

End of season report for project 21.10.06

Using Caiman yacare as a sentinel species to monitor environmental degradation of the Pantanal, wetlands Brazil.

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Summary

Essentially the research project was a great success. The primary purpose of the project was to contribute to the conservation of the crocodylian *Caiman yacare* and the Pantanal wetland it inhabits. To this aim the research goal has been attained and a manuscript detailing the results of the study has been published in the international journal *Wildlife Research*. This body of work received the comment by referee Prof. William Magnusson of the Amazon Research Institute as “An important contribution to crocodylian biology with substantial implications for the management of the species”. A second manuscript detailing the methodologies used in the project has been accepted by the journal *Marine and Freshwater Resources*, and a third manuscript is presently in submission to the *Journal of Herpetology*. Full details of the project methodology, results and conclusions can be found in the manuscript submitted with this report. Here I will only describe the study details in brief.

Details of spending

The small project grant that was obtained from the Rufford Maurice Laing foundation was spent on travel costs incurred by Hamish Campbell to and from the Pantanal (only internal flights). Also money was procured for food and lodging throughout the 3 field trips. A small monetary fee was also paid to the local community when they participated in the catching, tagging and sampling of animals. Any surplus grant money was spent on ID tags and surgical supplies for the removal and storage of tissue samples.

Study results

The primary long-term goal of the project is to develop *Caiman yacare* as a sentinel species for habitat degradation in the Pantanal. However, before this could be achieved information was required about the basic ecology of the species, and how physiological condition may vary both within and between individuals in space and time. It was also necessary to try a number of different methodologies to find the most suitable method of assessing overall health.

In this first stage of the project the distribution and physiological condition of 116 *C.c. yacare* was assessed over one year in a pristine habitat with very little anthropogenic disturbance. The physiological condition of *C.c. yacare* throughout the year was determined by changes in body mass and the relative amounts of intermediary metabolites in the blood. During the wet season the study site was completely submerged under water, but as the dry season progressed *C.c. yacare* became increasingly crowded around the remaining ponds. A seasonal comparison showed that *C.c. yacare* were feeding less and utilizing fat reserves during the dry season. Moreover, during the dry season, ~ 15 % of the male *C.c. yacare* in the study site inhabited dry grassland and did not have access to water. These animals were significantly lighter than the similarly sized (snout-vent length) male *C.c. yacare* with access to water. Essentially, blood plasma analysis showed that the dry grassland *C.c. yacare* had not eaten for a prolonged period of time and needed to metabolise tissue proteins for energy. This was so severe in some animals that recovery seemed unlikely. These energy deficient *C.c. yacare* were all males > 10 years of age.

Ecological significance

It was estimated that the number of males that inhabited dry grassland were ~ 15 % of the total number of male *C.c. yacare* within the study area and this proportion was increased to ~ 40% if only males > 10 years of age were considered. This is a significant proportion of the male population and must have serious repercussions on the social structure of the population. Therefore, the level and amount of surface water in a local area probably has significant effects on *C.c. yacare* population size and structure.

Management implications

The study were that *C. c. yacare* feed mainly during the wet season, when they inhabit the flooded grasslands and fast when their numbers become crowded within ponds, and therefore their the present increase in *C.c. yacare* density is an unlikely cause of depleted fish stocks in Pantanal river systems, as is presently considered. It is tempting to speculate, that the harvesting of large adult male *C. c. yacare* may be an option, as many are effectively redundant from the breeding population and potentially will die through starvation. However, the study has highlighted the need for more ecological work in regards to the size of *C.c. yacare* population that a discrete area of Pantanal wetland can sustain, and how this is influenced by inter-annual and multi-annual fluctuations in surface water.

Future directions

As previously mentioned the long-term goal of the study is to develop *Caiman yacare* as a sentinel species to monitor environmental degradation within the Pantanal. This annual study has shown that adult males are unsuitable study animals due to the large intra-individual variation in physiological condition. Future sampling studies will be restricted to juveniles and females. The present study has also gone a long way in developing capture and sampling methodologies and developing the partnership between scientists, the local community and land owners. It is really quite amazing how the project has promoted a keen local interest in ecological study. The project has been covered in local press and the local community are running eco-tourism trips through the area and take pride in describing the conservation research they are engaged in. Three groups of United Kingdom University students have worked along side the local guides in tagging and sampling of the animals. The joint venture has resulted in a great friendship and knowledge of different cultures which would not have been possible without the project.

The project has amassed 186 tissue samples from wild *C. yacare*, which are inhabiting a pristine area of the Pantanal. The samples have been stored to preserve any inorganic and organic compounds within them and can be kept indefinitely Future developments of the study are to now to analyse these tissue samples for organic and inorganic anthropogenic

contaminants and to copy the study identically into a *C.c. yacare* population that inhabits a very polluted disturbed river system.

The population from the disturbed area has already been identified and the river these animals inhabit receives run off from agricultural land and urban and industrial development. The area is on the lower regions of the Miranda river and sediment samples from this area have been found to contain very high level of heavy metals including zinc, cadmium and mercury, and the pesticides Parathion methyl, dichlorvos and even DDT (results courtesy of Debora Calherios of EMBRAPA, Corumba Brazil). It will be very interesting to compare the social structure behaviours and physiological condition of these *C.c yacare* to that of the recently studied population inhabiting pristine wetland.

Manuscripts generated from the study funded by a Rufford small grant

Campbell, H.A., Micheli, M., & Abe, A. (2008) A seasonally dependant shift in the distribution and physiological condition of *Caiman crocodilus yacare* in the Paraguay River Basin. *Wildlife Research* 35, 150-157.

C. E. Franklin, M. A. Read, P G. Kraft, N. Liebsch, F. Seebacher, S.R. Irwin and H.A. Campbell (2008) Remote monitoring of crocodiles: Implantation, attachment and release methods for transmitters and data-loggers. *Marine and Freshwater Resources*. (in press).

Campbell, H.A., Micheli, M (2008) Diurnal 3-dimendional movements *Caiman crocodilus yacare*: Influence of social hierarchy, and body temperature. *Journal of Herpatology* (in submission).