

EARTHWATCH INSTITUTE ANNUAL FIELD REPORT

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Period covered by this report: Sep 2007 to Dec 2008

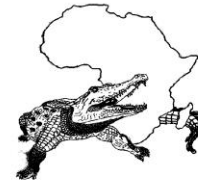
Project title: Conservation Ecology of the Nile crocodile, and community environmental education in the Middle Zambezi River, Zambia.

Cover letter to volunteers

**Dept Conservation Ecology
& Entomology**



Zambezi Crocodile Research



**UNIVERSITY OF STELLENBOSCH
FACULTY OF AGRISCIENCES**

Dept Conservation Ecology &
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Dear Intrepid Volunteers.....

Another year in the life of the Zambezi Crocodile Research team has come and gone...and it sure went quickly! So....what were some of this year's highlights?

All 28 of you contributed to the success of the first year of this project. With your help we managed to successfully capture-mark and release 347 crocodiles of various size classes, and no-one was bitten in the process! A huge quantity of unique, scientific data was gathered in the process, a first for the Zambezi Valley. We successfully translocated two crocodiles that would surely have been shot. We visited numerous schools contributing essential school items that you yourselves donated, and no one can forget the smile that puts on the kids faces. We produced two television documentaries that show crocodiles as the beautiful creatures they actually are. We established rapport with many wildlife rangers, both in Zimbabwe and Zambia, sharing expertise and experiences. And much, much more....

Without your help we would not have been able to accomplish any of this. Many, many thanks for your fantastic support and continued enthusiasm. I can assure you that it goes a very long way in an isolated valley in Africa!

Hope to see you all again sometime soon.

Sincerely,



Alison J. Leslie
Principal Investigator and the rest of the research team.

Reporting on research objectives

Objective 1: POPULATION ECOLOGY STUDY

1. Capture-Mark-Recapture

The area surveyed extends from the eastern boundary of the Lower Zambezi National Park (LZNP) to 10kms upstream of the town of Chirundu, including the first 45km of the Kafue River (Figure 1). Navigational problems, including submerged obstacles, extensive shallows and curious hippos have limited the surveys within the LZNP and Mana Pools National Park. The most intensively surveyed sections of the study site, thus far, includes the Zambian Chiawa Game Management Area (GMA), followed by Zimbabwe's Hurungwe Safari Area (SA), Zambia's Lower Zambezi National Park and Zimbabwe's Mana Pools National Park. In 2009 we plan to increase our research efforts in Mana Pools National Park, in the Sapi SA, the LZNP and the Rufunsa GMA.

Between September 2007 to December 2008, 347 crocodiles were caught in the Lower Zambezi Valley including 24 recaptures. Eighty-four percent of the crocodiles were caught on the Zambian side of the River and 16% along the Zimbabwean bank with an even overall sex ratio of 53.8 % male and 46.2% female (Figure 2). The sex of 22 crocodiles of the yearling size class was undetermined due to their small size. The bias to the Zambian side of the river is due to logistical reasons. Crocodiles that were not caught were also recorded as sightings. 1175 sightings were recorded throughout the year, size was estimated (7x the length of the head) and the GPS co-ordinates, date and time recorded as well as distance from the boat when the crocodile submerged. When a crocodile submerged before the observer could estimate the size, the sighting was recorded as 'eyes-only', 33.2% of the total sightings. Many studies have shown that capture rates decreased with an increase in crocodile body size and is certainly not due to a lack of effort on the part of the capture team. Possible reasons could be that the area has been exploited by both crocodile hunters and farmers; therefore it is quite possible that the majority of the adult crocodiles that remain have learned that to avoid a spotlight is to survive. The capture rate of those animals that were approachable (excluding 'eyes-only' category) was 47.3% for yearlings, 31.9% for juveniles, 18.4% for sub-adults and 1.9% for adults giving an overall mean capture rate of 24.9%.

We are now including day-light surveys, conducted during peak crocodile basking times, attempting to photograph a portion of each crocodile's tail. The tail markings are then entered into a database for possible future matching. Crocodiles have a tail pattern unique to each individual (a type of "finger print") and re-sightings of these animals are included in the population ecology study. Photographs 1 and 2 show the initial capture of a crocodile with the identification of number 1235, and then a re-sighting of the same crocodile a month later, which was photographed close to the original site of capture.

