.[12]

The breeding reward has generated goodwill for crocodile conservation among communities and a sense of ownership. It enabled the Mabuwaya Foundation to establish a head-start program for the species (van der Ploeg & van Weerd 2007). Despite the information campaign and the permanent presence of local guards, crocodile nests are still sometimes lost. We are currently investigating the possibilities to prevent predators from raiding nests (see also box 7).

Figure 21: Crocodile nests poster designed by students of ISU (2006)



[12] A point of attention is that sometimes the reward is spent by the barangay council on community projects in the barangay center. The crocodiles are generally located in remote sitios, and the people living in close proximity of the crocodiles sometimes do not profit from the reward. The CROC team generally discusses with the barangay council how the money is spent..

Activity 3.2: Establishment and maintenance of demarcation billboards along crocodile sanctuaries

The CROC project aimed to place billboards in the Dinang Creek and Disulap River crocodile sanctuaries. These billboards will visual demarcate the sanctuaries and inform the people about the importance of crocodile conservation. The billboards are installed with the consent and approval of the barangay officials.

Ten informative billboards were installed in Dinang Creek (3), Dunoy Lake (2), the NARRA project (1), and Disulap River (4). In addition, the CROC project restored eight billboards that were placed in 2001 along the Disulap River municipal Philippine crocodile sanctuary.

A crocodile was painted on a 6x6 truck, the only mode of transportation in the remote areas of San Mariano: a riding billboard.

Figure 22: CROC team installing an informative billboard in Dinang Creek (van der Ploeg 2006)

With funding of IUCN the project also installed 18 billboards in the barangay fish sanctuaries, and small markers to delineate the sanctuary (see also van Weerd & van der Ploeg 2006). Billboards were also placed in the San Jose holding pen (with Melbourne Zoo funding) and the rearing station in Minanga (with CEPF funding). Over the past seven years the CROC project has installed a total of 64 billboards in San Mariano (target in the consolidation proposal: 50 billboards). Billboards are a cost-effective way to inform the public. The Mabuwaya Foundation will continue to maintain these billboards and renew them whenever necessary.

Activity 3.3: Training Department of Environment and Natural Resources officials in crocodile conservation and protection

The DENR is the mandated national agency to conserve wildlife and is tasked to enforce the national laws. In practice, however, environmental law enforcement is non-existent in the remote rural areas. There is no reaction from the authorities when crocodiles are killed or critical habitat is destroyed. The project aimed to strengthen the capability of DENR officials to enforce environmental legislation.

A wildlife enforcement training was organized in cooperation with the DENR on 27 to 29 July 2005 at Punta Amelita Resort in Cordon. DENR staff members of the Legal Counsel Division and the Protected Areas and Wildlife Service (PAWS) gave lectures on the Wildlife Act. The CROC team was deputized as Wildlife Enforcement Officers (WEO).

Staff members of the DENR are invited to join field activities of the CROC team. For. Mina Labuguen of PAWS, For. Fochlee Mansibang of the office of the Protected Area Superintended (PASu) of the NSMNP, For. Luz Soriano of CENRO Cabagan and For. Willy Eraña of CENRO Naguilian joined on several occasions the CROC team to San Mariano. Their presence is especially valuable during community consultations: farmers have many questions about land rights in the protected area and the project has facilitated on several occasions a dialogue between the community and DENR staff. The foundation maintains regular contacts with the PAWS in Tuguegarao and PAWB in Manila.

Unfortunately these activities have not lead to a more pro-active role of the DENR in law enforcement on the ground. In fact the situation in San Mariano has deteriorated over the past two years: DENR officers do not visit the crocodile localities and there is no reaction on violations. The biggest issue, however, is not wetland management or crocodile conservation but illegal logging. Some DENR officials at CENRO Naguilian and PENRO Isabela are involved in the on-going illegal logging activities in San Mariano (see also Greenpeace 2006). This makes working in partnership with the DENR very difficult. Relations between the Mabuwaya Foundation and the DENR have become strained after the foundation reported illegal logging in the Northern Sierra Madre Natural Park to PAWB. The subsequent DENR investigation was flawed. DENR officials passed on the names of Mabuwaya Foundation staff to the illegal logging syndicates. This has lead to problems in the villages and concerns about the safety of the CROC team in the field. As long as structural reforms of the DENR are not undertaken (for example the replacement of corrupt officials), alternative solutions have to be found to improve law enforcement at the local level.[13]

The Mabuwaya Foundation is now working with community leaders and barangay officials to enforce national environmental legislation at the local level (see also van Weerd & van der Ploeg 2006). With co-funding of IUCN-NL the project organize trainings and workshops to empower barangay officials. A law-enforcement training for barangay officials was organized in March 2007 in San Mariano (see box 5). There is strong social support to conserve wetland resources on which rural communities depend

[13] The provincial government of Isabela and the diocese of Ilagan have also repeatedly reported illegal logging in the NSMNP and have requested the DENR to replace officials of PENRO Isabela. The DENR has not taken any action.

for their livelihoods. This alternative approach has resulted in local action to protect crocodiles and wetlands. On several occasions barangay officials have acted upon a violation, for example in San Jose where the barangay captain penalized three men for using pesticides to fish in Diwagden Creek. In the coming years we intend to strengthen this approach and work closely with barangay officials to protect crocodiles and wetland resources at the grassroots level.

Box 5: Enhancing the capacities of local law enforcers

In March 2007 the Mabuwaya Foundation organized a law-enforcement training at the Agricultural Training Institute-Regional Training Center (ATI-RTC) in Cabagan, Isabela. The training aimed to:

1. Raise awareness on wetland conservation among barangay officials, specifically on the benefits of sustainable wetland management;
2. Improve the basic knowledge of local law enforcers, specifically on environmental legislation;
3. Practice basic law enforcement skills and actions such as warnings, arrests, collecting of evidences and filing a case to strengthen effective law enforcement in the local level;
4. Strengthen links between barangay officials and government agencies (DENR, BFAR, LGU, DA, PNP, etc.);
5. Mobilize public support for the crocodile conservation;
6. Raise awareness on Philippine crocodile conservation.

The training was attended by the *Bantay Sanktuwaryo* members, barangay officials and barangay *tanods* (barangay policemen) of fifteen target barangay, and representatives from AFP, PNP, LGU and DENR. In total, there were 85 participants attended the training. The training was conducted in close collaboration with the LGU of San Mariano. Lectures were given by representatives from Tanggol Kalikasan (TK), DENR and the LGU of San Mariano. The five-day training consisted of classroom lectures and field practice in the municipal Philippine crocodile sanctuary in Disulap River. In the classroom lecture, all relevant environmental laws for wetland management and crocodile conservation (the Fisheries Code, the Forestry Code, and the Wildlife Act) were reviewed. Furthermore, the rights and responsibilities of barangay officials and the legal processes and procedures were discussed (such as arrests, from collection of evidences to filing of cases). During the last two days, the participants were involved in a role-play in the Philippine crocodile sanctuary in Disulap River. The participants were confronted with illegal activities. Six scenarios were played and the participants have to act in a correct manner. The scenarios played were taken from real-life situations which often happen in the barangay: such as a fisherman who is using electricity to fish. The participants practiced how to apprehend, read the Miranda rights and collected evidence. At the end of the day, the participants watched their role play on video and assessed their reaction. The following day the participants turned over the suspects to the PNP San Mariano and there they also practice how to file a case against the violators. The closing program was held on the roof deck of LGU San Mariano. This was attended by the municipal mayor, the CENRO Naguillian, the municipal trial judge of San Mariano, the chief of the PNP and two representatives from AFP. After the training the barangay officials were very eager to implement the knowledge they gained in the training in their respective barangays.

