

# **CROCODILE SPECIALIST GROUP NEWSLETTER**

VOLUME 24 No. 4 • OCTOBER 2005 - DECEMBER 2005



IUCN - World Conservation Union • Species Survival Commission

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**CHAIRMAN:**  
Professor Grahame Webb  
PO Box 530  
Sanderson, NT 0813  
Australia

**EDITORIAL AND EXECUTIVE OFFICE:**  
PO Box 530  
Sanderson, NT 0813  
Australia

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**COVER PHOTO.** Three-month-old *Crocodylus cataphractus* hatched at Emmen-Zoo in early September 2005 (see page 19). Photograph: Eddy Even.

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The CSG NEWSLETTER is produced and distributed by the Crocodile Specialist Group of the Species Survival Commission, IUCN-The World Conservation Union. The CSG NEWSLETTER provides information on the conservation, status, news and current events concerning crocodilians, and on the activities of the CSG. The NEWSLETTER is distributed to CSG members and, upon request, to other interested individuals and organizations. All subscribers are asked to contribute news and other materials.

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CSG Executive Office, PO Box 530, Sanderson NT 0813, Australia. Fax: (61) 8 89470678. E-mail: [csg@wmi.com.au](mailto:csg@wmi.com.au)

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## **Editorial**

Firstly, I would like to take this opportunity to wish everyone a prosperous year in 2006, and extend my hope to see as many of you as possible at the 18th CSG meeting to be held in Montélimar, France, 19-23 June 2006.

The last three months has seen various ongoing activities by CSG members. The report on the review mission to Peru, Paraguay, Ecuador and Bolivia is now complete, and a summary report is in this Newsletter (page 4). Alvaro Velasco (CSG Regional Chairman, Latin America and the Caribbean) also participated in a series of meetings in

Colombia in October, in which wide-ranging discussions were held (see page 13), including criteria for setting Colombia's self-imposed skin export quotas for captive-bred *Caiman crocodilus fuscus*. Alvaro took the opportunity whilst in Colombia to meet with CSG members Giovanni Ulloa (CSG Regional Vice Chairman, northern South America) and Sergio Medrano, who are developing a proposal for surveys of *C. c. apaporiensis*.

In Brazil, the University of Sao Paulo, in association with the CSG, held the "1st Workshop on Biology, Management and Conservation of Brazilian Caimans" in Piracicaba, State of São Paulo, 8-10 October (see page 6). The workshop was coordinated by Luciano Verdade (CSG Regional Vice Chairman, southern South America), Alvaro Velasco, Alejandro Larriera (CSG Deputy Chairman), Carlos Piña and Val Lance (CSG Vice Chairman, General Research) with financial support from the Sao Paulo Science Foundation. One of the aims of the meeting was to identify and bring together researchers from around the country to discuss domestic management and conservation of caimans.

Membership to the IUCN Species Survival Commission (SSC) lapses at the end of each triennium (November 2004) and renewed memberships are effective for the next triennium. The SSC only recently sought nominations for membership to the CSG and its other specialist groups. CSG Regional Chairmen proposed lists of nominees for their respective regions to the CSG Chairman, and Tom Dacey (CSG Executive Officer) has sent letters of appointment/reappointment by e-mail to some 400 people, inviting them to become members of the SSC (CSG) for this triennium.

All nominees must indicate their acceptance of the invitation and provide their latest contact details to the CSG Executive Officer before recommendations can be submitted to the SSC. A number of people have yet to respond, and thus their nominations cannot be processed. If you have received a letter of invitation and not responded, your early confirmation would be appreciated. There are also some "current" CSG members who have not advised the Executive Officer or Regional Chairmen of their current contact details, and letters of reappointment cannot be sent. If you fall into either of these categories, please contact Tom Dacey ([csge@wmi.com.au](mailto:csge@wmi.com.au)) as soon as possible.

Lastly, the CSG is unable to operate without the generous donations which come in from various organizations and individuals. I thank everyone collectively for their financial support during 2005 which was critical to the CSG carrying out its goals and objectives with the conservation and management of crocodilians.

Professor Grahame Webb, CSG Chairman

## CSG Review of Crocodilian Conservation and Management in Peru, Ecuador, Bolivia and Paraguay



A CSG review of crocodilian conservation and management in Peru, Ecuador, Bolivia and Paraguay was undertaken between 1 and 15 March 2005. Alejandro Larrierra (Deputy Chairman), Alvaro Velasco (Regional Chairman for Latin America and the Caribbean) and Bernardo Ortiz (LAC Regional Trade) participated in the review, which was carried out with the following goals:

1. To update the national status of each species, conservation programs and management and sustainable use of crocodilians. Identify strengths and weaknesses.
2. To meet with key players involved with crocodilian conservation and management, such as CITES Management and Scientific Authorities, traders, researchers, NGOs, research institutions and universities.
3. To offer the collaboration of the CSG, and determine how the CSG may be able to assist (within the constraints of budget); make contact with existing and potential CSG members; and, inform people of the newly-formed CSG Latin Office.
4. Based on the information gathered, make preliminary recommendations.

The CSG and its membership have a long history of activity within Latin America, including Peru, Ecuador, Bolivia and Paraguay. For example, CSG members have been involved in general crocodilian research and in the design and implementation of survey programs, management programs and sustainable use programs. The CSG itself has been involved in program evaluations and in representation in forums such as CITES. At the time of this review, each country had different priorities with regard to crocodilian conservation and management, and different strengths and weaknesses.

For the CSG, a better understanding of the problems at a national level, is the first step towards deriving solutions. Some particular issues in each country, which the CSG

had identified as being in need of update, were:

- A. Ecuador: Status of *Melanosuchus niger* farming program, status of wild populations of *Caiman crocodilus* and *Crocodylus acutus*.

*Caiman crocodilus* and the *Paleosuchus* spp. are abundant in the wild and there is a subsistence market for their meat, but there is no management program for the species. For *C. acutus* the principal problem is habitat destruction. The best population is found in the Guayas River, and studies were recently initiated to determine its status. The *M. niger* population is recovering, but more studies are required to determine the real situation. Ecuador does not have a National Conservation program for crocodilians. The *M. niger* ranching program (for commercial purposes) is not a national program nor is it part of any program. Recommendations were:

1. Design a National Conservation Program for crocodilians.
2. Define whether or not Ecuador is interested in maintaining the ranching program for *M. niger*, and if so, define new goals, upgrade the *M. niger* ranching program on the basis of experiences, and make strategic alliances with Universities and NGOs to manage the *M. niger* ranching program.
3. The *M. niger* ranching program has generated important information about captive management—this information needs to be assembled and perhaps compiled into a manual.
4. Design a Conservation Program with *C. acutus* on the Pacific coast, based on the experience in Guayaquil City.

- B. Peru: Status of *C. acutus* farming program, and status of wild populations of *C. crocodilus* and *M. niger*.

No detailed studies have been carried out on any of the five species. The situation for *C. crocodilus* is good, but is unknown for *Paleosuchus* spp. Some work is being carried out with *M. niger* in Samaria and Manu National Parks, where the best populations are found. Wild *C. acutus* populations are very depleted, and a captive breeding program has been implemented in Tumbes, Puerto Pizarro region. Recommendations were:

1. Design a National Conservation Plan for crocodilians.
2. Determine the status of all crocodilians in the country.
3. Began studies with wild *C. acutus* near the captive breeding activity in Puerto Pizarro.
4. Continue the strategic relationship with Universities and NGOs to manage the captive breeding of *C. acutus* in Puerto Pizarro.
5. Make contacts with the regional Government of Guayaquil City in Ecuador and the private sector,



to learn about the *C. acutus* program and exchange experiences.

- C. Bolivia: Status of the *C. yacare* management program, and status of conservation programs for *C. latirostris* and *M. niger*.