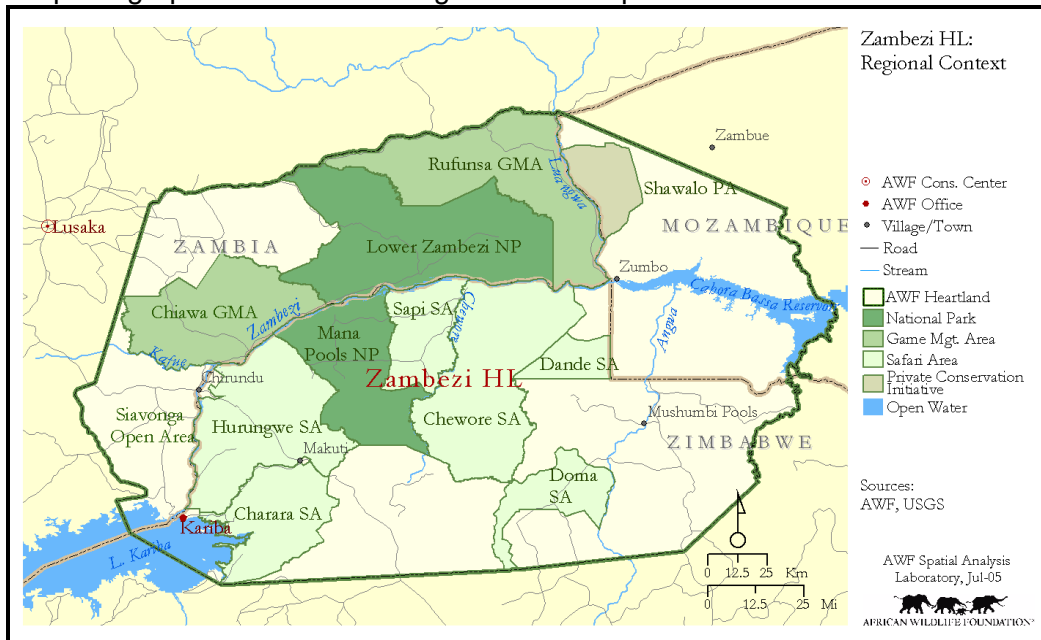


Figure 1. The Zambezi Crocodile Research study area within the Zambezi Heartland.

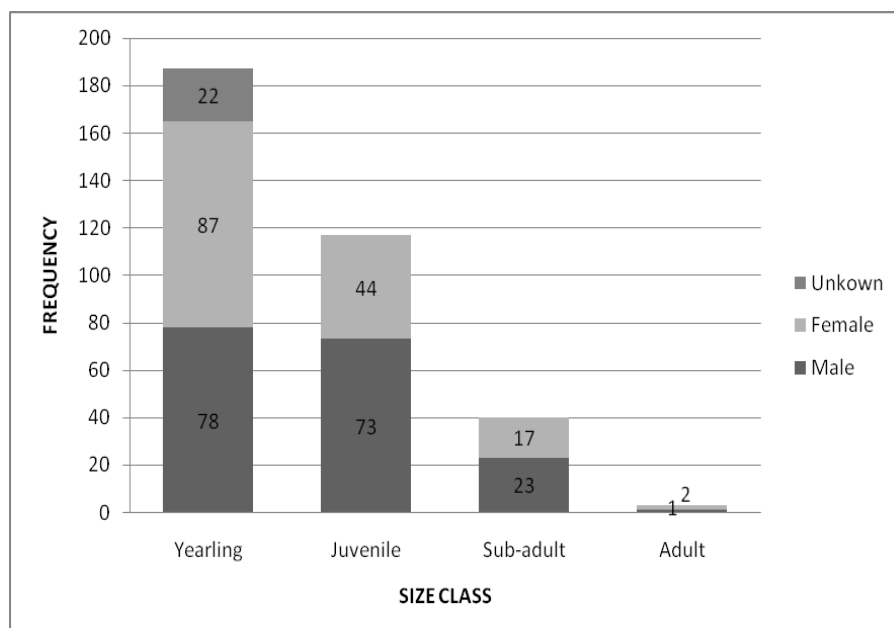


Figure 2. Total numbers, size classes and sex ratio of crocodiles captured from September 2007 to December 2008.



Photograph 1 of crocodile ID 1235 captured 04/09/2008, prior to cutting the scutes for future identification.



Photograph 2 of crocodile ID 1235 taken on 03/10/2008. The fourth single scute on the tail that has been cut denotes the number 30. Although the remaining cut scutes that denote the rest of the unique ID number cannot be seen, the tail markings are identical to those in photograph 1.