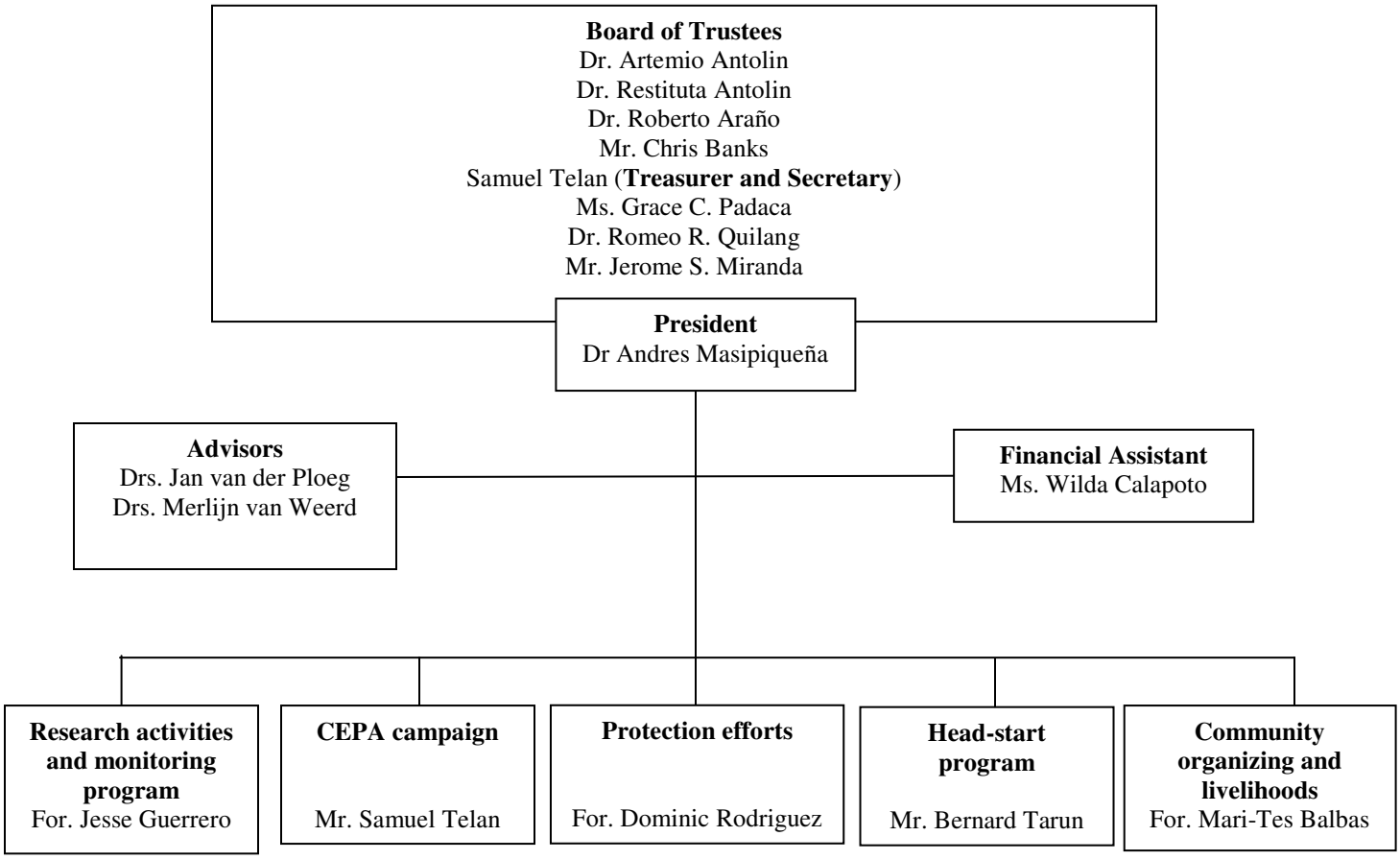
Activity 4.1: Establishment of the Mabuwaya Foundation as a regional centre of expertise regarding crocodile and wetland conservation

An important objective of the consolidation project was to strengthen the Mabuwaya Foundation to assure the continuity of Philippine crocodile conservation action in the northern Sierra Madre. It is envisioned that the foundation becomes a regional center of expertise for crocodile conservation.

4.1.1. Institutional set up

The Mabuwaya Foundation Inc. is registered as a non-stock, non-profit organization at the Securities and Exchange Commission (SEC) (registration no. CN200314661). Figure 23 presents an overview of the organization of the foundation. The Board of Trustees, chaired by the President, advises the Mabuwaya Foundation. In principle the board meets once a year. The secretary of the foundation keeps the minutes of the board meetings. The director is the executive officer of the foundation, responsible for the day-to-day management formally known as the CROC project team leader). The Treasurer is responsible for the financial management. The books of the foundation are audited annually by a registered audit firm. The crocodile conservation program has five components, which are the responsibility of the staff members. Field reports are made after every field activity. A team meeting is held every Monday. Annual staff performance evaluations are done in June.

Figure 23: Organizational structure of the Mabuwaya Foundation Inc.



The main partners of the Mabuwaya Foundation are the LGU of San Mariano, the DENR and ISU. The LGU of San Mariano has accredited the Mabuwaya Foundation as a partner in crocodile conservation. The foundation signed a Memorandum of Agreement with the DENR. A gratuitous permit for the head-start program was issued in 2007. Isabela State University has made office space available for the foundation at the Environmental Information Center (EIC) building at the campus in Cabagan. The Cagayan Valley Program on Environment and Development (CVPED) supports the foundation with administrative and logistical matters, including the salary of the financial assistant. The foundation has basic office and field equipment (see table 4).[14]

Table 4: Equipment purchased during the consolidation project

Units	Equipment	Value in PhP.	Value in US$	Date of purchase
2	Steel cabinet (Hermaco)	12,400.00	-	02/02/05
6	Sleeping bags	4,536.00	-	02/03/05
4	Rain meter		299.48	10/14/05
2	Lifevest	14,787.00	-	10/18/05
1	Digital camera	25,052.00	-	10/18/05
1	USB Hub	700.00	-	11/07/05
2	Computer table	12,000.00	-	12/16/05
1	HP Ink Toshiba Projector	109,435.00		12/23/05
1	Eco 4 Tent	5047.00		09/20/05
1	Desktop and scanner	45,925.00		08/22/05
3	PI Tents (Coleman)	12450.00		10/26/05
4	Sleeping bags (Coleman)	5320.00		10/26/05
1	Cam tracker		80.32	02/10/06
1	night vision Orion		199.00	02/18/06
1	Battery charger		54.99	02/18/06
1	Scan disk (1GB)		89.99	02/18/06
1	Solar Battery Charger		4.99	02/18/06
1	Aquarium for croc hatchlings	19,000.00		10/02/06
4	Tent (coleman)	15,219.00	-	09/30/06
2	Flash Light	1169.50	-	09/30/06
1	Tripod	2,430.00	-	09/30/06
1	Video Camera		536.97	10/06/06
1	Lens		121.00	10/06/06
1	Battery for the Video cam		86.55	10/06/06
1	Microphone		84.87	10/06/06
1	Memory stick		24.37	10/06/06
1	Video bag		9.24	10/06/06

Dr. John Thorbjarnarson of the Wildlife Conservation Society (WCS) visited the CROC project in May 2005. His report can be considered as a mid-term evaluation of the CROC project (Thorbjarnarson 2005).

Table 6 gives an overview of the funding sourced for Philippine crocodile conservation by the CROC project over the past years.

[14] Idea Wild donated additional field equipment to the Mabuwaya Foundation.

4.1.2. CROC team

At present the CROC team consists of 9 motivated people, who have extensive field experience on wildlife conservation in the northern Sierra Madre.[15]

1. Andres B. Masipiqueña (52) is the president of the Mabuwaya Foundation. He obtained a PhD from the University of the Philippines in Los Baños with a thesis on community-based forestry management. He is a professor at Isabela State University and the Filipino coordinator of CVPED. Dr. Masipiqueña is the contact person with government officials and academics in the Philippines. His work for the foundation is on a voluntary basis. Email: cvpedgarita@yahoo.com
2. Jessie Guerrero (34) is a forestry graduate student of ISU. He has been researching Philippine crocodiles since 2000 in the framework of the Plan International NSMNP-CP. In 2002 he joined the CROC project. Jessie coordinates the quarterly monitoring program and the crocodile surveys in Northeast Luzon. Jessie presented the CROC Project at the BPCP award ceremony in London in 2006. His salary is paid from BPCP funding. Email: guerreroryan@yahoo.com
3. Samuel Telan (32) will graduate as a forester from ISU in March 2008. He has been involved in Philippine crocodile research since the CROC Gold Award and has conducted extensive crocodile surveys throughout the Northern Sierra Madre and the Cordillera Mountains in northern Luzon. At present he is in charge of public awareness campaigns Sammy represented the CROC project at the BPCP award ceremony in London in 2004 (Top Follow-Up Award winner in 2003). Sam is the secretary of the Mabuwaya Foundation. His salary is paid from BPCP funds. Email: sammytelan@hotmail.com
4. Dominic Rodriguez (33) is also a forestry graduate student of ISU. He is one of the discoverers of the Philippine crocodile in Northeast Luzon and has been involved in the Philippine crocodile research and conservation work since 1999. At present Dominic is responsible for protection efforts. In 2006 BPCP funded his trip to Europe where he presented a paper at the IUCN Crocodile Specialist Group Working Meeting in France (see Annex 2). His salary is paid from BPCP funding. Email: rodriguezdom@yahoo.com
5. Bernard Tarun (34) is a forestry graduate student of ISU. He has been working on Philippine crocodile distribution, population size, ecology, conservation and especially behavior since 2000. First in the framework of the Plan International NSMNP-CP and since 2002 with the CROC project. At present he is in charge for the head-start program of the Mabuwaya Foundation. His salary is paid from BPCP funding. E-mail: nard_racroc@yahoo.com
6. Mari-Tes Gatan-Balbas (33) is a forestry graduate from ISU. She worked for Plan International and WWF-Philippines. In 2004 she joined the Mabuwaya Foundation. Tess is responsible for the community organizing and livelihood component. The Mabuwaya Foundation pays her salary (with funding of IUCN-NL). Email: mikaela_tess@yahoo.com
7. Wilda Calapoto (33) is the financial assistant of CVPED. She graduated from business administration and worked for WWF-Philippines. She keep the financial