The wild *C. yacare* populations are good and have supported a wild harvest over the last 6 years. Over the last two years the CITES Scientific Authority has been doing surveys to evaluate the capacity of the population for wild harvesting. In the absence of recent data, the current status of *C. latirostris* and *M. niger* is unknown. Recommendations were:

1. Determine the status of wild populations of *C. latirostris* and *M. niger*.
2. Continue the monitoring program on wild *C. yacare* in more areas to determine the real harvest potential.
3. Review the methodology to distribute the annual harvest quota. (At the time of the review the methodology probably resulted in overexploitation in some areas).
4. Continue with the relationship between the CITES Management Authority and local governments.
5. Continue the strategic association with NGOs and the Biotrade Initiative.
6. Implement and monitor the management plans in the Indigenous Community territories.
7. Confiscated illegal skins could be given to prisoners in Trinidad Jail, so that they can be manufactured into products that can be sold domestically, and create the precedent that such skins cannot ever be included in the annual harvest quota.

- D. Paraguay: Status of *C. yacare* management program.

No recent studies have been carried out to determine the status of wild populations of *C. latirostris*, *M. niger* and *P. palpebrosus*. Local surveys were carried out for *C. yacare* to determine the capacity of wild harvesting two years ago, before a moratorium was implemented by Government. At the time of the CSG visit, the Government were reviewing the National Program for Wild Harvest of *C. yacare*, and had implemented the moratorium that will not allow any harvest until legislation has been evaluated. There are no conservation programs for the other crocodilian species.

1. Conclude the revision of the legal framework for the *C. yacare* harvest program.
2. Design a National Conservation Program for crocodilians.
3. Design a National Conservation and Sustainable Use program for *C. yacare*.
4. Design and implement a monitoring program for *C. yacare*.

5. Determine the status of all wild crocodilians populations in the country.
6. Establish discussion that includes Universities, NGOs, tanning industry, traders and local governments that could produce recommendations or suggestions to the CITES Management Authority on the design of National Conservation Programs for crocodilians.

A full version of the report, in Spanish and English) is available for downloading at "[www.wmi.com.au/csgarticles](http://www.wmi.com.au/csgarticles)".

Tom Dacey, *CSG Executive Officer*, <[csg@wmi.com.au](mailto:csg@wmi.com.au)>.

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## New CSG Thematic Group

Grahame Webb has created a new thematic group within the CSG - Zoos and Community Education - and has asked me to head this group.

Many of our members are already involved in zoo and educational activities. The formation of this group is not intended to dismiss their many contributions. Rather, it is a recognition of the importance of these activities to our core mission and an acknowledgment that we have not, in the past, paid as much attention to these two arenas as we should.

As we begin to identify all of the areas with which the group needs to concern itself, promoting the conservation philosophy and goals of the CSG through public education certainly seems to be the most central. There are already many educational programs directed at crocodilian conservation produced by schools, zoos and environmental education centers. We hope to collect many of these and produce, or make more widely accessible, educational materials relevant to crocodilian conservation. We will try to make these available to educators in a centralized location - a website and possibly a CD-ROM.

Interestingly, the first major challenge to this is simply identifying what our message is. We have never really clearly identified what our "talking points" should be. Perhaps in association with content development for the new CSG website, we will formulate a coherent set of key discussion points relative to our mission and goals. Importantly among these, we must enlighten many educators and public alike on the importance of sustainable utilization as a conservation strategy.

It is clear that the objectives of a CSG education campaign cannot simply be the enlightenment of the general public. Most importantly, we must design educational instruments that result in a positive outcome for crocodilians. That is, our central objective must be to create a more positive attitude toward wild crocodilians and their conservation.

The goal is not necessarily that everyone must “love” crocodilians, but to move people in a positive direction - from intolerant to tolerant, from negative to neutral, from neutral to accepting and supporting. To meet this central objective, we must think of education beyond the narrow view of public education in schools, zoos, and environmental centers. To be truly effective, educational efforts must be directed at changing the attitudes of people in areas cohabited by crocodilians.

In regions inhabited by critically endangered crocodilians, we must promote and assist the development of community-based programs, such as the excellent initiative of Jan van der Ploeg and Merlijn van Weerd with *Crocodylus mindorensis* in San Mariano, in the Northern Sierra Madres of Luzon (Philippines). In areas where crocodile attacks are a real threat to the local inhabitants, we must promote “living with crocodiles” educational campaigns and use our expertise to help reduce the dangers of crocodile attacks.

Zoological associations and institutions already contribute greatly to worldwide conservation efforts. Zoo professionals are expert in cooperative breeding programs and genetic management of small populations. Everyone seems to agree that the central contribution of modern zoos to conservation is through education. Zoological institutions throughout the world have devoted tremendous resources to public education. We can collaborate with these established education entities in promoting our own educational agenda. Zoos are populated with highly motivated, dedicated individuals who wish to participate more closely in global conservation efforts.

One goal of our new thematic group must be to coordinate and provide the necessary means by which these professionals can become increasingly actively involved in our own conservation activities. The World Association of Zoos and Aquarium (WAZA) has recently published *Building a Future for Wildlife: The World Zoo and Aquarium Conservation Strategy*. This thoughtful document includes numerous areas of cooperation between zoos and field conservation projects. These include linking exhibits to field conservation projects, linking retail sales with *in-situ* conservation programs, other fundraising activities for field conservation, setting up training courses, active participation in field projects by zoo professionals, etc. Our goal would be to help coordinate these ventures, find support for our field projects, and link interested individuals and zoos with projects requiring support.

I am seeking any ideas and/or suggestions on directions that this group should consider. Anyone wishing to be actively involved in the Zoos and Community Education group, please contact me directly.

Dr. Kent A. Vliet, *Vice Chairman, CSG Zoos and Community Education Group*, <kent.vliet@zoo.ufl.edu>.

## “Science and CITES” Workshop

Between 28 November and 2 December, a meeting entitled: “Science & CITES, Workshop for the South American sub-region” was conducted in Brasilia, Brazil. It was organised by the CITES Secretariat and IBAMA (Instituto Brasileiro do Meio Ambiente), with the support of UNDP and UNEP. The workshop was directed at the CITES Management and Scientific Authorities from Argentina, Bolivia, Brazil, Chile, Paraguay and Uruguay. The most relevant goal of the Workshop was to improve the application of CITES in the region.

The general methodology of the meeting was based on expert conferences and real case workshops involving all participants. The cases reviewed were parrots, timber, fish and caymans (specifically *Caiman yacare* in the region). I was invited to make a presentation on Sustainable Use and Crocodilian Conservation in the region, and I also had the chance to work together with national representatives of Argentina, Bolivia, Brazil and Paraguay, evaluating the evolution of the management programs for the Yacare cayman in the region.

It was a very productive meeting, not just for the results obtained in the practical exercises during the workshop, but also because of the very good relationships established between all participants, and (hopefully) because of the very good communication that I expect we will maintain with all the representatives.

Alejandro Larriera, *CSG Deputy Chairman*, <yacare@arnet.com.ar>.

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## Regional Reports



### Latin America & the Caribbean

#### Brazil

The University of Sao Paulo, in association with the CSG, carried out the “1st Workshop on Biology, Management and Conservation of Brazilian Caimans” in Piracicaba, State of São Paulo, Brazil, on 8-10 October 2005. The workshop was co-ordinated by Luciano M. Verdade, Alvaro Velasco, Alejandro Larriera, Carlos Piña and Val Lance, and had the financial support of Sao Paulo Science Foundation (FAPESP, Proc. No. 2005/02205-2).

The workshop assembled both experienced (eg Bill

Magnusson, George Rebello, Zilca Campos, Marcos Coutinho, Carlos Piña, Alvaro Velasco, Alejandro Larriera, Val Lance) and young (eg Adriana Malvácio, Sônia Mendonça, Sônia Canto, Leandro Scur, Augusto Kluczkovski, Pablo Siroski) researchers. The Center for the Study of Amphibians and Reptiles (RAN) of the Brazilian Wildlife Agency (IBAMA) was represented by Antonio Pacaya (Chairman), Vera Luz and Vitor Hugo Cantarelli.