2. Nesting Surveys

Various crocodile farmers have a quota to collect both crocodile eggs and adult crocodiles for farms in Zambia, and crocodile eggs for farms in Zimbabwe. We are working with wildlife officials in both countries in order to collect GPS data on nest sites, as well as estimated sizes of the breeding adults and the number of eggs removed from the system. This data will assist us in estimating the size of the breeding segment of the population.

3. Aerial surveys

Due to financial constraints we have not yet been able to undertake any aerial surveys. We hope that this situation will change in the near future.

4. Radio Telemetry

Three adult crocodiles were caught in November and December 2007, and fitted with radio transmitters. A limited amount of tracking data was obtained from one male (3.1m) for the month of December 2007, and from February to March 2008. Unfortunately we have still been unable to locate either of the females (2.3 and 3.0m) since their release. Possible

reasons for this is either transmitter failure or the crocodiles have moved beyond range of the VHF telemetry equipment.

5. Reproductive cycles

Blood and urine samples have been collected from the majority of captured crocodiles, however the capture of adults has not been successful and adult blood samples are required for this study. The animals are extremely skittish and wary of humans which makes capture difficult. We are also unable to use baited traps on either of the river banks for fear of catching various other dangerous wildlife species such as lion, hyena, leopard etc. However, with time we may catch enough adults for this study.

6. Population genetics

We have thus far collected over 300 blood and scute samples and will continue to do so for the duration of the project. Samples are currently being stored and a sub-sample will later be selected for further analysis at Stellenbosch University.

Objective 2: TO DETERMINE THE HEALTH STATUS OF THE CROCODILE POPULATION AND PROVIDE INFORMATION ON CROCODILIAN PARASITES

We have collected numerous blood and urine samples for this study and we have removed a number of leeches from crocodiles. These samples are currently being stored for further analysis. We will continue collecting samples for the duration of the study.

Objective 3: TO DETERMINE THE EXTENT OF THE HUMAN/CROCODILE CONFLICT (HCC) WITHIN THE ZAMBEZI HEARTLAND REGION AND TO PROVIDE ELEMENTS OF A LONGTERM SOLUTION TO THIS CRITICAL PROBLEM.

This study will commence in March 2009. We will use voluntary participation for structured interviews in villages and towns, as well as obtaining government information including population census statistics, records from clinics, hospitals and police stations, Zambia Wildlife Authority (ZAWA) reports that are routinely collected and any information for members of the crocodile farmers association, in order to quantify the social and economic impact of HCC. Part of the obligations of our research permit (issued by ZAWA) is a Human Crocodile Conflict study. ZAWA officials are fully aware of our project and we are expecting a reasonable degree of co-operation. Data will include personal information, date, time, location, severity and consequences of the attack with the opportunity for suggestions on the part of stakeholders, detailing both human and livestock incidents. Over the past year we have formed close links with the local communities, wildlife organisations and the crocodile farmers association and it is hoped that this will increase co-operation and reduce the amount of bias that is inherent in such a survey. The first interviewee will be HRH The Princess in Chiawa village. At each subsequent village we shall first obtain permission from the headman and offer him the first interview followed by the elders. This is a matter of protocol and will be adhered to and with their participation it will be easier to interview the locals in the village. After this, households will be selected at random. Data collected will be analyzed both spatially and temporally based on attacks comparing trends between gender and age classes as well as identifying major factors contributing to attacks. This data will be used to show attacks over time, correlated to human and crocodile population density and changes. Mapping the spatial data can be achieved using ArcView (a [Geographic Information System](#) software product).

Objective 4: EDUCATION: TO BUILD CAPACITY BY DEVELOPING LOCAL EXPERTISE AND BY PROVIDING A UNIQUE OPPORTUNITY FOR COLLABORATION BETWEEN AFRICAN SCIENTISTS.

As a research team we understand the necessity of education within conservation and during the year we were involved with the education and leadership programme which is in place at WildTracks Lodge. We gave a power-point presentation about the importance of crocodiles in the ecosystem to students from Lake Road School in Lusaka in August, which also included two game viewing road trips to the Lower Zambezi National Park. During October a similar presentation was given to learners from Simba School in Ndola and a presentation was also given to members of the Lusaka Scout group that were visiting Kwalata Lodge in October. A number of local village schools were also visited during the course of the year and Earthwatch volunteers assisted with the games programme. In addition to the schools education programme, we have also visited many lodges on the Zambian side of the Zambezi River. These visits have primarily been to inform the lodge owners and staff about the research project. We distribute pamphlets about the project and we have also offered to return to lodges and to give informal seminars if enough interest is shown by lodge clients and/or local guides and staff.