[15] From 2004 to 2007 Racquel Gatan-Utdo worked for the Mabuwaya Foundation. She assisted the CROC team in the public awareness campaign.

records of the Mabuwaya Foundation on a voluntarily basis. Email: calapotowilda@yahoo.com

8. Merlijn van Weerd (37) graduated as a wildlife biologist at Groningen University. At present he works at Leiden University as CVPED coordinator. Merlijn is responsible for the international network of CROC Project. He is a member of the IUCN Crocodile Specialist Group. BPCP funded his participation in the SCB conference in 2007 in Port Elizabeth, South Africa. He coordinates (on a voluntary basis) the research program on distribution, population size, habitat preference, ecology, behaviour and conservation planning of the Philippine crocodile. Email: merlijnvanweerd@yahoo.com
9. Jan van der Ploeg (30) is a PhD. candidate at Leiden University. He studied environmental anthropology in Leiden. From 2001 to 2007 he was the coordinator of the Cagayan Valley Program on Environment and Development (CVPED), the academic partnerhsip of Leiden University and Isabela State University. BPCP funded his participation in the SCB conference in 2005 in Brasilia, Brazil. He is the Treasurer of the Mabuwaya Foundation and a member of the IUCN Crocodile Specialist Group. His work for the Mabuwaya Foundation is on a voluntary basis. Email: vanderploegjan@hotmail.com

Figure 24: The CROC team testing the remote trigger camera trap in front of the Environmental Information Center in Cabagan. From left to right: Jan van der Ploeg, Merlijn van Weerd, Bernard Tarun, Racquel Gatan-Utdo, Andy Masipiqueña, Dominic Rodriguez, Samuel Telan and Jessie Guerrero (Mabuwaya Foundation 2006)

The Mabuwaya Foundation is now functioning as a center of expertise for Philippine crocodile conservation activities in North Luzon (see also paragraph 4: continuity).

Activity 4.2: Co-ordination of crocodile conservation activities on Luzon

Cooperation with other stakeholders has been an important objective of the CROC project. The CROC project aims to distribute all project reports to its partners.[16]

In the region the project is closely cooperating with the LGU San Mariano, DENR, ISU and Conservation International (CI). There are often informal contacts between these groups. Every six months a regional Philippine crocodile recovery team meeting is held. The Mabuwaya Foundation acts as a secretariat and keeps the minutes of the meetings. All people working with crocodiles are invited to attend the regional recovery team meetings. In general representatives from LGU San Mariano, ISU, the DENR (office of the PASu of the NSMNP, PAWS, CENRO Naguilian, PASu of St. Victoria Caves) and CI attend the meeting. Staff members from CAVAPPED and the Northern Sierra Madre Wilderness Foundation have also attended the meetings.

The CROC project maintains an extensive network in the region (Cagayan Valley). The most important forum to share information on crocodile conservation in the northern Sierra Madre is the Protected Area Management Board of the NSMNP. Dr. Masipiqueña represents the Mabuwaya Foundation in the PAMB. The foundation is working closely together with the Isla Biodiversity Conservation Foundation on Dalupiri Island. Joint crocodile surveys have been organized in 2005, 2006 and 2007 (see Oliveras et al. 2005). The foundation also provides technical support to the Northern Sierra Madre Wilderness Foundation (NSMWF) based in Maconacon. The NSMWF focuses on the conservation of the estuarine crocodile population in Blos River (with financial support of CEPF). Mabuwaya Foundation staff gave a training on survey and monitoring techniques to NSMWF staff and barangay officials on 9-11 March 2006. The Mabuwaya foundation has developed good contacts with the Provincial Government of Isabela. The governor of the province, Ms. Grace C. Padaca, now sits in the Board of Trustees of the foundation. The National Economic and Development Authority (NEDA), the Bureau of Fisheries and Aquatic Resources (BFAR), the Department of Tourism (DOT) and the Diocese of Ilagan are also important partners of the Mabuwaya Foundation in the Cagayan Valley.

The Mabuwaya Foundation is also investing in partnerships outside the region. The environmental lawyers of Tanggol Kalikasan (TK) have assisted the Mabuwaya Foundation in the training program for barangay officials (see box 5). The Center for Environmental Awareness Education (CEAE) provided valuable advice on how the improve the CEPA campaign. The foundation provides technical assistance to the Crocodile Team of University of Southern Mindanao (USM). Initial contacts are made with Crocodylus Porosus Philippines Inc (CPPI), an organization of crocodile farmers in the Philippines. Every year CROC team members present an update of the CROC project at symposium of the Wildlife Conservation Society of the Philippines (WCSP) (see annex 2). The project is closely collaborating with the Palawan Wildlife Rescue and Conservation Center (PWRCC). PWRCC staff provides technical support to the head-

[16] The Mabuwaya Foundation also facilitates the communication between school children. A letter exchange program was set up between the Holy Spirit School in Melbourne Australia and the San Isidro Elementary School in San Mariano.

start program and CROC staff was trained at the crocodile farm in Puerto Princesa. In addition there is regular contact with PAWB in Manila.

The CROC team provides a regular update of project activities in the IUCN Crocodile Specialist Group Newsletter (see annex 1) and have presented the project at the Crocodile Specialist Group Working Meeting (see annex 2). The project also writes regular updates for the BPCP newsletter.

The CROC team members are now widely regarded as the region's crocodile experts. The challenge remains to institutionalize crocodile conservation. In San Mariano, crocodile conservation activities (the sanctuaries, the *Bantay Sanktuwaryo*, etc) should be included in the Comprehensive Land Use Plan (CLUP). The DENR has to become more pro-active in the enforcement of environmental laws (particularly regarding illegal logging in the Northern Sierra Madre Natural Park – see activity 3.3). Also the provincial government should become more involved in preserving crocodiles in Isabela. Progress has been made, but pro-active crocodile conservation in the Northern Sierra Madre will come to an end once the Mabuwaya Foundation will cease operations. The coming years the foundation will work hard to institutionalize crocodile conservation and sustainable wetland management in the operations of the DENR, BFAR, provincial government and the LGU of San Mariano. The coming years the CROC team also aims to publish the results and lessons of the CROC project in international scientific journals (for example in *Oryx*).

Figure 25: Crocodile survey in Dalupiri in cooperation with the Isla Biodiversity Conservation Foundation and PWRCC (Telan 2005)

2. Budget

Table 5 presents the budget overview of the CROC consolidation project (2005-2007). The consolidation project budget was US$ 75,014 (PhP. 3,873,246)[17]. The project has a budget deficit of PhP. 158,246 (US$ 3,888).

Table 5: CROC consolidation project budget

Activity	**Total expenses (PhP.)**	**Proposed budget (PhP.)**	**Balance (PhP.)**
Activity 1.1: Quarterly monitoring of Philippine crocodile sub-populations.	629,253.51	435,000.00	(194,253.51)
Activity 1.2: Quarterly monitoring of possible conservation issues regarding Philippine crocodile localities	72,152.90	50,000.00	(22,152.90)
Activity 1.3: Involvement of Isabela State University Students in crocodile research activities	161,493.25	180,000.00	18,506.75
Activity 2.1: Design and production of Communication, Education and Public Awareness (CEPA) materials	420,644.26	600,000.00	179,355.74
Activity 2.2: Interactive communication and participation activities	271,188.10	412,500.00	141,311.90
Activity 3.1 Reward scheme for hatchlings[xvii]	37,372.40	25,000.00	(12,372.40)
Activity 3.2 Billboards and billboard maintenance[xviii]	42,835.35	62,500.00	19,664.65
Activity 3.3 Training DENR Personnel	20,000.00	50,000.00	30,000.00
Activity 4.1: Establishment of the Mabuwaya Foundation as a regional centre of expertise regarding crocodile and wetland conservation	2,198,992.76	1,875,000.00	(323,992.76)
Activity 4.2: Co-ordination of crocodile conservation activities on Luzon	19,314.00	25,000.00	5,686.00
Total	**3,873,246.53**	**3,715,000.00**	**(158,246.53)**

Additional activities of the Mabuwaya Foundation (such as habitat restoration, the head-start program and the wetland management strategy) were funded from other projects (see table 6, paragraph 3 for an overview). The receipts of all expenses are kept. The books of the Mabuwaya Foundation are audited on an annual basis.

