

## Final Report

# Phoenix Zoo Conservation and Science Grant Head-starting students: Involving local students in studies to improve Philippine crocodile head-starting



**Amount awarded:** \$ 3000  
**Project period:** April – November 2010  
**Project Location:** San Mariano, Isabela province, Philippines  
**Primary Investigator:** Dominic Rodriguez  
**Organization Affiliation:** Mabuwaya Foundation, Inc.  
**Address:** EIC building, Isabela State University Campus, Cabagan, Isabela  
**Phone:** +63 (0) 78 622 8001  
**Email:** [Mabuwaya@yahoo.com](mailto:Mabuwaya@yahoo.com)  
**Project web page** [www.mabuwaya.org](http://www.mabuwaya.org)



Mabuwaya Foundation  
January 2011

## Foreword

In February 2010 a terrible and unexpected event happened; a Philippine crocodile attacked a person, the first ever recorded attack of this species on a human being. Of course this had many consequences. The attack happened in the village of Lumalug, where the release of head-started juveniles was planned. This release was temporarily postponed, though by now we have new plans for the release in 2011 as the community has not stopped supporting the project. Fieldwork priorities, however, have shifted.

Since reports over the radio mentioned, falsely, that the attack was done by one of our head-started crocodiles, and because of the necessity of studying the attacks of crocodiles on livestock, we sponsored a student to go to the field sites and record all instances of human-crocodile conflict. The planned study comparing growth rates in the rearing station and in the wild was slightly changed. Additionally, with the money we did not spend on the release of head-started crocodiles, we sponsored nine students of Veterinary Medicine to do a study at the rearing station. The planned study of Development Communication at the rearing station has been finished as planned, though their graduation has been postponed due to a heavy typhoon that raged through the area in October. As the focus of our project has remained research, we are confident that you will agree with these minor changes. Best regards,



Dominic Rodriguez  
January 2011

## **Contents**

<b><i>Introduction</i></b>	<b>4</b>
<b><i>Research</i></b>	<b>5</b>
* <i>Visitors evaluation of the rearing station</i>	5
* <i>Rearing strategies in captivity and in the wild</i>	6
* <i>Human-crocodile conflicts</i>	7
* <i>Crocodile caretaking</i>	8
<b><i>Conclusion</i></b>	<b>9</b>
<b><i>Budget</i></b>	<b>10</b>
<b><i>Photo-pages</i></b>	<b>11</b>

## Introduction

The endemic Philippine crocodile *Crocodylus mindorensis* is the most severely endangered crocodylian on the planet with an estimated wild population of less than 100 mature individuals (Ross 1998). It is critically endangered (IUCN 2010) and is the top priority species for conservation action for the IUCN Crocodile Specialist Group (Ross 1998). A small remnant population of 10 adults was discovered in 1999 in the municipality of San Mariano, Isabela Province, northeast Luzon (Van Weerd and Van der Ploeg 2003). A grassroots conservation project was started and institutionalized as the Mabuwaya Foundation in 2003 (Mabuwaya is a contraction of the words 'mabuhay' = long live and 'buwaya' = crocodile).

Despite effective conservation resulting in a complete stop of crocodile killings, the establishment of crocodile sanctuaries and increased awareness amongst local communities, the recovery of the Philippine crocodile population is a slow process. Hatchling mortality is high in crocodiles, and especially in San Mariano, where most of the suitable nesting and hatchling habitat (nursery pools and small creeks) has been converted into rice fields. The result is that crocodiles nest next to fast flowing rivers and hatchlings are consequently washed away.

A head-start program was initiated in 2005, collecting hatchlings and raising them in captivity for 14 - 18 months in a rearing station before releasing them back into the wild (Van Weerd and Van der Ploeg 2008). The Municipal Philippine Crocodile Rearing Station doubles as a crocodile information centre that attracts hundreds of visitors every year. Since 2005, 141 hatchlings have been collected of which 112 have survived (79%). Forty nine have been released back into the wild with another 33 to be released in 2011. Crocodiles are released in improved habitats, such as small constructed ponds in crocodile sanctuaries. Initial monitoring results show that adaptation of released crocodiles is generally good.