We contributed to two television documentaries during the reporting period. The first was a production for an Italian film crew (Missione Natura) and the second production was with an Australian film crew for the Discovery Channel.

We have unfortunately not been successful in recruiting any Zambian students. This was also the case in Botswana and is no doubt due to the general fear of crocodiles as a species.

Objective 5: TO PROVIDE SCIENTIFIC EXPERTISE AND DETAILED BIOLOGICAL INFORMATION TO ASSIST CROCODILE FARMERS IN ZAMBIA, ZIMBABWE AND MOZAMBIQUE.

This objective will be met upon completion of the project,

Objective 6: TO HIGHLIGHT CONSERVATION IMPLICATIONS AND TO PROVIDE MANAGEMENT RECOMMENDATIONS TO THE ZAMBIA WILDLIFE AUTHORITY, THE ZIMBABWE PARKS AND WILDLIFE MANAGEMENT AUTHORITY AND TO THE MOZAMBIQUE AUTHORITIES (DNFFB & TCHUMA TCHATO).

This objective will be met upon completion of the project,

Non-technical summary of results

How do these data contribute to achieving conservation impacts? (e.g. actions based on results, management plans, site protection).

Numerous impacts are envisioned:

1. A better understanding of a keystone species in the unique middle Zambezi ecosystem
2. A contribution to a concise conservation strategy and management plan
3. Crocodile / human conflict will be determined and resolutions proposed
4. The development of a sustainable utilisation programme
5. The potential of crocodiles as an increased tourist attraction will be investigated

6. Crocodiles as a bio-indicator (a species whose need for specific types of habitat and prey allows its status to be a measure of the health of many environmental aspects of a certain landscape) of water quality and thus a link to human health
7. Postgraduate science degrees will be awarded
8. The collaboration of numerous scientists from around the world
9. Capacity building via our educational programme

What is/ are the significance/ benefits of this research at the following levels?

Local:

Once again this past year, our project's ever expanding educational programme benefited many school children (and adults) in the area. School kids not only received books and stationary items from generous Earthwatch volunteers, but they were also exposed to a research team in action and exposed to a live crocodile, gaining a better understanding as to the importance of these creatures.

National:

On a national scale we are working very closely with the Zambia Wildlife Authority and with the Zimbabwe Parks and Wildlife Management Authority. When working on the Zimbabwe side of the Zambezi River we always take a Zimbabwean park ranger with us. Thus far over 10 rangers have been exposed to our project and scientific techniques. We have also given two presentations at the Zambia Wildlife Authority headquarters in Lusaka.

International:

Internationally we have strengthened our collaborations (University of Saskatchewan Canada and Imperial College, London, specifically) and this is expected to increase even further when our publications become available.

Communication of results

In line with our mission, the Earthwatch Institute is committed to research and results that will be disseminated to local, national, and international audiences.

Printed: peer reviewed scientific publications; books / book sections; reports, management plans or policies; fact sheets, brochures, leaflets, pamphlets, posters, academic dissertations, annual reports, proceedings of conferences or workshops; letters; newsletters.

Linked to the Okavango Crocodile Project:

Gomersall, D.P., Smit, N.J., Oosthuizen, M.C., Penzhorn, B.L. & Leslie, A.J. 2007. Molecular phylogenetic analysis of crocodylian blood protozoans of the genus Hepatozoon. *Journal of the South African Veterinary Association* 78: 102 (published abstract).

C J Lovely, J M Pittman and A J Leslie. 2007. Normal haematology and blood biochemistry of wild Nile crocodiles (*Crocodylus niloticus*) in the Okavango Delta, Botswana. *Journal of the South African Veterinary Association*. 78(3): 137–144.

Kevin M. Wallace and Alison J. Leslie. 2008. The Diet of the Nile Crocodile (*Crocodylus niloticus*) in the Okavango Delta, Botswana. *Journal of Herpetology* Vol 42, No 2, pp 361-368.

C J Lovely and A J Leslie. 2008. Normal intestinal flora of wild Nile crocodiles (*Crocodylus niloticus*) in the Okavango Delta, Botswana. *Journal of the South African Veterinary Association*, 79 (2)

JM Bishop, AJ Leslie, S Bourquin, L Badenhorst, C O'Ryan. Overexploitation and the declining effective population size of a top predator. *Biological Conservation* (in press).

Visual: artwork; visitor centre, poster or display, slides, photographs

Pamphlets distributed in local villages and to lodges within the study area.