On the first day (8 October) the program included presentations on general biology and technology of meat and leather processing. On the second day (9 October) participants discussed the current Brazilian programs on caiman management, with special emphasis on the sustained use program of Black caiman (*Melanosuchus niger*) in the State of Amazonas, and the steps necessary to improve Brazilian law and institutions on wildlife management. The necessity of changing the status of that species at CITES was discussed, as was the possibility of holding the 19th working meeting of the CSG - a proposal on the latter might be officially presented in France.

Some social events also took place: a special caiman dinner with both broad-snouted (*Caiman latirostris*) and black caiman meat and a "happy hour" with a special musical performance of Eduardo Verdade (the artistic representative of the Verdade family...) and a rock and roll band formed by students of the University of Sao Paulo. Last but not least, some participants attended the exciting field trip that included a rafting on Jacare-pepira River. By the way, "jacare-pepira" in local Indian language means "scraped caiman". I cannot think of a better place to end a caiman specialist meeting!

Dr. Luciano Verdade, CSG Regional Vice Chairman for southern South America, <lmv@esalq.usp.br>.

**NILE CROCODILE FARMING VENTURE ENDS.** After nearly 15 years of controversy and effort, the attempt to establish captive breeding (farming) of Nile crocodiles (*Crocodylus niloticus*) in Brazil was ended by court order

recently. The episode began in 1990, when entrepreneurs imported a breeding stock of Nile crocodiles from Zimbabwe, with the intention of establishing commercial captive breeding for this valuable species. The event initiated the CSG's long standing attempts to define a policy in opposition to introduction of exotic species of crocodilians into the range of other crocodilians. A CSG Task Force is working currently to revise and refine that policy.

In Brazil, the venture was opposed by local environmentalists but remained active at a low level for many years, and was intermittently in contact with CSG until we declined to support their special request to export captive-bred material in the late 1990s. About 1.5-2 years ago a local judge ruled that the project had to have an environmental impact statement or destroy the animals. As they were not making money from the skins and economic and legal restrictions prevented the proliferation of breeding farms stocked with their hatchlings, every last one of them was killed and skinned. Leandro Scurr, a well-known trader of crocodilian skins in Latin America, accompanied the whole process and bought the skins. Estimated losses were \$US500,000! As near as I can tell, there are now no potentially breeding pairs of *C. niloticus* in South America.

William E. Magnusson, *Coordenação de Pesquisas em Ecologia, Instituto Nacional de Pesquisas da Amazônia*, CP 478, 69011-970, Manaus-AM, Brazil, <bill@inpa.gov.br>.

**LONG-TERM STUDY OF THE ANAVILHANAS CAIMAN POPULATIONS AND THE BOTICÁRIO FOUNDATION.** The Fundação o Boticário de Proteção à Natureza ([www.fbnp.org.br](http://www.fbnp.org.br)) turned 15 years old in 2005. Since 1991, this NGO has donated \$US5 million to 990 conservation projects in all Brazilian biomes. The caiman population study undertaken by two of us (WEM and RDS), between 1989 and 1999 (Da Silveira 1993; Da Silveira *et al.* 1997), in the Anavilhanas Ecological Station funded by Boticário Foundation started in 1994 (Da Silveira 2001). It was the longest caiman population monitoring program ever undertaken in the Amazon basin, and collected data on abundance, breeding areas and growth of Spectacled caiman (*Caiman crocodilus*) and Black caiman (*Melanosuchus niger*).

Two other species of Amazonian caimans (*Paleosuchus* spp.) also occur in the Anavilhanas Reserve and the study of these four sympatric species has helped us to better understand the patterns of distribution and abundance of the taxa throughout the Amazon River flooded forests (Da Silveira 2003).

We returned to the Anavilhanas Reserve in July 2005 because the Boticário Foundation chose 15 projects it had



funded to be part of a book celebrating the foundation's "coming of age", and to our surprise and honour, our study was one of those chosen. Harold Palo Jr., nature photographer ([www.brazilimagebank.com](http://www.brazilimagebank.com)) and Manoel Francisco (Kiko) Brito, environmental reporter ([www.oeco.com.br](http://www.oeco.com.br)), went with us to the Anavilhanas to take photographs and collect information for one of the chapters of the Boticário book - "Sinais da Vida: Algumas Histórias de Quem Cuidada Natureza no Brasil".

Returning to Anavilhanas 6 years after finishing our study was very exciting, and we had good nights catching caimans and discussing Amazonian conservation. However, reports from the Brazilian Institute of the Environment and Renewable Natural Resources (IBAMA) about growing of threats to the Anavilhanas Reserve since our study, were alarming. On 21 July we saw an example of those threats. It was the peak of wet season, and we had gone to the last unflooded site in the Anavilhanas Archipelago, that represents about 28% (100,000 ha) of the Reserve, and which protects the second largest freshwater Archipelago in the world and the largest with protected status.

The area of dry land was only 200 m<sup>2</sup> where our boat dropped anchor, and we found a small icebox (Fig. 1) abandoned by people who had run off when they saw us coming. In the box were three male *C. crocodilus* with necks cut, probably with a machete (Fig. 2). We are used to seeing Amazonian caimans killed in Brazil for their skins (Rebello and Magnusson 1983; Da Silveira *et al.* 1998), for commercial or subsistence hunting for meat (Da Silveira and Thorbjarnarson 1999; Da Silveira 2003; Mühlen *et al.* 2003) and as catfish-bait (Da Silveira and Viana 2003). However, the size of individuals killed on this occasion was disturbing. The largest was 74 cm total length and 1140 g - probably a two-year-old. The others were hatchlings, probably 6-8 months old. One was 40 cm long and weighed 165 g. The other was smaller, had its head cut off, and we estimated its length as 36 cm and weight as 100 g.



Figure 1. Three *C. crocodilus* found in an abandoned icebox (see text).

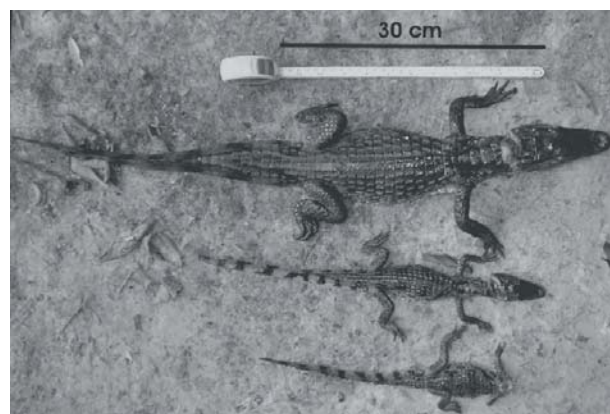


Figure 2. Two of the three *C. crocodilus* in the icebox were hatchlings (6-8 months), and the largest one was estimated to be about two-years-old.

The large individual had one earthworm and one beetle larva in its stomach. The intermediate size individual had an empty stomach, and the smaller had only two beetle wings (elytra) in its stomach. During the wet season in the Anavilhanas Archipelago, and in most of the Amazonian flooded forest, caiman-prey densities are very low because river levels can be 15 m higher than during the dry season. At the height of the wet season, caimans eat very little over a period of more than three months (Da Silveira and Magnusson 1999). Like the caimans, local residents have problems collecting food during the wet season.

In the icebox we also found 17 small fish representing four taxonomic families and of 9 species (Cichlidae: *Satanoperca lilith*, *S. jurupari*, *S. lilith*, *Cichla temensis*, *C. orinocensis* and *Hoplarthus psittacus*; Anostomidae: *Leporinus falcipinnis*; Pimelodidae: *Pinirampus pirinampu*; Erythrinidae: *Hoplias cf. malabaricus*). This amount of fish would sustain a traditional Amazonian family for only a couple of days. Fish diversity of the Negro River is high (Goulding *et al.* 1988). However, in the Anavilhanas area, fish are abundant only in the Archipelago, where any kind of fishing is illegal. In the terra firme streams, where people live, diversity and biomass of fish are too low to sustain subsistence fishing.