In this project we continued monitoring of released crocodiles through field surveys and recapturing to determine the most effective release strategies. In addition we studied two rearing strategies at the station: one using individual crocodile tanks and the second using a soft release pond. Local sanctuary guards (Bantay Sanctuwarayo, deputized and salaried by municipal government) were involved in fieldwork activities with recapturing and human-crocodile conflict studies.

A second component of this small project was to improve the effectiveness of the rearing station as a visitors centre. Communication students of ISU conducted an interview study among visitors to determine how the rearing station could be improved to fulfill local information needs. Veterinary Medicine students studied the rearing station to look for possible improvements in the housing and general caretaking of the crocodiles.

## Research

A total of 14 students were involved in these studies, of which 12 were Bachelor students and 2 master students. All, except for one, students were from the local Isabela State University (ISU), from 2 different campuses; Cabagan and Echague. One was an international student from the Netherlands. For details see the table below.

**Table 1: Students involved in the Phoenix Zoo project 2010**

Name	Course	University*	Topic
Rex Mahabague	Development Communication	ISU-C	Information facilities rearing
Mary Jane Malsi	Development Communication	ISU-C	Information facilities rearing
Rodolpho Baui	Development Communication	ISU-C	Information facilities rearing
Sam Telan	MSc. Environmental Studies	ISU-C	Rearing strategies
Femke Koopmans	MSc. Forest and Nature Conservation	WUR	Human-crocodile conflicts
Christopher de la Cruz	Veterinary Medicine	ISU-E	Crocodile caretaking
Cecilia Raymundo	Veterinary Medicine	ISU-E	Crocodile caretaking
Winston Saet	Veterinary Medicine	ISU-E	Crocodile caretaking
Krista Mae Damian	Veterinary Medicine	ISU-E	Crocodile caretaking
Jan Kenneth Castro	Veterinary Medicine	ISU-E	Crocodile caretaking
Brandon Acoba	Veterinary Medicine	ISU-E	Crocodile caretaking
Jobelle Patriarca	Veterinary Medicine	ISU-E	Crocodile caretaking
Herman Mago III	Veterinary Medicine	ISU-E	Crocodile caretaking
Mark Anthony Sadang	Veterinary Medicine	ISU-E	Crocodile caretaking

\* ISU = Isabela State University, C = Cabagan and E = Echague campuses, WUR = Wageningen University (Netherlands)

### Visitors evaluation of the information services offered and the Municipal Philippine Crocodile Rearing Station

*The study below was done by three bachelor students of Development Communication. The following are excerpts from their draft thesis. The full report is expected to be finalized in April 2011, when they will defend their thesis and graduate.*

This study tried to evaluate the information services offered at the Municipal Philippine Crocodile Rearing Station which will serve as basis for improving the information facilities and services offered at the MPCRS. In assessing the perceived usefulness of the different information materials, facilities and services as well as in gathering feedback about the possible ways to generate funds for improving these services, a self-administered questionnaire cum interview guide was used among the visitors who came to visit the rearing station in the year 2010 and were chosen as respondents using quota sampling.

The four-page questionnaire probed into the respondents' socio-demographic profile, background information about their purpose for the visit, their background knowledge and attitude about the Philippine crocodile, their perceived usefulness and evaluation of the facilities and services, their opinion, preferences and suggestions about fees, souvenirs and donation, which may be implemented to help improve the delivery of the information and services offered. Data were presented and analyzed using frequencies and percentages.

Most of the 108 respondents, mostly teenagers, came from the municipality of San Mariano where the rearing station is situated, and all came from Isabela province. In general the visitors to the rearing station visited the rearing station to see the real life crocodiles, after hearing about them through the Mabuwaya Foundation posters or other information materials.