Digital: database; internet - websites, email group/ blog/forum; CD Rom, e-newsletter

www.sun.ac.za/consent

Mass media: broadcast production; film; TV, radio, print (newspaper/ magazine coverage); Press releases; press conference; interview, article creation; press trip

Two television documentaries and one radio interview.

Meetings and conferences: presentations/ lectures; conferences; workshops; training sessions; discussions; local community meetings and events.

As mentioned in text above.

Educational Opportunities

Does the project directly or indirectly involve the following groups in your research topic?

- Local communities
- Students
- Early career scientists
- Other groups

All of the above.

How does this research help these groups better understand and act towards the conservation of a sustainable environment? (Please provide specific examples of any activities you are aware of.)

Both students and employed staff are involved in this study, and due to the multi-dimensional nature of the project everybody is expected to undertake all aspects of the study. This gives one the opportunity to stray outside of a particular specialised field, and to experience other fields.

As a research team we try and interact with the local communities as often as possible. We permanently employed Mr Paul Mwale from a nearby community in February 2008 and he

has been instrumental in spreading the word about the research project. He also runs a village shop and the research team helps him bring supplies in whenever possible. This has a direct feed-back to the various communities.

We have twice been asked to remove crocodiles from a community fish farm and the successful relocation of these animals has definitely shown villagers that the animals do not have to be killed outright.

The school children that we visit on a monthly basis need to be made aware of the importance of crocodiles in their environment, and how the animals form an integral part of the delicate ecosystem in which they live. We believe that our educational programme is achieving this goal.

Has your project contributed to the completion of Masters' or PhD theses or degrees, or other educational research findings?

Currently one registered PhD student, although more are expected.

7. Other

Is there anything else you would like to tell us about? (E.g. unexpected outcomes, quotes, etc)

“Loved the hands on fieldwork, the crocs are wonderful animals, a well organised project and well run. Great cooking! Thanks so much, had a great time, I learned a lot” “Thank you so much for allowing us to share in your crocodile adventures. The experiences we were involved in were fantastic. To be able to be on the Zambezi at night with the stars and the hippos and catching crocs was a time to remember. Kevin, thanks for your tireless effort cooking for us, even after long hours on the boat. Thank you Audrey for making sure we enjoyed ourselves on the water with the crocs. Cheers”

“What a wonderful experience. I learned a lot about crocodiles. Your leadership is ongoing. Thank you for helping me with the birds! You introduced us to African culture as well as crocodiles. I felt privileged to have handled crocodiles. Best of luck, I enjoyed my stay” “I’ve had a wonderful life-changing time on this project. Kevin and Audrey, can’t wait to read the memoirs once your project is complete. My list of things I don’t like / things I can tolerate / things that I love has changed completely. I will always remember the midnight tea on the Zambezi. Thank you so much for all your kindness” “I don’t think I could have got a more wilder experience... even if I paid double the price! Kev and Auds, you’re magic, thank you so much for everything. Don’t worry, when I’m on TV, rich and famous, you won’t be forgotten”

“I told you two years ago that I would be here and it has become so. I couldn’t possibly express how much I appreciate all you’ve done for us, shared your experience and humour and expanded an understanding of the world through your unique talents and knowledge”

“We spent a wonderful time helping you with your research and I want to thank you for everything you gave us. Especially I will remember the star-gazing, the hippo breaks, ‘our tree’ in the National Park, the handling of these amazing creatures, the good cuisine in the bush, your stories – scientific and non-scientific, the laughs we had. I admire you for your way of life, your cheerfulness, easiness, politeness, welcoming and open spirits. Wish you both lots of luck and energy for your research and that it will be successful!” “Heart-warming experience! Definitely changed my perception of this beautiful creature. Hope to establish a

firm fellowship with you guys so that in future the project could be replicated in my home country, Ghana, thanks and love to you all”

“Thank you for a truly wonderful experience. I learnt so much about the Nile crocodile and hope your research goes a long way for its protection and preservation. Your team work is highly commendable. I wish you the very best in the future. The food was superb, facilities great – a little paradise!”

8. Acknowledgements

Our collaborators and sponsors:

Earthwatch Institute

Zambia Wildlife Authority (ZAWA)

Zimbabwe Parks and Wildlife Management Authority (ZPWMA)

Conservation Lower Zambezi (CLZ)

WildTracks Lodge, ZA

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Samil Motor Corporation, RSA

Stellenbosch University, RSA

Imperial College of London, UK

National Environmental Research Council, UK

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