[17] Please take note that US$ - PhP. exchange rates have been very unfavorable over the past 2 years. In the proposal we used an exchange rate of US$ 1 :PhP. 52. Current exchange rates are US$ 1 : PhP. 40. The Mabuwaya Foundation has a US$ account at the Philippine National Bank in Tuguegarao.

3. Spin-off activities

The Consolidation Award covered the core operational costs the Mabuwaya Foundation: salaries, fieldwork, equipment and office supplies. The funding of the BP Conservation Program (total US$120,484 - Gold Award 2002, Top Follow-Up Award 2003 and Consolidation Award 2005) enabled us to generate funds from other donors for conservation action for the species. Over the past six year the CROC project sourced US$ 315,080 for Philippine crocodile conservation in Northeast Luzon (see table 6). [18] Thus, every dollar invested in the Mabuwaya Foundation by the BP Conservation Program generated an additional US$ 1.615 for Philippine crocodile conservation.

Figure 26: Children show the skull of a sub-adult crocodile killed in barangay Buyasan (van der Ploeg 2007)

[18] In the table we have only included funds that have been transferred to the Mabuwaya Foundation. The foundation was instrumental in sourcing funds (PhP. 2,000,000) for the NARRA project, a reforestation project in *sitio* San Isidro that is implemented by the San Isidro Agro-Forestry Development Multi-Purpose Cooperative (SIAFDMPC), a farmers' cooperative. CEPF funded the crocodile conservation activities of the NSMWF in barangay Reina Mercedes in Maconacon (US$ 20,000). Melbourne Zoo financially supported the Isla foundation to organize crocodile surveys in Dalupiri.

Table 6: financial support to the Mabuwaya Foundation (in US$)

Donor	**Project title**	**Budget (US$)**
BP Conservation Program (Gold Award)	Crocodile Research, Observance, & Conservation Project (CROC)	10,484
BP Conservation Program (Top-Follow Up Award)	Crocodile Rehabilitation, Observance, & Conservation Project (CROC) Top Follow up Award	35,000
Chicago Zoological Society	Ground work for the declaration of the Dinang Creek crocodile sanctuary	4,000
Haribon Foundation	Philippine crocodile ecology and behavior study in Lake Dunoy	4,500
WWF- Philippines	Crocodile surveys along the coastal side of the Sierra Madre and preparation of a crocodile conservation plan for the Northern Sierra Madre Natural Park (NSMNP)	7,750
Critical Ecosystem Partnership Fund	Organization of a regional Philippine crocodile workshop to develop a Philippine crocodile conservation plan for the Sierra Madre Corridor	13,000
Netherlands Committee for IUCN – Small Wetland Projects Fund	Adopting an ecosystem approach for Philippine crocodile conservation in San Mariano, Isabela (Pilot wetland conservation project)	13,000
Melbourne Zoo (2004)	Upgrading of municipal Philippine crocodile holding pen	3,150
Idea Wild	Provision of equipment; mini-video camera and laptop	1,000
Van Tienhoven Foundation	Small habitat modification project	10,836
Netherlands Committee for IUCN – Small Wetland Projects Fund	Towards an ecosystem approach for Philippine crocodile conservation in San Mariano, Isabela (Follow up proposal)	53,314
Critical Ecosystem Partnership Fund	A re-enforcement strategy for the critically endangered Philippine crocodile population in Northern Sierra Madre: Natural Park	8,000
Cullen Vivarium	Donation Mr. Terry Cullen	6,000
BP Conservation Program (Consolidation Award)	Crocodile Rehabilitation, Observance, & Conservation Project (CROC), Consolidation Award	75,000
Melbourne Zoo (2005)	Nest and hatchling protection, head-starting and hatchling reintroduction program for Philippine crocodile Crocodylus mindorensis in NE Luzon, Philippines	2,958
IUCN NL Ecosystem Grants Programme (EGP)	Welcome to Crocodile Valley: strengthening community-based wetland conservation in the Cagayan Valley	54,805
Provincial Government of Isabela	Philippine Crocodile *Crocodylus mindorensis*: Head-starting and reintroduction program in the Northeast Luzon, Municipality of San Mariano, Isabela, the Philippines	3,467
CROC-AZA	Philippine Crocodile *Crocodylus mindorensis*: Head-starting and reintroduction program in the Northeast Luzon, Municipality of San Mariano, Isabela, the Philippines	1,960
IUCN-SSC Crocodile Specialist Group	Cross visit to Liguasan marsh, Mindanao	2,500
Melbourne Zoo (2007)	Safeguarding a Philippine crocodile nesting area: Dunoy Lake	4,356

4. Continuity

The first signs of a recovery of the Philippine crocodile population can be seen in San Mariano. Conservation action has to be sustained for a few more years to ensure a full recovery of the population in North Luzon.

For the past two years the BP Conservation Program Consolidation Award has been the main source of funding. The termination of the CROC consolidation project poses a major challenge for the financial continuity of *in-situ* Philippine crocodile conservation activities in North Luzon. The Mabuwaya Foundation has successfully generated additional funds (see table 6) but most donations are relatively small and pose strict limits on staff and administrative costs.

Table 7 provides an outline of the annual costs of the Mabuwaya Foundation. The foundation needs US$ 58,625 per year to implement the Philippine crocodile conservation strategy in Northeast Luzon. This will cover the basic activities of the foundation:

1. Salaries: the foundation employs five young, motivated and well-trained staff members who are responsible for the five components of the conservation strategy.
2. Monitoring program: a quarterly count of the Philippine crocodile population in San Mariano and an annual count of the crocodile population of along the Pacific coast.
3. Communication, education and public awareness campaign (CEPA): students of ISU make a poster and perform a puppet/dance show in the twelve target barangays, presentations in schools, and school visits to Dunoy Lake to see crocodiles.
4. Protection: follow up violations with the authorities, rapid reaction in case crocodiles are captured.
5. Head-start program: breeding award, nets protection and husbandry.
6. Community: organization of regular consultations and community dialogues in twelve target barangays in San Mariano
7. Administration: annual audit (requirement of the SEC), travel costs for the team leaders, communication (phone, internet) and office supplies.
8. Equipment: basic field equipment (tents, flashlights, water proof bags, photo cameras, etc.).

Table 7: annual budget Mabuwaya Foundation

Component	**Activity**	**Costs per unit**	**No. of units**	**Total (PhP.)**
Salaries (49.5%)				
	Staff 1: research and monitoring	18,000	13	234,000
	Staff 2: communication and education	18,000	13	234,000
	Staff 3: protection	18,000	13	234,000
	Staff 4: head-start program	18,000	13	234,000
	Staff 5: community organizing & livelihoods	18,000	13	234,000
Monitoring (10%)				
	Quarterly monitoring San Mariano	50,000	4	200,000
	Annual monitoring coastal area	50,000		50,000
CEPA (6.5%)				
	Poster	50,000		50,000
	Show	5,000	10	50,000
	School visits	5,000	10	50,000
Protection (2.5%)				
	Rescues	10,000	4	40,000
Head-start program (7%)				
	Rearing station	10,000	12	120,000
	Annual release	25,000		25,000
	Breeding Award	500	40	20,000
Community (2.5%)				
	Consultations and dialogues	5,000	12	60,000
Administration and management (18%)				
	Audit	50,000		50,000
	Communication	10,000	12	120,000
	Travel costs	60,000	2	120,000
	Office supplies	10,000	12	120,000
Equipment (4%)				
	Field equipment	100,000		100,000
TOTAL in PhP.				**2,345,000**
TOTAL in US$	Exchange rate: 1:40			58,625
TOTAL in €	Exchange rate 1:60			39,083

The Mabuwaya Foundation is working hard to secure structural funding for the *in-situ* conservation of the Philippine crocodile in San Mariano.[19] The most promising development is the partnership with international zoos. A number of zoos in Australia, the U.S. and Europe are supporting the foundation and educating their visitors on the conservation of the Philippine crocodile. The initiative is led by Melbourne Zoo and Gladys Porter Zoo in cooperation with the ASA and the ZAA. Another possibility to secure structural financial support for *in-situ* Philippine crocodile conservation is the

[19] The Mabuwaya Foundation has submitted a proposal for the Whitley Fund for Nature 2008 and the Ocean Park Conservation Foundation in Hong Kong to assure the continuity of crocodile conservation action in San Mariano after December 2008.

commercial crocodile leather industry. Crocodylus Porosus Philippines Inc. and the affiliated Philippine Crocodile Society could play an important role in educating the general public in the Philippines and securing funding for conservation action. The foundation is exploring innovative funding mechanisms. In cooperation with Triple-E a web-site is developed where people can support crocodile conservation action.