A five point Likert Scale was used in evaluating the performance and quality of services and facilities in the MPCRS. Results of the evaluation of the information facilities revealed an average rating of 4.25 (very good), the other facilities, such as comfort room and landscaping, as 3.88 (good). The information materials, storybooks, t-shirts etc., had an overall rating of 4.06 which is again 'very good'. Information services, such as taking a picture with the crocodiles and the tour, averaged highest with 4.46.

The most common complaint/item for improvement, was the heat inside the building, which is kept high to facilitate the crocodiles. Other suggestions were the selling of pictures with visitors and crocodiles, a small entrance fee, and souvenirs such as key chains etc, which would cost less than 50 pesos.

### Rearing strategies in captivity and in the wild

*Sammy is a master student of Environmental Sciences, but he is also staff of the Mabuwaya Foundation. In this framework, he is involved in the ongoing research to the effectiveness of reintroduction of the Philippine crocodile. The following are part of the findings of his study, together with other staff of the foundation.*

Since 2005, 49 head-started juveniles have been released in the wild. Since 2008, every year a recapture effort is done to try and determine survival rates of these crocodiles. At recapture, the crocodiles are also measured to determine growth rates. By comparing data from different release sites and strategies, the optimal release strategy is determined. In August 2010, 10 juvenile crocodiles were housed in a soft-release pond, outside the rearing station. These individuals will hopefully have a better chance of survival after they will be released in the wild, as they have been able to practice hunting and social skills in a risk free environment.

As can be seen in table 1, all 10 individuals in the soft-release ponds outside the rearing station have survived for the 103 days they were there. All gained weight and all grew in length. We can therefore call this project a success; the crocodiles managed to live together without fatal injuries due to fighting, and they all managed to obtain foods to grow. However these juveniles have not been released in the wild yet, so eventual improvements in survival rate will have to be studied in the future.

**Table 1: Measurements of growth if individuals reared in the soft-release pond**

Code	Date measured	Weight (g)	Total Length	Date measured	Weight (g)	Total Length	Difference weight	Difference Length
1309	20-Aug-10	690	58.8	1-Dec-10	860	64.4	+170	+5.6
1311	20-Aug-10	580	56.3	1-Dec-10	1010	67.2	+430	+10.9
1312	20-Aug-10	600	58.1	1-Dec-10	960	67.1	+360	+9.0
1314	20-Aug-10	640	59.0	1-Dec-10	950	66.8	+310	+7.8
1316	20-Aug-10	590	57.9	1-Dec-10	1020	68.5	+430	+10.6
1317	20-Aug-10	640	58.7	1-Dec-10	920	65.5	+280	+6.8
1320	20-Aug-10	530	56.4	1-Dec-10	790	64.5	+260	+8.1
1321	20-Aug-10	570	57.3	1-Dec-10	710	62.6	+140	+5.3
1333	20-Aug-10	710	60.8	1-Dec-10	1150	70.3	+440	+9.5
1334	20-Aug-10	610	57.5	1-Dec-10	960	66.7	+350	+9.2
<b>Averages:</b>		616	58.08		933	66.36	+317	+8.3

Previously released head-started juveniles were also recaptured, in June of this year. The oldest head/started juveniles that were caught are around 4 years old. As can be seen in figure 1, the growth rates do not differ much between the different strategies in the long run. Crocodiles that

were hand raised (first batch, when the rearing station did not exist yet) grew much more rapidly because they were given lots of individual attention; there were only 4 individuals. Later batches, however, were usually with around 30 individuals and were reared in specially designed holding tanks. Different strategies after release in the wild (after 18 months) were tried; soft-release in the wild (a fishpond with additional feeding for the first 4 months) or just hard-release (no special treatment). In the end it does not seem to make much difference. Also the 10 individuals that were soft-released in the ponds outside the rearing station were added in this graph, they are intermediate regarding length compared to the other strategies. However, recapture data is scarce, so there might well be effects on survival rate that are as of this moment hard to measure. Yearly recapturing in coming years will likely give more information.