During our 10-year study in the Anavilhanas Archipelago, only once did we find evidence that a medium-sized *C. crocodilus* was eaten. The apparent increase in hunting for caiman meat might not directly threaten caiman populations, but a reduction in fish stocks could reduce the prey base available to caimans in the lower Negro River. It is obvious that caiman management cannot be undertaken independent of management of fish stocks and the development of alternative economic sources for the local people.

#### Acknowledgements

We thank Jansen Zuanon (INPA) for fish identification,



Harold and Kiko for the good time in Anavilhanas, Ezequias Breláz for helping in the field, John Thorbjarnarson for review of the manuscript, and the Boticário Foundation for funding this long-term study.

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## Mexico

BINATIONAL SURVEY (GUATEMALA-MEXICO) OF *CROCODYLUS MORELETII* IN THE USUMACINTA RIVER. Morelet's crocodile is distributed in the lowlands of the Gulf of Mexico and the Caribbean slopes in Mexico, Guatemala and Belize. The conservation of the species in the three countries depends on a coordinated tri-national effort. For this reason, and with the idea of forming a tri-national working group, a workshop was held at Las Guacamayas Biological Station in the Laguna del Tigre (Jaguar Lagoon) National Park, at El Peten Department in Guatemala on 5-9 June 2001, to gather researchers, governmental employees and farmers from the three countries (Fig. 1) and to discuss about the species' situation in the region and the establishment of a working strategy.

As part of the activities, a night survey was performed on 9 June on the Usumacinta River, the natural border between Guatemala and Mexico. The Usumacinta River is the most plentiful in Mexico. It is formed by the union of other rivers in Guatemala, making the border between Guatemala and Mexico and uniting with the Grijalva River in the State of Tabasco, forming an important delta before flowing into the Gulf of Mexico. In the surveyed location, the Usumacinta River crosses a dense evergreen forest known

as “Lacandona Jungle”, the last large remaining area of this type of vegetation in Mexico and Central America.



Figure 1. Some of the participants in the night survey.

The night survey started at Yaxchilán Station in Sierra del Lacandon National Park at 1000 h and ended at Ceiba de Oro at 0100 h the next day. The weather conditions were not very adequate due to a previous heavy rainfall that increased the river’s level, prompting our decision to perform the survey upstream.

Twenty crocodiles of different sizes were seen in a surveyed distance of 10 km, and one specimen was captured. The crocodiles were grouped using the classes of Sigler (2001) [I <0.51 m (neonates excluded); II 0.51-1.00 m; III 1.01-1.50 m; IV >1.50 m; eyes only- where size could not be determined]. Crocodiles sighted were distributed as: Class I= 0 (0%); Class II= 5 (25%); Class III= 7 (35%); Class IV= 7 (35%); eyes only= 1 (5%). Density was 2 crocodiles per km.

The captured crocodile was a subadult, male *C. moreletii*, the last one sighted during the survey. The animal was taken back to the station where it was marked (scute-clipped as “1”), measured (total length= 1.01 m; head length= 146 mm; hand length= 49 mm; foot length= 91 mm; snout length= 100 mm; snout width (at 10th maxillary tooth)= 45 mm) and photographed (see Fig. 2) before release at the site of capture the next day.

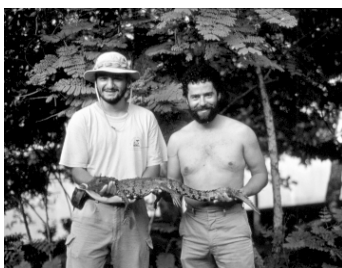


Figure 2. (from left) Francisco Castaneda and Luis Sigler with “Marciano”, the *C. moreletii* captured during the survey.

Interestingly, during the survey 90% of the sighted crocodiles were on the Guatemalan side, but the next morning 100% of the observed crocodiles were on the Mexican side. I believe that the presence of the crocodiles on one or other side of the river is the result of a thermoregulatory factors, because the river has a northeast-southwest axis, and Mexico is on the western side and Guatemala the eastern side; during sunset, the last sunned beaches are the Guatemalan ones, but at sunrise, the first ones are the Mexican ones.

There was an obvious absence of small (Class I) crocodiles. Hatchlings emerge in August and the female crocodiles nest in areas peripheral to the Usumacinta River, such as streams and small lagoons, where they find enough vegetation for nesting. Around hatching time the Usumacinta River reaches its highest level, so nesting on its banks would be very risky for a female Morelet’s crocodile; moreover the beaches are sandy-lime or rocky-lime, and lack vegetative matter for building a typical mound nest.

The presence of the Morelet’s crocodile in the fast waters of the Usumacinta River indicates the plasticity of this species, as it prefers quiet or stagnant waters. It is very possible that the sighted crocodiles in this river are crocodiles that have dispersed from breeding areas in streams and small lagoons.

I must thank the participation and collaboration of Francisco Castaneda Moya, Bayron Medina, Omar Molina, Francisco Romero, Oscar Rebollo, Marciano Valtierra, Miriam Venegas, Manuel Muñoz, Yvonne Martinez, Mario P. Lopez, Oscar Hinojosa, Adrian Reuter, Eduardo Sandoval and the other partners that helped with this survey. Also the Park guards of Sierra del Lacandon National Park who drove the boats with mastery that night when the Usumacinta showed its powerful flow. Special thanks to Jacqueline Gallegos and Fabian Aguirre for reviewing this document.

Luis Sigler, *Herpetology Department, The Dallas World Aquarium, USA*, <cocodriloblanco@yahoo.com>.

## Costa Rica

RECENT SURVEYS OF THE AMERICAN CROCODILE (*CROCODYLUS ACUTUS*) IN THE OSA PENINSULA REGION OF SOUTHWESTERN COSTA RICA: JUSTIFICATION FOR LONG-TERM STUDIES AND CONSERVATION. The American crocodile is the most widely distributed Meso-American crocodilian and is one of two species native to Costa Rica. The Osa Peninsula, and areas of the adjacent mainland in the southwest of Costa Rica (Area de Conservación Osa - ACOSA) have extensive areas of wetland habitat ideal for *C. acutus*: well over 50% of the country’s mangrove

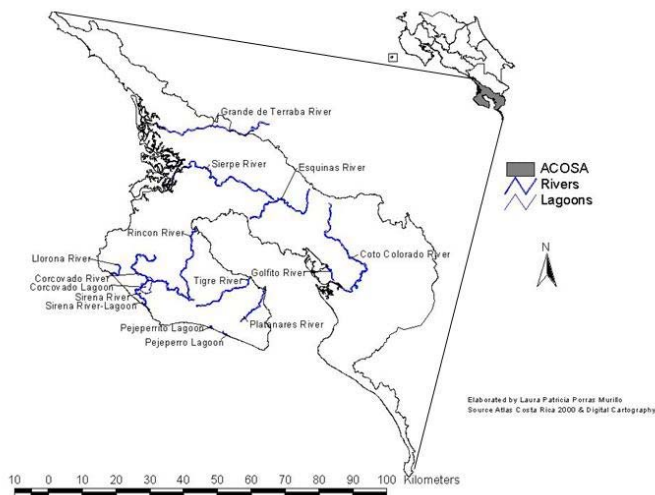


Figure 1. Location of study site in Area de Conservacion Osa (ACOSA), Costa Rica.

wetlands are found in this area, some 20,254 hectares. The CSG Conservation Action plan designated the determination of the status and ecology of *C. acutus* in Costa Rica as a high priority project (Ross 1998).

Extensive studies on the population distribution of *C. acutus* in Costa Rica have been completed primarily in the rivers of the northwestern Pacific region (Sasa and Chaves 1992; Torrealba *et al.* 1992; Motte 1993; Piedra 2000; Porras 2004). However, only a few surveys have been conducted in the southwestern Pacific region (Bolaños *et al.* 1996, in prep.; Porras 2002). The results of two preliminary surveys conducted between September 2004 and April 2005 are presented in Table 1.