The Mabuwaya Foundation has been established as an independent foundation. The Board of Trustees consists of well-connected and experienced people from the region. The staff of the Mabuwaya Foundation (the CROC team) has extensive field work experience. In the coming years we continue to enhance the capacities of the CROC team.[20] Over the past seven years crocodile conservation activities were coordinated by Merlijn van Weerd and Jan van der Ploeg (CROC team leaders). In the coming years their involvement in project will become less intensive. The foundation will look for an experienced Philippine director/manager.

Over the past years the Mabuwaya Foundation has learned how to effectively protect the Philippine crocodile in the wild. The Philippine crocodile population in San Mariano is slowly recovering. But we are not yet there. The Mabuwaya Foundation is looking for donors and partners who can financially support the conservation project for the Philippine crocodile in the Northern Sierra Madre. We can safe the Philippine crocodile from extinction: our target is to reach a non-hatchling crocodile population of 200 individuals in the wild in San Mariano in 5 years time (2012).[21]

Box 6: Research as a basis for conservation action

Very little is known about the Philippine crocodile. Research plays an important role in the Philippine crocodile conservation activities in San Mariano. Basic information is gathered on the ecology of the Philippine crocodile and the conditions in which it survived. Behavior observations in Dunoy Lake have generated insights in diet and micro-habitat use. Telemetry studies gave insight in movements, habitat preference and territorial behavior. Twelve Philippine crocodiles were radio-tagged and monitored in Disulap River and Catalangan River over the past 2 years. In addition the Mabuwaya Foundation has collected information on crocodile nests and water quality. This ecological information is used to design conservation interventions, for example the size of the crocodile sanctuaries. Research enables the Mabuwaya Foundation to assess the effectiveness of conservation action: during the quarterly monitoring program crocodiles are counted, the ultimate indicator of the success of the conservation strategy. The impact of the public awareness campaign is also monitored to improve the outreach component of the project. Research showed that in the current societal context eco-tourism is not a viable option to generate benefits for rural communities. Research results are made available to stakeholders and used to adapt the conservation project in constantly changing conditions.

[20] Three possibilities should be highlighted here. First, IUCN-NL has allocated € 5,000 (US$ 7,500) to build the capacities of the CROC team (English language course and internship with a national environmental NGO). Second, the Netherlands Fellowship Program (NFP). Third, the Conservation Leadership Program continues to provide travel grants for alumni (for example to attend the annual SCB conference),

[21] The challenge: 200 crocodiles in 2012 for € 200,000 (US$ 293,125).

Conclusions and recommendations

There is hope for the survival of the Philippine crocodile in the wild!

In San Mariano the Mabuwaya Foundation has monitored the Philippine crocodile population on a quarterly basis. The project has generated scientific information on the ecology of the species in the wild, which served as an input for the design of effective conservation action. The project has developed a public awareness campaign to mobilize public support for the conservation of the species. Most people in San Mariano now know that Philippine crocodiles are protected and take pride in the occurrence of the species in their barangay. Students and faculty members of Isabela State University are actively involved in the research activities and the public awareness campaign. The local government of San Mariano has enacted legislation protecting crocodiles in the wild and allocated a budget for the *Bantay Sanktuwaryo*. Three breeding areas are clearly delineated with boundary posts and bill-boards. Crocodile nests are protected. A head-start program was established to reduce hatchling mortality and enable a rapid recovery of the species. Two nursery pools created optimal habitat conditions for *Crocodylus mindorensis*. Local officials were trained to effectively implement environmental legislation. As a result barangay councils are now taking action against illegal fishing and have proclaimed nine fish sanctuaries. The CROC consolidation project has enabled the Mabuwaya Foundation to enhance the capacities of its staff and improve the organization. The Mabuwaya Foundation has created a technical support network, and has sourced additional funding for Philippine crocodile conservation.

Throughout the Philippines, the CROC project is regarded as an innovative model for community-based wildlife conservation. In June 2006 the IUCN Crocodile Specialist Group awarded the Castillo Award to the CROC project in recognition of the significant contribution the project made to the *in-situ* conservation of crocodilians (Dacey 2006). The project was described in a recent article in the scientific journal *Bioscience* as an "emerging success story" (Posa et al. 2008: 234). The replication of the crocodile conservation strategy in other areas in the Philippines, notably the coastal area of the Northern Sierra Madre Natural Park and the Ligauasan and Agusan marshes in Mindanao, is a major challenge in the coming years.

The ultimate indicator for the success of the conservation strategy is the number of crocodiles surviving in the wild. The number of adult crocodiles in San Mariano is increasing. But the crocodile population is still critically small and several serious threats remain. In San Mariano people no longer kill crocodiles purposively. But crocodiles are still occasionally captured in fish traps and nets. Nests and hatchlings are often lost to natural predators. Crocodiles are still occasionally caught. Destructive fishing methods continue to pose a threat to the Philippine crocodile population and to local people's livelihoods. Illegal logging poses another threat.[22] Agricultural encroachment and rapid changes in land use are other concerns. Farmers are clearing remnant forest patches for the cultivation of GMO corn and make intensive use of pesticides and insecticides. Shallow pools and creeks, important habitat for juvenile crocodiles, are drained for the cultivation of rice. These processes are often encouraged by government agencies: it's

[22] Illegal logging destroys the moral fabric of society. Local people are losing trust in government have to cope with high transport costs for their agricultural products and face the risks of landslides and floods. Rural communities are paying the price of corruption and greed.

essential to integrate crocodile conservation and sustainable wetland management in government planning.[23]

To counter these threats we recommend, on the basis of seven years conservation action in the Northern Sierra Madre, the following activities:

1. **Research and monitoring**:
    a. Continue the quarterly monitoring program of the Philippine crocodile population in San Mariano;
    b. Continue the annual monitoring program of the Philippine crocodile population in other crocodile localities on Luzon;
    c. Continue with the ecological research activities (telemetry, behavior observations) and publish the results in scientific journals;
    d. Design cost-effective methods to improve the protection of crocodile nests;
    e. Assess the effects of land use intensification on the crocodile population (mainly the use of pesticides and chemicals);
    f. Investigate the possibility of a compensation scheme for crocodile attacks on livestock;
    g. Evaluate the effectiveness of the re-enforcement strategy;
    h. Involve students in research activities of the conservation project (internships, summer courses, fieldwork);
    i. Survey other possible Philippine crocodile localities.
2. **Communication, education and public awareness (CEPA)**:
    a. Enable ISU students to design, test, produce and distribute CEPA materials (1 poster per year, 1 calendar per year);
    b. Perform a cultural show during the barangay fiestas featuring crocodiles;
    c. Give lectures in schools on the conservation of the Philippine crocodile;
    d. Bring high-school students to the field to see the Philippine crocodile in the wild (school visits);
    e. Organize cross-visits for communities to see the Philippine crocodile conservation activities;
    f. Produce an informative radio show on crocodile conservation (*tele-novella*);
    g. Involve the media (TV and radio) regularly in conservation activities (especially in the release events).
3. **Protection**:
    a. Maintain buffer zones around the crocodile sanctuaries to assure safe breeding areas, avoid chemic pollution of wetlands and minimize crocodile-livestock conflicts;
    b. Monitor the compliance with local regulations and encourage the authorities to take action (in case of violations);
    c. Develop an emergency response to rescue captured crocodiles (see box 4);
    d. Train and equip the *Bantay Sanktuwaryo*;

[23] This is especially relevant in the context of large-scale mining operations that are proposed in the Northern Sierra Madre.

e. Enhance the capacity of the Department of Environment and Natural Resources (DENR), the PNP and barangay officials to effectively enforce environmental legislation;
f. Delineate the crocodile sanctuaries and place (and maintain) informative bill boards;
g. Halt agricultural encroachment in the Philippine crocodile habitat management zone of the Northern Sierra Madre Natural Park;
h. Harmonize government policy and integrate crocodile conservation in municipal, provincial, regional and national land use planning[24];
i. Report illegal logging to the DENR, LGU, PNP and the media.