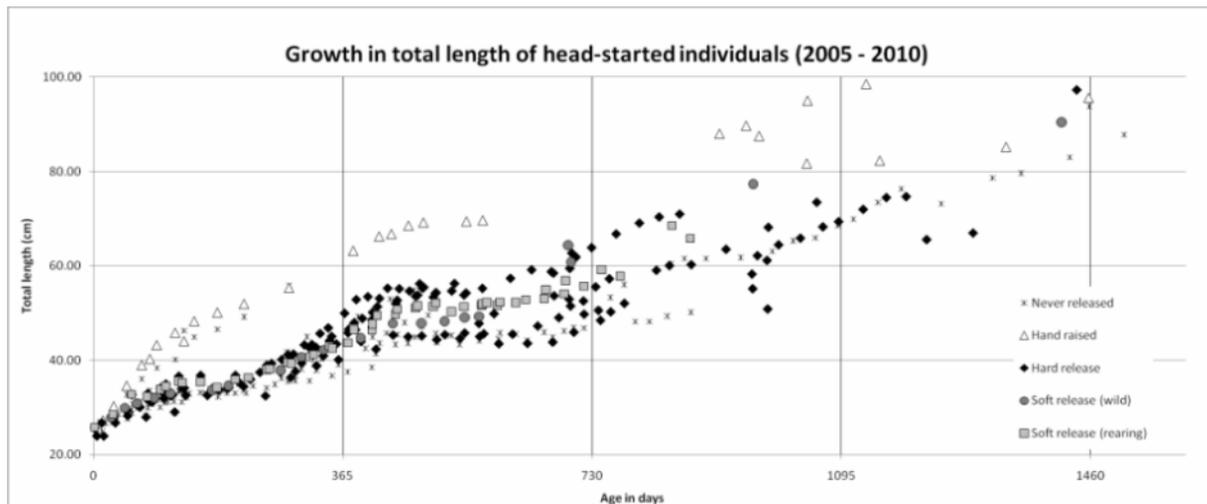


Figure 1: Growth rates of head-started Philippine crocodiles

### Human-crocodile conflicts

*The study below was done by a master student in Forest and Nature Conservation. The following are excerpts from her preliminary findings. She is now in the process of writing her thesis, which is expected to finish in the spring of 2011.*

In this study a total of 133 conflicting situations were recorded. Most cases involved small livestock such as chicken and ducks. Also dogs and pigs were attacked by crocodiles, fish were taken out of fishponds and fishing gears were damaged. Moreover, in February 2010 a lady was attacked and in September of the same year a fisherman.

In most of the cases the conflict took place at night or at dusk in or in proximity of water. Of the 133 cases, 89 domestic animals were killed and in the case of fishing gear totally destroyed. The costs suffered by these losses were classified by respondents as high or low, according to their income and personal estimation. Out of the 113 cases of which people could give an indication of the loss they suffered, 49 attacks were classified as big loss. If this would be expressed in monetary units, small losses were chicken and ducks, worth up to a few hundred pesos. Big losses were dogs, pigs and fishing nets, worth up to 3.000 pesos.

There are a few causal factors of the conflicts such as the intense use of rivers and other water bodies by people in some locations. In these places there is a lot of potential contact between people, their animals and fishing gear and crocodiles which live in the same area. Also the housing of livestock seems to play a role. Most animals are free roaming and move to water bodies where they are attacked by crocodiles. Even when animals are on a rope, such as pigs, they seem an easy prey for crocodiles which will even come close to the houses to grab them.