#### Spotlight Surveys

The purpose of the surveys was to obtain a preliminary assessment of the presence and size distribution of *C. acutus* in select waterways within the ACOSA. This assessment would support the need for implementation of a long-term

population study. Surveys were completed during September 2004 (Rios Esquinas, Coto Colorado and Platanares) and April 2005 (Rios Coto Colorado, Esquinas, Rincon and Tigre). Standard spotlight survey methods were utilized to locate crocodiles by eyeshine. Wherever possible, size estimates were made to accurately classify animals as hatchling (<50 cm), juvenile (50-150 cm), sub-adult (150-250 cm) and adult (>250 cm). Where size estimates were not feasible, 'eyeshine only' was recorded.

The length of each survey route was estimated from topographical maps (1:50,000) and rounded to the nearest 0.5 km for determining the relative abundance. Surveys performed in April 2005 followed the same routes as in September 2004. The total numbers observed are summarized in Table 1.

#### Nesting Activity

In addition to the spotlight surveys, a survey on foot of the Rio Tigre was performed. No indications of nesting activity (tail drags, tracks or shells) were found along the Rio Tigre. A kayak survey of the Laguna Pejeperrito, a freshwater coastal lagoon along the Pacific coast of the Peninsula de Osa was performed in September 2004. No nesting evidence was indicated, though many small (juvenile) crocodiles were observed retreating into the bordering saw grass during a night survey and several adult crocodiles were spotted, including a large (~3m) individual approached to within 2 m via kayak. A follow-up survey was performed in April 2005 (Tamarac, Wildlife Conservation Society, unpub. data).

Past canoe surveys (by Harris and Boston) in 2003 and 2004 of the Rio Sirena, Corcovado National Park revealed at least two known nesting sites (designated A and B). At Site A, 28 hatchlings were observed on April 26, 2003 and 26 hatchlings were observed on April 17, 2004. In 2005, nesting activity was observed (by Boston) further up the river at Site B. No hatchlings were observed at Site A in 2005.

Table 1. Number of crocodiles observed on select river surveys of the ACOSA. \* Surveys on successive nights both yielded 19 animals.

Class	Rio Esquinas		Río Coto Colorado		Río Rincon	Río Platanares	Laguna Pejeperrito	Sirena	
	Sep 04*	Apr 05	Sep 04	Apr 05	Apr 05	Sep 04	Apr 05	River Aug 05	Lagoon Aug 05
Hatchlings	10	3	5	0	1	0	22	0	10
Juveniles	4	3	14	5	0	13	17	13	7
Subadults	0	0	3	1	0	0	2	2	2
Adults	2	0	2	2	0	0	3	2	1
EO	3	3	5	11	1	0	11	2	0
<b>Totals</b>	<b>19</b>	<b>9</b>	<b>29</b>	<b>18</b>	<b>2</b>	<b>13</b>	<b>55</b>	<b>19</b>	<b>20</b>
Distance (km)	4.5	4.5	5.0	5.0	1	0.5	-	6	3
Density	4.2	2.0	5.8	3.6	2.0	26.0	-	3.2	6.7



## Discussion

The results indicate that the Area de Conservación Osa may hold a significant portion of the total crocodile population found in Costa Rica. Total numbers observed in September 2004 were significantly higher than those observed in April 2005. The reasons for this may be that: 1) surveys in 2005 coincided with the daily high tide; and, 2) the higher than average rainfall in southwestern Costa Rica during February-April 2005. In addition, no hatchlings were observed on the Río Sirena at nest site-A in April 2005, possibly due to high water levels.

## Recommendations

A long-term plan (5 years) to systemically survey the waterways of the ACOSA is in preparation. It is recommended that this plan include both foot and spotlight surveys of the principal rivers, as well as the smaller tributaries to initially identify nesting and rookery areas. Recent crocodile attacks in northwestern Costa Rica have caused residents to treat crocodiles with disdain. Consequently, it is important to educate the local population on the benefits of crocodiles in maintaining the health of the ecosystems of the ACOSA, as well as an important staple in the economy of the region through eco-tourism.

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- Mike Boston, *OsaAventura P.O. Box 39-8203, Puerto Jimenez, Peninsula de Osa, Costa Rica*, <mike@osaaventura.com>; Laura Patricia Porras Murillo, *100m Sur Escuela Rincon de Ricardo, San Pablo, Heredia, Costa Rica*, <lauporras@costarricense.cr>; Steve Conners, *Miami Metro Zoo, 12400 SW 152nd St., Miami, FL, USA* <sconner@miamidade.gov>; Matt Harris, *607 Old Stage Rd., Saugerties, NY 12477, USA*, <mharris@matabuey.com>; Joe Wasilewski, *Natural Selections, Inc., 24305 SW 142 Ave., Princeton, FL 33032, USA* <jawnatsel@bellsouth.net>.

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I am currently a Senior at Winthrop University in Rock Hill, South Carolina, where I am majoring in Environmental Studies and minoring in Biology, and hope to eventually earn a doctorate in Ecology and work with crocodilians and habitat preservation.

In March 2005, my Biology class traveled to Costa Rica for a week to participate in a water quality study of the Río Lagarto. We stayed at the Marine Research Station in Punta Morales, located directly north of Puntarenas on the Pacific coast in the Gulf of Nicoya. While there, I was allowed the privilege to hold some young American crocodiles, *Crocodylus acutus*.

From what my professor translated, the young crocodiles were being raised for reintroduction efforts. The Research Station has what is essentially an "adopt a crocodile" program where schools can help feed "their" crocodile by donations. They get a picture and can even come observe the crocodile being released into the wild. The smallest specimens were between 37.5 and 60 cm long, the largest was just over 1 m. These crocodiles were kept in concrete enclosures with a simple pool and seemed very healthy



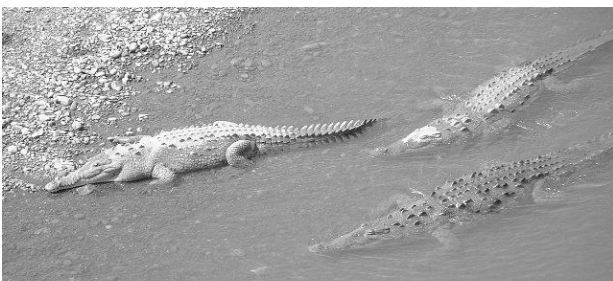
and active. Since I was allowed such close interaction, it gave me the perfect chance to teach my class a little about crocodile biology and the importance of habitat preservation. Many of them (including my professor) learned many facts about crocodilians.



There was also a fenced enclosure that held larger crocodiles (up to 2m). Sadly, I was not allowed to get a closer look at these crocodiles. This pen had a U-shaped pool with a concrete slab in the middle, for what was assumed to be a feeding station. There were plenty of shade and basking areas. I did not get a chance to ask about the purpose of these crocodiles, but they appeared healthy and well kept.

Later in the week we traveled south to visit a tropical dry forest nature preserve. On the way we stopped at the famed Tarcoles River Bridge. There were several large crocodiles in the water, some approaching 6 m in length. The water was very unclean, and trash such as car tyres could be seen even from the bridge. No chickens were sacrificed that day.

This trip was a great experience for me, not only for the research we did but for the chance to show my classmates the ecological importance of large predatory species. I hope to go back in the future and do research on *C. acutus* management in Costa Rica.



Richard “Croco” Dial, 107 Ralph Frame Rd., McConnells, SC 29726, USA, <dialr2@pobox.winthrop.edu>.

## Colombia

On behalf of the CSG, and in my capacity as Regional Chairman for Latin America and the Caribbean, I visited Colombia between 7 and 14 October, with a number of goals in mind. A summary of these goals and results obtained with each are briefly summarised here. The full report (in Spanish and English) is available at [www.wmi.com.au/csgarticles](http://www.wmi.com.au/csgarticles).