4. **Head-start program**:
   a. Construct or restore shallow nursery pools in the Philippine crocodile sanctuaries to create optimal habitat condition for hatchlings and to create suitable release sites for captive-raised juveniles;
   b. Improve the protection of Philippine crocodile nests;
   c. Develop the facilities of the head-start program, especially husbandry techniques and the educational function;
   d. Continue the breeding reward program;
   e. Involve rural communities in the release events (name captive-raised juveniles after children in the area);
   f. Re-introduce Philippine crocodiles in Dicatian Lake, Divilacan.
5. **Communities**:
   a. Enhance the capacity of the local government (on provincial, municipal and barangay level) in the sustainable management of freshwater wetlands and fisheries;
   b. Establish a participative monitoring system to assess the impact of the barangay fish sanctuaries on local livelihoods;
   c. Organize annual community consultations in the target barangays;
   d. Assist farmers in a transition to sustainable land use (for example reforestation activities and the reduction of the use of pesticides and insecticides)
   e. Assist communities in securing land rights.
6. **Mabuwaya Foundation**:
   a. Provide technical support on Philippine crocodile conservation to other institutions in the Philippines;
   b. Replicate the lessons of the CROC project in other areas in the Philippines where crocodiles occur;
   c. Improve linkages with (inter)national technical specialists on crocodile conservation and sustainable wetland management;
   d. Enhance the capacities of the staff of the Mabuwaya Foundation;
   e. Secure the financial continuity of Philippine crocodile conservation action in North Luzon through innovative financing methods and long-term partnerships;
   f. Transfer the leadership of the conservation program;

[24] Integrate crocodile conservation and sustainable wetland management in the agenda of NEDA, DENR, BFAR, NCIP and the LGUs and address conflicting policies.

g. Regularly attend the PAMB meetings of the NSMNP and stress the need to conserve crocodiles
h. Document the results of the conservation program and share lessons with other stakeholders (organization of bi-annual regional Philippine crocodile recovery team meeting and annual presentation in the WCSP)

Box 7: Re-enforcement strategy for the Philippine crocodile: the head-start program

Conservation action for the Philippine crocodile in San Mariano started in 2000. Seven years later, Philippine crocodiles are no longer purposively killed in the municipality of San Mariano, illegal fishing methods are banned, and the majority of the people actively supports the conservation of the species in the wild. However, the Philippine crocodile population in San Mariano is still critically small. Specific action is needed to create the necessary conditions for the recovery of the species in the wild.

To assure a rapid recovery of the species, the Mabuwaya Foundation and the local government of San Mariano, in consultation with (inter-)national crocodile specialists have set up a head-start program. Natural mortality rates of hatchlings are high among crocodilians. By collecting hatchlings and keeping them in controlled captive conditions until they have reached a size that natural predators (rats, monitor lizards, herons, etc.) no longer pose a serious risk, it is aimed to reduce hatchling mortality. A gratuitous permit was secured from the Department of Environment and Natural Resources to collect Philippine crocodile hatchlings in the wild. A low-cost head-start facility was established, which was officially opened on 28 August 2007 by the municipal mayor and the provincial governor (See figure 28). Thirty juvenile Philippine crocodiles are now held in the municipal Philippine crocodile rearing station and will be released back to the wild in 2008. The activities in the head-start program include:

- Searching crocodile nests: the CROC team and the *Bantay Sanktuwaryo* search for crocodile nests during the quarterly monitoring. Local people are asked to immediately report crocodile nests (see paragraph 3.1.);
- Guarding crocodile nests: when a nest is located the *Bantay Sanktuwaryo* will permanently protect the nest;
- Rewarding communities: PhP. 500 per hatchling is paid to the community fund of the barangay for every surviving hatchling (breeding reward);
- Collecting hatchlings: the CROC team brings the hatchlings to the head-start facility in barangay Minanga (the municipal Philippine crocodile rearing station);
- Rearing hatchlings: the crocodiles are kept in captivity for 18 months in the head-start facility. The animals are regularly fed to assure optimal growth rates;
- Sharing information and educating people: visitors are welcome in the municipal Philippine crocodile rearing station. Visitors can see crocodiles and are informed about the importance of conserving crocodiles in the wild (CEPA);
- Releasing juveniles: an annual release event is organized in the barangays. VIPs are invited to release the animals. Media coverage assures that the general public is also well informed about *in-situ* crocodile conservation and reintroduction;
- Monitoring: the released juvenile crocodiles are monitored to assess the effectiveness of this re-enforcement strategy.

The head-start program was set up with funding from the Critical Ecosystem Partnership Fund (CEPF). Additional funding was secured from Melbourne Zoo, the Provincial Government of Isabela and AZA. Several other partners have indicated their support for the head-start program.

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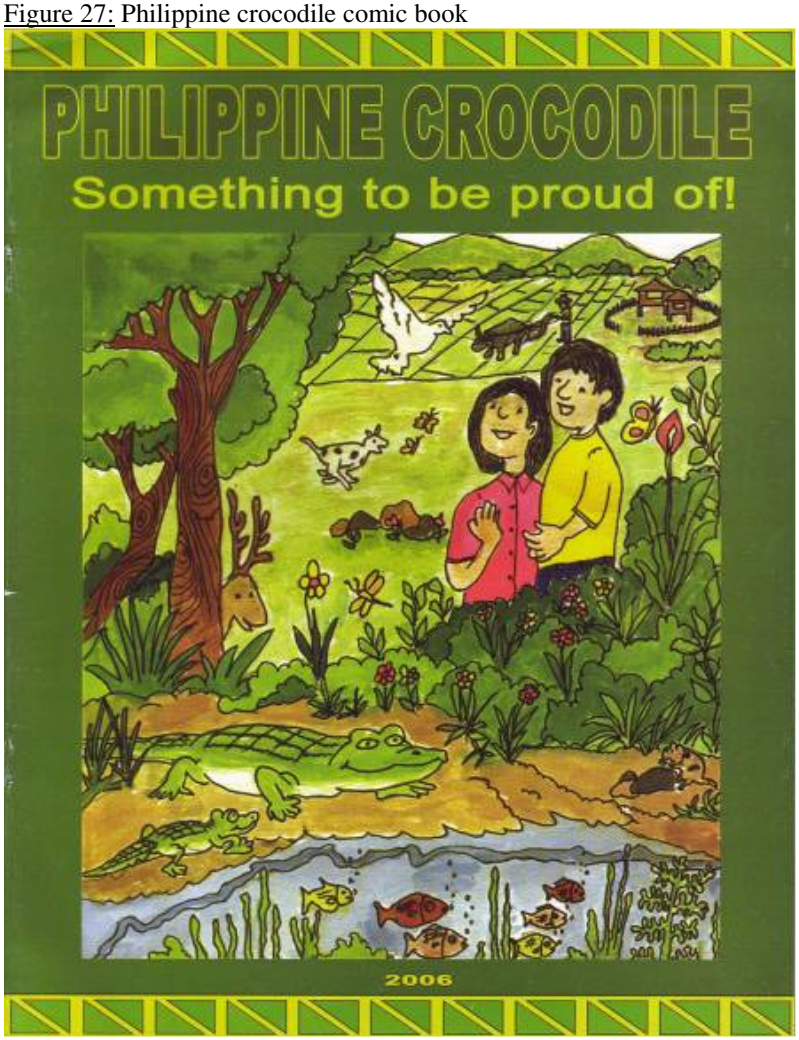
Figure 27: Philippine crocodile comic book



List of abbreviations

AFP	Armed Forces of the Philippines
ATI-RTC	Agricultural Training Institute-Regional Training Center
AZA	American Zoo Association
BFAR	Bureau of Fisheries and Aquatic Resources
BP	British Petroleum
BPCP	British Petroleum Conservation Program
BS	Bantay Sanktuwaryo
CAVAPPED	CAgayan VAlley Partners for Peoples Empowerment and Development
CDCAS	College of Development Communication Arts and Sciences
CEAE	Center for Environmental Awareness and Education
CENRO	Community Environment and Natural Resource Office
CEPA	Communication, Education and Public Awareness
CEPF	Critical Ecosystem Partnership Fund
CFEM	College of Forestry and Environmental Management
CI	Conservation International
CITES	Convention on International Trade in Endangered Species
CLUP	Comprehensive Land Use Plan
CML	Institute of Environmental Sciences
CPPI	Crocodylus Porosus Philippines Inc.
CROC	Crocodile Rehabilitation, Observance and Conservation
CSG	Crocodile Specialist Group
CVPED	Cagayan Valley Program, on Environment and Development
DA	Department of Agriculture
DENR	Department of Environment and Natural Resources
DEVCOM	DEVelopment COMmunication
EGP	Ecosystem Grant Program
FFI	Flora and Fauna International
GEF	Global Environmental Facility
ISU	Isabela State University
IUCN	World Conservation Union
IUCN-NL	IUCN National Committee of the Netherlands
LGU	Local Government Unit
MFI	Mabuwaya Foundation Inc.
NCIP	National Commission on Indigenous Peoples
NARRA	Native Advocacy for Rural Reconstruction and Agro-reforestation
NEDA	National Economic and Development Authority
NPA	New Peoples Army
NSMNP	Northern Sierra Madre Natural Park
NSMNP-CP	Northern Sierra Madre Natural Park-Conservation Project
NSMNWF	Northern Sierra Madre Wilderness Foundation
PAMB	Protected Area Management Board
PASu	Protected Area Superintendent
PAWB	Protected Areas and Wildlife Bureau
PAWS	Protected Areas and Wildlife Service