As one of the possible causal factors is the intense use of water bodies, increased awareness is needed among local people on how to use the rivers properly and possible dangers. Moreover they should be supported in improving the housing of their livestock. Another solution is when people say that losing an animal to a crocodile is 'part of the game' since these animals share their habitat with people and livestock. Financial compensation of losses does not seem to be a proper solution, as people might misuse this by claiming that their animal was eaten by a crocodile while in fact it was not. In some locations the placement of small stretches of fence lines might be a good solution because it will give people a secure feeling and might reduce conflicts on places where people cross crocodile habitat.

Future research is recommended on the influence of the head-start program on the behavior of crocodiles. It is not yet clear to what extent crocodiles lose their natural fear to humans or even associate humans with food after being raised in captivity. This information is very important in order to reduce human- crocodile conflicts in the future. Not only by having better insight in possible relations between captive raised crocodiles and conflicts, but also for education purposes to the local community about these animals and to improve the head-start program.

### **Crocodile Caretaking**

*In September 2010, nine students in Veterinary Medicine (last year) did part of their internship at the Municipal Philippine Crocodile Rearing Station. They joined in the general maintenance of the facility and talked at length with the caretaker, the information officer and the staff of the Mabuwaya Foundation in charge of the facility. They also helped in the monthly measuring of the juveniles, and cutting of the scutes of the new hatchlings, which arrived at the station from June to August. The internship is still ongoing in other facilities where animals are reared and therefore a draft thesis is not yet available.*

## Conclusion

How has this research helped the Philippine crocodile? Research to this species is immensely important as it is the only population of this critically endangered species that is being studied. All results will be directly used for improved conservation action.

Our information and awareness raising campaigns have been very successful in almost completely stopping crocodile killings from happening in the municipality of San Mariano. However recovery of this species is slow. The crocodile strategy is to lay many eggs of which only few would make it to adulthood to start reproducing on their own. By head-starting the animals, we greatly increase these chances of survival. Of course, the more successful the head-start program is, the faster the Philippine crocodile can recover and become a self-sustaining resilient population once again. This includes both the strategies with which we rear the crocodiles in the rearing station as the strategies of releasing them in the wild, both of which have been studied during this project.

The results of the DevCom study will give valuable insights in the level of awareness that the general population of San Mariano has. But these are often not the ones actually living with the crocodiles in the wild.

Besides that, improving our information facilities, and especially the income generating projects, will make the project more sustainable, as it is not possible every year to find funding for the head-start program.

With the slowly growing crocodile population, human-crocodile conflicts will be more common as time goes by. Knowing the underlying causes and possible solutions for prevention or mitigation are of course valuable in maintaining support for crocodile and wetland conservation in the areas where Philippine crocodiles still live today.

## Budget

Received in Philippine pesos: \$3000 - \$1.5 bank charge= \$2998.50\*45 = 134,932.50

<b>Item</b>	<b>Cost PhP</b>
Fieldwork at the rearing station (Evaluation of the information services & Crocodile caretaking)	28,028.00
Fieldwork in the wild (Human-crocodile conflicts & Rearing strategies)	39,984.60
Field equipment, materials and supplies	42,950.00
Office supplies	26,492.00
<b>Total</b>	<b>137,454.60</b>
Budget	134,932.50
<b>Balance</b>	<b>-2,522.10</b>

## Photo-pages

### *Development Communication*



DevCom students interviewing visitors to the rearing station, in this case elementary school children

### *Environmental Sciences*



Student recapturing head-started juveniles in the wild (right) together with the sanctuary guards (left)



New nesting site discovered during surveys



Recapturing in the soft release ponds

**Forest and Nature Conservation**



Student interviewing person who's livestock was attacked and the damage done by crocodiles to a fishing net



Respondents sorting species, including crocodile but also rat and toad etc, according to how big a problem they are



Respondent showing his prevention strategy: blockade so crocodiles will not go into his rice field

**Veterinary Medicine**



VetMed students measuring hatchlings (left)



cutting scutes to encode them (right)