1. To attend the workshop on the “Formulation the National Program for the Conservation and Sustainable Use of Black Caiman (*Melanosuchus niger*, Spix 1825) in the Colombian Amazonia”, organized by the SINCHI Institute, CITES Scientific Authority and the Ministry of Environment, Housing and Territorial Development.

The SINCHI Institute, with the recommendations obtained in the workshop, in the short- or medium-term will present the final version of the National Plan of Conservation and Sustainable Use of *Melanosuchus niger* in Colombia.

2. To meet with Mr. Leonardo Muñoz, Director of the Ecosystems Directorate of the Ministry of Environment, Housing and Territorial Development.

Mr. Muñoz commented on the advances achieved in the captive breeding program for *Caiman crocodilus fuscus*, the obligation of the farms to mark all *C. crocodilus* breeding stock with microchips, upgrade inventories on all farms and the revision of the criteria and indicators that will be used to define the annual production quotas. He indicated that they have to commence communication with Giovanni Ulloa to conclude their approval and publication process for the National Program of Conservation with *Crocodylus acutus*. In concluding the meeting Mr. Muñoz stated that he was very pleased to know that they have CSG support, and that if necessary he will consult on working jointly.

3. To formulate and design of the proposed research project with *Caiman crocodilus apaporensis* with Giovanni Ulloa (Regional Vice Chairman for northern South America) and Sergio Medrano.

The final draft of the project should be ready in the last week of October. Discussions were held with Consuelo Burbano, who has agreed to work on the genetic component of the project, given her wide experience in this area. The best time to carry out fieldwork is considered to be July to September 2006.

4. To meet with the Directors of Azoocol.

The President of Azoocol, Alex Rinkel, indicated his gratitude to the CSG for continuing to work together

with them. Azoocol has had difficulties with the design of the criteria and indicators to estimate the annual production quota for *C. c. fuscus*, which they consider do not consider the total caiman production on the farms. Azoocol supports the upgrade of farm inventories and the tagging of breeding stock with microchips. They consider that this should permit the elimination of the limit on the export quota imposed on Colombia (599,000 skins annually), and that they should be allowed to export based on annual levels of production. The CSG mission of 2004 suggested that the export quota be eliminated.

5. To meet with the authorities of the Ministry of the Environment, Vice Minister of Environment.

On behalf of the CSG, we reiterated to the Vice Minister our desire for working jointly in conservation and sustainable use of the crocodilians in Colombia, a point that was very well received. Equally, we expressed to him the CSG's concern regarding the approval of the National Program for Conservation of *Crocodylus acutus* and in the implementation of the new criteria and indicators for the captive breeding activity in Colombia.

6. To attend the Public Audience on the Proposal of Resolution, which defines the criteria and indicators to assign the annual production quotas to captive-breeding facilities for *Caiman crocodilus fuscus*.

In all, some 23 people spoke, including the National Congress Deputies, the Regional Autonomous Corporations, the Alexander von Humboldt Institute (CITES Scientific Authority), CSG, Azoocol, farm owners and technicians. With the exception of the Humboldt Institute and the CSG, all participants indicated their disagreement with the resolution project, and recommended that the criteria and indicators proposed by the CSG in their 2004 review report be revised. They also indicated that they had carried out meetings between the Ministry, the Corporations and the farms owners which have not been completed, to reach agreement on a system to assign the annual production and export quotas. The Vice Minister of Environment made a commitment to revise and take into account all suggestions and recommendations expressed by all participants for the design of a new resolution that expresses the consent of all interested parties in captive breeding activities in Colombia. He also undertook to revise the suggestions made by the CSG and to inform us of the decisions to be taken.

Alvaro Velasco, *CSG Regional Chairman for Latin America & Caribbean*, <velascoalvaro@tutopia.com>.

PRESS RELEASE: SAN ANTERO, CORDOBA - A SOCIETY COMMITTED TO THE CONSERVATION OF THE AMERICAN CROCODILE (*CROCODYLUS ACUTUS*) - AN ENDANGERED SPECIES. The National Police of the Municipality of San Antero, Córdoba, confiscated a live, 3 m long female American crocodile (*Crocodylus acutus*) from "unscrupulous" hunters. Despite numerous invitations to hunters by the CVS (Corporacion de los Valles del Sinu y San Jorge), the Ministerio de Environment, Housing and Territorial Development, the Mayor of San Antero and a community group that was formed by ex-hunters (ASOCAIMAN; which fights for the conservation of the species and supports sustainable development as a positive alternative), two men were arrested by San Antero's Police Force. The men are well known in the area for illegal hunting and trading of live caimans and eggs.

Animals of similar sizes are illegally traded in the region. However, numerous efforts to disseminate information about the project are generating a positive attitude in the San Antero community that can contribute to the conservation of the species.

San Antero's community condemns illegal hunting and are committed to the harmonious development of their community, rejecting any actions that will compromise the efforts of ASOCAIMAN. ASOCAIMAN is a community group that decided to take the road to sustainable development as an alternative lifestyle for their families, and today are worthy of admiration as an example of national and international societies that advance in a firm way towards improving their conditions of life.



CVS, the National Police and the Mayor of San Antero the Greater of San Antero have played an important role in establishing clear bonds with the municipal society, by virtue of its praiseworthy actions and therefore the commitment of the community to advance in the construction of a society with integrity.

The conservation Program for *C. acutus* has been led by the CVS, ASOCAIMAN and by Proyecto Manglares of the Ministry of Environment, Housing and Territorial Development, and supported by the Mayor of San Antero,

the Von Humbolt Institute, International Conservation Colombia (C.I), Nature Foundation. Agrosoledad, C.I. Zoben S.A and C.I. Garbe S.A. Biologists, Giovanni Ulloa and Clara Sierra, are in charge of the project.

## West Asia

### India

MUGGER CROCODILES OF VADODARA CITY, GUJARAT STATE, INDIA. Usually on rainy days, frogs come out from hiding places and burrows, croaking loudly, and occupying every water body of Vadodara City. But this time the picture is quite different - the frogs are silent. Mugger crocodiles (*Crocodylus palustris*) have occupied every water body in place of the frogs and there is a slow growling instead of croaking.

The city was flooded in the last week of June 2005, due to continuous rains over 7 days. The average annual rainfall (800-900 mm) was received over these 7 days alone. The river overflowed and entered the city, achieving a height of over 12 m. This was 4.5 m above the danger mark of 7.5 m. The low lying part of the city was almost entirely submerged for a day.

Small breeding populations of mugger crocodiles are present in the Vishwamitri River (Vyas and Vyas 2002; Vyas and Bhatt 2004), which flows through the city. This population came out with the floodedwaters of the Vishwamitri River and entered the nearby slums and open

sewages. These muggers exacerbated the problems of the people of Vadodara, who were already panicked due to the heavy floods.

Local citizens reported mugger crocodiles from every corner of the city, and others in nearby villages that were affected by the floods. Local animal welfare groups and other agencies rushed to save the muggers following the reports on the presence of muggers in various human settlement areas. Confirmed records indicate that 14 muggers of various sizes (1 to 3 m) were rescued by various agencies (Table 1), including volunteers and army and Forestry staff (Fig. 1). All rescued muggers were released into Ajwa Sarover, in the upper area of the Vishwamitri River.

There were also reports of three muggers being killed by local people, one of which was burnt due to people's fear of wildlife laws (Fig. 2).

Along with muggers, other reptiles were also rescued, including over a hundred non-venomous and venomous snakes (various species), and two large Ganges soft-shell turtles (*Aspideretes gangeticus*).

This flood situation not only swept out muggers but also took toll on turtle species. A good number of fresh water turtles (*Lissemys punctata* and *Aspideretes gangeticus*) were swept into sewages and storm water systems from nearby waterbodies, blocking up the drainage system at many places of the city. And a number of turtles were found dead during cleaning of the drainage systems after the floods.