PD	Presidential Decree
PENRO	Provincial Environment and Natural Resource Office
PhP.	Philippine Peso
PNB	Philippine National Bank
PNP	Philippine National Police
PWRCC	Palawan Wildlife Rescue and Conservation Center
RA	Republic Act
SB	Sanguniang Bayan (municipal council)
SIAFDMPC	San Isidro Agro-forestry Developers Multi-purpose Cooperative
SK	Sanguniang Kabataan (youth council)
TK	Tanggol Kalikasan
USM	University of Southern Mindanao
WEO	Wildlife Enforcement Officer
WCS	Wildlife Conservation Society
WCSP	Wildlife Conservation Society of the Philippines
WWF	World Wildlife Fund
ZAA	Zoological Association of America

Box 8: A transition to sustainable land use: the NARRA project

Illegal logging and unsustainable land use are threatening the watersheds on which crocodiles and people depend. The Mabuwaya Foundation is assisting a farmers' cooperative, the San Isidro Agro-forestry Developers Multi-purpose Cooperative (SIAFDMPC), to reforest a denuded watershed in *sitio* San Isidro: the Native Advocacy for Rural Reconstruction and Agro-reforestation (NARRA). The NARRA project is funded by the Innovative Marketplace Program of the WorldBank and WWF-Philippines. Sixteen hectares were reforested with fruit trees (citrus, jackfruit, rambutan, etc) and timber trees (kamagong, molave, narra, etc). No exotic tree species were planted and existing vegetation was kept intact. Forestry students of Isabela State University assist the peoples' organization in the project (see paragraph 1.3.2). Despite serious setbacks (the delay in the issuance of a tenure instrument by DENR, and the forest fire that destroyed 8 hectares of the plantation in April 2007) the members of SIAFMPDC remain committed to the reforestation project. A caretaker is permanently staying in the plantation. The timber and fruit trees are growing, and in some areas already bear fruit. An adult Philippine crocodile, which was kept in the San José municipal holding pen for six years, was released in August 2006 in a small lake in the NARRA project. The NARRA project, located on a plateau between the Disulap River and Catalangan River watersheds, provides a direct link between local people's livelihoods and crocodile conservation.

Annex 1: CROC project publications

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Annex 2: CROC project presentations

Table 8 summarizes the oral and poster presentations given by the CROC project staff on crocodile conservation.

Table 8: Oral and poster presentations on Philippine crocodile conservation

Presenter	Title	Date	Event	Place
Jan van der Ploeg	Contested crocodiles? Philippine crocodile conservation, rural development and indigenous peoples' rights in the Northern Sierra Madre	April 2005	CVPED regional conference on environment and development	Cabagan, the Philippines
Sammy Telan	Poster presentation: The environment is not a crocodile: strengthening sustainable wetland management for the benefit of people and crocodiles in the municipality of San Mariano, Isabela	April 2005	WCSP	Tuguegarao, the Philippines
Bernard Tarun	Ecology and behavior of the Philippine crocodile (Crocodylus mindorensis) in the wild in Northeast Luzon, the Philippines	April 2005	WCSP	Tuguegarao, the Philippines
Jesse Guerrero	Updates on crocodile conservation in the Northern Sierra Madre Natural Park	August 2005	PAMB Northern Sierra Madre Natural Park	Divilacan, the Philippines
Merlijn van Weerd	An update of the Crocodile Rehabilitation, Observance and Conservation (CROC) project	August 2005	CML E&D Seminar	Leiden, the Netherlands
Jan van der Ploeg	An update of the Crocodile Rehabilitation, Observance and Conservation (CROC) project	November 2005	AFP 5 infantry division	Gamu, the Philippines
Marites Balbas	Illegal logging in the Northern Sierra Madre	December 2005	Greenpeace - Paradise Forest Push	Tokyo, Japan
Jan van der Ploeg	The Crocodile Rehabilitation, Observance and Conservation (CROC) project	January 2006	Kennismarkt Ontwikkelingslanden [in Dutch: knowledge market on developing countries for high school students]	Leiden, the Netherlands
Sammy Telan	Poster presentation: Philippine crocodile *Crocodylus mindorensis* behavior and ecology. Initial results of observation and telemetry studies on the Lake Dunoy sub-population in San Mariano, Luzon	April 2006	WCSP	Puerto Princesa, the Philippines
Merlijn van Weerd	Poster presentation: Philippine crocodile *Crocodylus mindorensis* conservation in Luzon. A wetland ecosystem approach to conserve	April 2006	WCSP	Puerto Princesa, the Philippines

	crocodiles, wetlands and wetland resources.			
Jan van der Ploeg	The environment is not a crocodile: community-based wetland and crocodile conservation offers a new future for the Philippine crocodile in the wild	June 2006	18th Meeting of the IUCN/SSC Crocodile Specialist Group	Montélimar, France
Dominic Rodriguez	Philippine crocodile conservation in NE Luzon: an update of population status and new insights into *Crocodylus mindorensis* ecology	June 2006	18th Meeting of the IUCN/SSC Crocodile Specialist Group	Montélimar, France
Merlijn van Weerd	Community-based conservation: what is it and how can it be useful for crocodilian conservation	June 2006	18th Meeting of the IUCN/SSC Crocodile Specialist Group	Montélimar, France
Jan van der Ploeg	The Crocodile Rehabilitation, Observance and Conservation (CROC) project	June 2006	Lecture in the course Environment and Social Change	Leiden, the Netherlands
Dominic Rodriguez	Philippine crocodile conservation in Northeast Luzon: an update of population status and new insights into *Crocodylus mindorensis* ecology	June 2006	CROC colloquium CML	Leiden, the Netherlands
Jan van der Ploeg	A paradigm shift in Philippine crocodile conservation?	June 2006	CROC colloquium CML	Leiden, the Netherlands
Merlijn van Weerd	The Crocodile Rehabilitation, Observance and Conservation (CROC) project	June 2006	CROC colloquium CML	Leiden, the Netherlands
Marites Balbas	Native Advocacy for Rural Reconstruction And Agroforestation (NARRA): A community-managed agroforestry project	July 2006	CVPED summer course	Cabagan, the Philippines
Jan van der Ploeg	Re-enforcement of *Crocodylus mindorensis*: the start of the recovery of the species in the wild?	August 2006	Press conference pilot release	San Mariano, the Philippines
Dominic Rodriguez	Crocodile Rehabilitation, Observance and Conservation (CROC) project	September	Comic book launching	San Mariano, the Philippines
Shyla Alejandro	A communication, education and public awareness campaign to conserve the Philippine crocodile	November 2006	National DEVCOM student conference	Los Baños, the Philippines
Marites Balbas	Crocodile Rehabilitation, Observance and Conservation (CROC) project	December 2006	IUCN-NL/GEF SGP workshop	Bali, Indonesia
Merlijn van Weerd	Crocodile conservation	December 2006	IUCN-NL	Amsterdam, the Netherlands
Jan van der Ploeg	Crocodile Rehabilitation, Observance and Conservation	December 2006	IUCN-NL	Amsterdam, the

	(CROC) project			Netherlands
Jerome Miranda	The role of the local government unit of San Mariano in Philippine crocodile conservation	February 2007	National forum on crocodiles in the Philippines	Manila, the Philippines
Merlijn van Weerd	In-situ Philippine crocodile conservation: experiences from northeast Luzon. International forum on crocodiles in the Philippines. Manila, Philippines	February 2007	National forum on crocodiles in the Philippines	Manila, the Philippines
Jan van der Ploeg	A cultural history of the Philippine crocodile. International forum on crocodiles in the Philippines. Manila, Philippines	February 2007	National forum on crocodiles in the Philippines	Manila, the Philippines
Myrna Cauilan-Cureg	Communication, Education and Public Awareness campaigns in support of Philippine crocodile conservation in Northeast Luzon.	February 2007	National forum on crocodiles in the Philippines	Manila, the Philippines
Restituta Antolin	Restocking the Philippine crocodile population in Dicatian Lake	February 2007	PAMB Northern Sierra Madre Natural Park	Cabagan, the Philippines
Bernard Tarun	Poster presentation: Conserving crocodiles by empowering local communities	April 2007	WCSP	Davao, the Philippines
Jan van der Ploeg	Community-based conservation in the Philippines: the Crocodile Rehabilitation, Observance and Conservation (CROC) project	May 2007	Lecture in the course Environment and Social Change (CML)	Leiden, the Netherlands
Merlijn van Weerd	Here be dragons: crocodile conservation in Southeast Asia. The Philippine crocodile: from symbol of evil to source of pride.	June 2007	IIAS symposium: Caring for the environment: the role of religion and identity in Southeast Asia	Leiden, the Netherlands
Merlijn van Weerd	Recovery of the critically endangered Philippine crocodile *Crocodylus mindorensis* through community-based conservation	June 2007	Society for Conservation Biology Meeting	Port Elizabeth, South Africa
Jan van der Ploeg	The relationship between biodiversity conservation, poverty alleviation and indigenous people	November 2007	UNESCO-MAB regional meeting	Maolan, Guizhou China
Jan van der Ploeg	Community-based conservation in the Philippines: the Crocodile Rehabilitation, Observance and Conservation (CROC) project	November 2007	East China Normal University	Shanghai, China
Merlijn van Weerd	Applied Multidisciplinary Science as a basis for conservation of the Philippine crocodile	November 2007	Spotlight Seminar Biology	Leiden, the Netherlands

Jan van der Ploeg	Community-based conservation in the Philippines: the Crocodile Rehabilitation, Observance and Conservation (CROC) project	December 2007	Lecture in the course Developmental problems (CA-SNWS)	Leiden, the Netherlands
Jan van der Ploeg	Creating space for crocodiles: environmental governance in the Philippines	December 2007	Lecture in the course South-east Asia: contested identities and political experiments	Amsterdam, the Netherlands

Annex 3: Press coverage

To disseminate the results of the CROC project, the team maintains close contacts with the media. For specific activities (for example the release of crocodiles) journalists are invited. Bombo Radyo, a regional radio station based in Cauayan, has frequently reported on the CROC project. ABS-CBN and GMA7, the 2 main TV-networks of the Philippines have featured the CROC project (the release of Margie and Isabela on August 2006 and August 2007).

The Center of Environment Awareness Education (CEAE) made a documentary on biodiversity conservation in the Philippines, in which the CROC project was highlighted. The CROC team accompanied the film crew to the field on 11-21 July 2006. The première of the CEAE documentary was held last 17 April 2007 in Makati City.

The CROC project was featured on the website of CEPF (see figure 30) and on the website of the GEF. Several newspapers and websites have reported on the CROC project (see below), including an article on the front-page of the Philippine Star, the 3rd largest newspaper in the Philippines (Lagasca 2007).

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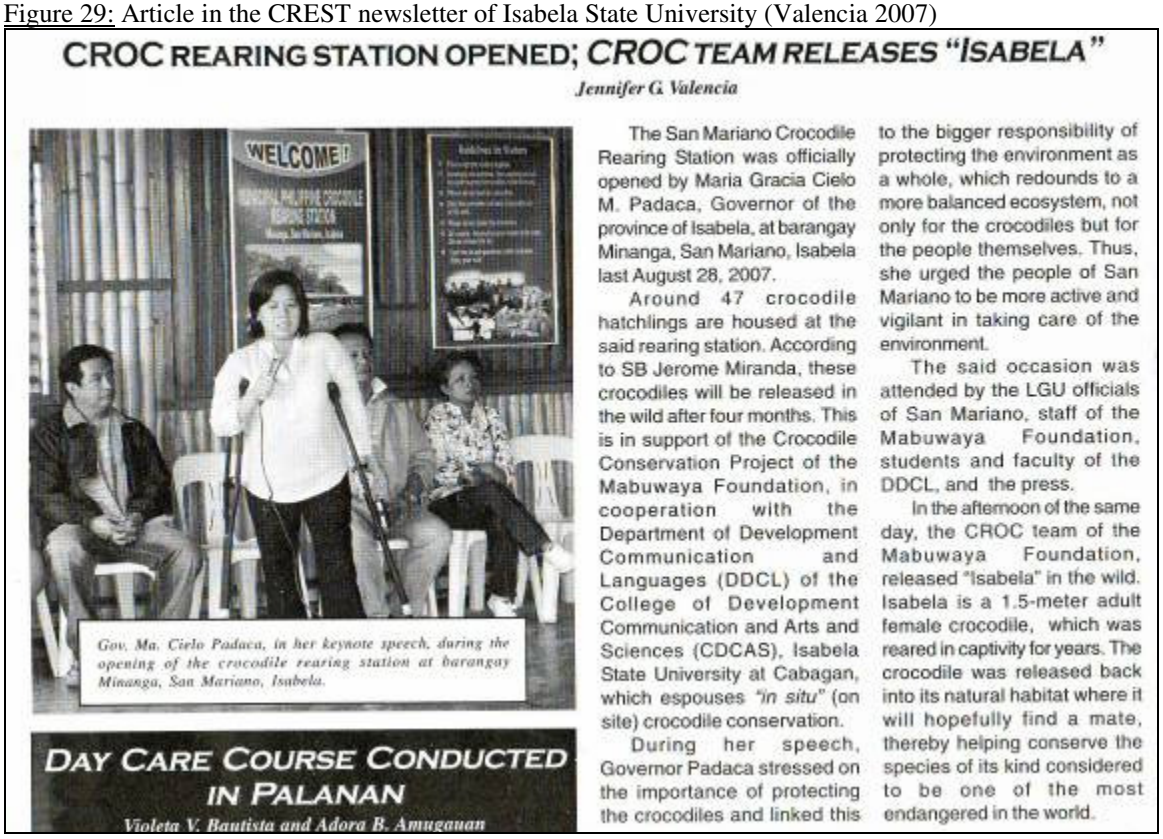
Figure 28: The official opening of the municipal Philippine crocodile rearing station in San Mariano. From left to right: Dr. Robert Araño, *Sanguniang Bayan* member Jerome Miranda, Mayor Edgar Go, Governor Grace C. Padaca, *Sanguniang Panlalawigan* member Anna Go, staff members of the Provincial Environment and Natural Resource Office and students of the Bitun cultural group of ISU San Mariano (Rodriguez 2007).

Figure 29: Article in the CREST newsletter of Isabela State University (Valencia 2007)



CROC REARING STATION OPENED; CROC TEAM RELEASES "ISABELA"

Jennifer G. Valencia

Gov. Ma. Cielo Padaca, in her keynote speech, during the opening of the crocodile rearing station at barangay Minanga, San Mariano, Isabela.

The San Mariano Crocodile Rearing Station was officially opened by Maria Gracia Cielo M. Padaca, Governor of the province of Isabela, at barangay Minanga, San Mariano, Isabela last August 28, 2007.

Around 47 crocodile hatchlings are housed at the said rearing station. According to SB Jerome Miranda, these crocodiles will be released in the wild after four months. This is in support of the Crocodile Conservation Project of the Mabuwaya Foundation, in cooperation with the Department of Development Communication and Languages (DDCL) of the College of Development Communication and Arts and Sciences (CDCAS), Isabela State University at Cabagan, which espouses *"in situ"* (on site) crocodile conservation.

During her speech, Governor Padaca stressed on the importance of protecting the crocodiles and linked this to the bigger responsibility of protecting the environment as a whole, which redounds to a more balanced ecosystem, not only for the crocodiles but for the people themselves. Thus, she urged the people of San Mariano to be more active and vigilant in taking care of the environment.

The said occasion was attended by the LGU officials of San Mariano, staff of the Mabuwaya Foundation, students and faculty of the DDCL, and the press.

In the afternoon of the same day, the CROC team of the Mabuwaya Foundation, released "Isabela" in the wild. Isabela is a 1.5-meter adult female crocodile, which was reared in captivity for years. The crocodile was released back into its natural habitat where it will hopefully find a mate, thereby helping conserve the species of its kind considered to be one of the most endangered in the world.

DAY CARE COURSE CONDUCTED IN PALANAN

Violeta V. Bautista and Adora B. Amugauan

Figure 30: Article on the CROC project on the CEPF website