Table 1. A list of Mugger crocodiles recorded during the rainy seasons of 2005, in and around Vadodara, Gujarat, India; most crocodiles were rescued. VC= Vadodara City; GSPCA= Gujarat Society for Prevention of Cruelty to Animals.

No.	Date	Location	Rescued by:
1	2 Jul, 2005	Student Hostels, M.S. University, Fatehgunj, VC	GSPCA
2	2 Jul, 2005	Saibaba Temple, Navjivan Society, Vaghodiya Road, VC	GSPCA
3	3 Jul, 2005	Kala Ghoda, Sayajigunj, VC	GSPCA
4	3 Jul, 2005	Fain Arts College, Fatehgunj, VC	GSPCA
5	3 Jul, 2005	Palace Compound, VC (dead due to electrocution)	-
6	7 Jul, 2005	Harni, VC (killed and body burned by local villagers)	-
7	7Jul, 2005	Parshuram Bhatha, Sayajigunj, VC (killed and thrown in garbage pit)	-
8	8 Jul, 2005	E. M. E Campus, VC	Army staff
9	9 Jul, 2005	Navlakhi Compound, VC	Fire Brigade staff
10	9 Jul, 2005	Munj Mahuda, VC (killed by local slums people)	-
11	9 Jul, 2005	Sadar Bazar, Fatehgunj, VC	Local youths
12	20 Jul, 2005	Jarod Village, Vaghodiya, Vadodara	GSPCA
13	3 Aug, 2005	Patel Park Society, Varsiya, VC	GSPCA
14	4 Aug, 2005	Savali Village, Vadodara	GSPCA
15	29 Aug, 2005	Ashutosh Society, Vaghodiya Road, VC	GSPCA
16	30 Aug, 2005	Lal Baug, VC	GSPCA
17	11 Sep, 2005	Kariyalha Talaw, Padara Village, Vadodara	Local people
18	30 Sep, 2005	Munj Mahuda, VC	GSPCA





Figure 1. A large-sized rescued mugger (*C. palustris*) was transferred from human settlement area of Vadodara City, Gujarat State, India. Photograph: Mahendra Parikh.



Figure 2. A half-burnt Mugger crocodile (*C. palustris*) killed by unknown citizens of Vadodara City, Gujarat State, India. Photograph: Manoj Thakar.

There were two reports of muggers being rescued from areas of human habitation by the forestry department, in the other parts of the state. One was in Surat (a metre long mugger rescued on 30 August 2005, from Tapti River, Surat district) and the other from Junagadh City (a metre long mugger was rescued on 12 September 2005).

#### Literature

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Vyas, R. and Vyas, R. (2002). Mugger survey in the Vishwamitri River of Gujarat, India. Crocodile Specialist Group Newsletter 21(3): 9-10.

Raju Vyas, 505, Krishnadeep Apartment, Mission Road, Fatehgunj, Vadodara, Gujarat State, India, <razoovyas@hotmail.com>.

## Africa

### Conservation, Status and Biology of Crocodilians in West and Central Africa

The rivers, lakes and forests of West and Central Africa support all three species of African crocodiles yet the existence, status and conservation of these populations is extremely poorly known outside of the region. The CSG has identified this as an area where they can provide assistance to facilitate the conservation of these species.

One of the themes of the 18th Working Meeting of the CSG to be held at Montelimar, France (June 2006), will be to address this problem. It is proposed that part of the program be devoted to presentations by participants from west and central Africa and others with specialist knowledge in this area to share and compile our knowledge on:

- The existence and status of populations of all three species.
- The legal status, effective protection and management of all three species.
- The threats to all three species - identify and quantify.
- The biology of all three species in west/central African habitats and the taxonomy of *Osteolaemus* and *C. niloticus*.
- Identification of priority areas/populations for protection, management and research.

Ideally a representative from each country in the region will cover these aspects at a national level. The strategy is therefore to:

- Identify influential people who can address these issues,
- Ensure their attendance, presentations and participation
- Convene a working group for the region to
  - formalise networking between people with related and similar challenges;
  - develop a co-ordinated approach to management, conservation and research;
  - collect and present information on threats such as the bushmeat trade and conflict; and,
  - look at ways to make crocodiles a greater conservation and research priority in the region.

We believe it is most important that this notification be circulated to all CSG members and to any other individuals, institutions and agencies that can help with putting this strategy into operation. Please direct any comments and questions to Dr. Richard Fergusson <zeahtco@zol.co.zw> and Dr. Ekke Waitkuwait <Wwaitkuwait@aol.com>.

Details on the CSG and its programs can be found at "www.flmnh.ufl.edu/natsci/herpetology/crocs.htm". Information on the 18th CSG Working Meeting can be



found at “[www.lafermeauxcrocodiles.com/meeting](http://www.lafermeauxcrocodiles.com/meeting)”.

Dr. Richard Fergusson, *CSG Regional Chairman for Africa*, <[zeahtco@zol.co.zw](mailto:zeahtco@zol.co.zw)>.

## **South and Southeast Asia**

### **Philippines**

Crocodylus Porosus Philippines, Inc. (CPP) is an association of fledgling crocodile farms created for the commercial utilisation of captive Philippine *Crocodylus porosus*. CPP is currently comprised of 6 farms on the islands of Mindanao and Luzon. Originally, CPP farms were to act as rearing centres for young, captive-bred crocodiles purchased from the Crocodile Farming Institute, Palawan, through the Natural Resources Development Corporation. It quickly became apparent that this scheme was impractical, and now all CPP farms are evolving into closed-cycle captive breeding establishments. At present half the CPP farms have been successful at captive propagation, the others are expected to accomplish this shortly. It is hoped that the CPP will contribute to the trade of captive crocodile skins within three years.

With this goal nearing realisation CPP is now considering ways that it can contribute to the conservation of crocodiles in the Philippines. At a recent meeting of CPP officers in Manila, several activities, possibly funded through a minimal levy on the sale of skins, were discussed. It was agreed that CPP should contribute to crocodile conservation of *C. mindorensis* through three broad programs.

Of immediate interest was developing an education program. Most of the CPP farms currently entertain school field trips (with groups of up to 1000 children) and local tourists. However, there is little or no attempt to educate visitors on the two species of crocodiles in the Philippines, their status and the role of population pressure, economics, and habitat degradation on conservation. CPP realises that an opportunity to educate the public about these topics is currently being squandered and CPP members are interested in developing an education program, possibly including the development of a DVD in local languages that can be used at the farms and be provided at no cost to the Department of Education for dissemination to schools throughout the country. The development of a web page where commercial and conservation programs on crocodiles in the Philippines will also be explored.

CPP is also considering hosting a meeting for all persons and entities interested in conservation and commercial use of crocodiles in the Philippines. It was noted that recent meetings where Philippine crocodile management and conservation were discussed were at overseas venues and had limited participation by Filipinos. A local meeting held

near Manila would be an opportunity for Government, NGOs and private groups to interact. It is anticipated that papers, posters and extensive dialogue be included.

The second program discussed dealt with the captive management of *C. mindorensis*. It was noted that captive propagation of the species was at a standstill. Institutions charged with this goal were either experiencing funding problems or no longer had space for more animals. As such, there has been negligible recruitment of young *C. mindorensis* into the captive resource and few young currently exist. CPP members agreed that housing and breeding of *C. mindorensis* at CPP farms for non-commercial purposes was feasible. In fact, for some farms that have an abundance of food for crocodiles, maintaining a small colony of breeding *C. mindorensis* would be beneficial. It was felt that diversification of the genetic resource would contribute to the sound management of the species.

The current status of both species of crocodiles in the central and southern Philippines is poorly known. No survey work has been conducted in these regions since the early 1980s. It was felt that as some CPP farms are in areas of concern, that they are in a unique position to gather information. Initially the feasibility of a crocodile status survey in the Agusan River drainage (the largest freshwater marsh system in the country), in Mindanao, will be explored. It is noted that both species of crocodiles are found in this area and conservation of both species in the wild is of value.



Figure 1. From left to right: Dan Barlis, Toy Mercado, Vic Mercado and William Belo of Crocodylus Porosus Philippines Inc. survey marshland in Davao del Norte Province (Mindanao Island, southern Philippines) to determine suitability of release of captive-reared *C. mindorensis* into semi-wild conditions.

All management and conservation programs for the release or reintroduction of captive-raised *C. mindorensis* into the wild are a major goal. Given current conditions in the Philippines this may not be a realistic goal. However, release of individuals in controlled semi-wild situations may be an alternative. Several CPP members were interested in this activity. The Pag-Asa Farm in Davao del

Norte (Mindanao) has already purchased several areas of unwanted swampland, easily protectable, where release of *C. mindorensis* is feasible. Other members suggested that in the future CPP, or individual members, might be interested in purchasing additional areas that could be used for this purpose.

Vicente Mercado, *President, Crocodylus Porosus Philippines, Inc.*, <philippinecroc@yahoo.com>.

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## **Australia and Oceania**

### **Australia**

**CROCODILE ATTACKS.** A recent analysis of Saltwater Crocodile (*Crocodylus porosus*) attacks between 1971 and 2004 indicated that the frequency of attacks was increasing over time (Caldicott *et al.* 2005). The data indicated that there was an average of 4.0 attacks per year between 2001 and 2004. The year 2005 was consistent with the previous few years, with five attacks (3 fatal, 2 non-fatal) occurring in three States/Territories. These attacks comprised:

- East Alligator River, NT: 5 April 2005. A 4 m crocodile jumped around 1.8 m out of the water and attempted to grab a man sitting on a boat. The man suffered bites on the head and arm. The crocodile was later shot by wildlife rangers.
- Normanby River, QLD: 16 August 2005. A 60-year-old man and his wife were trailing a fishing line from a canoe. Attracted by the bait, a crocodile approached the canoe. The man was grabbed by the arm as he tried to fend off the crocodile, and was dragged into the water. A 4 m crocodile killed by wildlife rangers had no human remains in its stomach, and the recovery a few days later of a thigh bone belonging to the man suggests that another crocodile was responsible for the attack.
- Groote Eylandt, NT: 24 September 2005. A 37-year-old man was killed by a crocodile as he was snorkelling off a popular beach. His body was later recovered about 1.6 km away at the mouth of a creek. The wounds on the victim were consistent with a 4 m long crocodile. Searches by police and wildlife rangers were unsuccessful in locating the crocodile responsible.
- Coburg Peninsula, NT: 29 September 2005. A 56-year-old man scuba-diving for coral and ornamental fish was killed by a 4-4.5 m crocodile. An autopsy revealed that the man had been grabbed around the head. There are a number of large crocodiles in this area, and as there was no guarantee that the crocodile responsible for the attack would be captured - no further action was taken by wildlife rangers.
- Sale River, WA: 3 October 2005. A 10-year-old girl was grabbed around the torso by a 2.5-3 m crocodile as she was swimming in a freshwater lagoon. Her father freed her from the crocodile as her 14-year-old brother punched the animal. The girl suffered punctures and

lacerations on her chest, back and arms.

The last three attacks occurred within a 10-day period, at the same time as the Federal Minister of Environment was considering the safari hunting component of Northern Territory's Saltwater crocodile management program.

Caldicott, D.G.E., Croser, D., Manolis, C., Webb, G. and Britton, A. (2005). Crocodile attack in Australia. An analysis of its incidence, and review of the pathology and management of crocodilian attacks in general. *Wilderness and Environmental Medicine* (in press).

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### **Marshall Islands**

**LONG-DISTANCE MOVEMENT BY A SALTWATER CROCODILE.** In October 2004, the CSG was informed of a crocodile that was captured near Ailinglaplap Atoll (in the Railik Chain) in the Marshall Islands. This represents the first record of a crocodile in the Marshall Islands, which lies about 2000 km from Papua New Guinea/Solomon Islands, the closest population of crocodiles. Palau lies about 3100 km to the west of the Marshall Islands.

By the time a National patrol boat had arrived at the scene, locals had already captured and killed the crocodile. The patrol boat brought the crocodile to Majuro Atoll, but it had already begun to decompose (Fig. 1). Photographs sent by Glen Joseph (Director, Marshall Islands Marine Resources Authority) suggest that it was a Saltwater crocodile (*Crocodylus porosus*).



Nancy Vander Velde noted that at the same time as the crocodile was located a good deal of driftwood and other material appeared to be coming from the Papua New Guinea area. Soon after there was also a report of a long dugout canoe fitting the description of a Papuan canoe made of erima wood (*Octomeles sumatrana*). These observations point to the possible origin of the crocodile and prevailing currents that may have been involved. The CSG is awaiting further details on the crocodile itself.

*Report compiled by Charlie Manolis (CSG Regional Chairman for Australia and Oceania) using information provided by Nancy Vander Velde and Glen Joseph from the Marshall Islands.*

## Europe

### RESCUE STATION FOR CROCODYLIANS.

The first rescue station in Germany, especially for unwanted crocodilians, has been opened. Krokodilstation Golzow ([www.krokodilstation-golzow.de](http://www.krokodilstation-golzow.de)), owned and managed by Karl-Heinz Voigt, keeps 15-20 adult *Caiman crocodilus* and *C. yacare* in indoor and outdoor enclosures. Some of the animals were confiscated by German authorities, others came from private owners who have problems with their crocodilians. Krokodilstation Golzow is funded through donations from visitors and the owner's private money. Karl-Heinz Voigt is a member of DGHT's AG Krokodile, the crocodilian working group of the German Herpetological Society.

Ralf Sommerlad, *Roedelheimer Landstr. 42, Frankfurt 60487, Germany*, <[crocodilians@web.de](mailto:crocodilians@web.de)>.

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"NATURAL" OFFSPRING FROM *CROCODYLUS CATAPHRACTUS* IN EMMEN-ZOO. In early September 2005, Emmen-Zoo in The Netherlands once again had offspring hatch from our *Crocodylus cataphractus*. The breeding pair has been housed in the zoo since 1980, and has produced eggs since 1987. Until now, these eggs were always removed from the beach, and only occasionally incubated to hatch. Most of the years the eggs were directly destroyed after removal, because there is little interest from other zoos obtaining and maintaining this species. 2003 was the last time eggs were incubated, only one egg hatched that time (from 10 eggs, out of a clutch of 32).



This year the female made a small mound of sand, which was not as obvious as in previous years. Her behavior was less aggressive than usual after laying eggs, so we doubted if there were any eggs at all. But on 4 September, in the early morning, we found 5 dead (drowned?) hatchlings in the 80 cm deep pond. We saw the female take some young from the nest, and carry these in her jaws to the pond.

We quickly dug out the rest of the hatchlings and eggs from the nest, and put them in a separate enclosure. One

hatchling was a little deformed, the other 9 were perfect. They are raised on small fresh- and saltwater fish, boiled mussels, worms and baby mice. They are always hungry! Compared with other crocodile hatchlings they are surprisingly 'silent'.

Eddy Even, *Emmen-Zoo, The Netherlands*, <[even0013@planet.nl](mailto:even0013@planet.nl)>.

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## North America

### United States of America

TAKING ON A TOMISTOMA. In preparation for a major expansion scheduled to open in late 2007 or early 2008, the Virginia Aquarium and Marine Science Center has become the first facility in the United States to house a Tomistoma as a temporary exhibit. The goals of this exhibit are intended to provide the staff of the aquarium's Herpetology department with an opportunity to gain husbandry experience with this species, to generate public awareness of the Tomistoma and to raise funds for conservation.

The exhibit features "Pip," the captive-born Tomistoma hatched at Florida Cypress Gardens in 1999. Now six years old, Pip has spent the summer in a specially built exhibit featuring a 3200 litre pool in the aquarium's Bay and Ocean Pavilion Promenade Hallway. Originally scheduled for three months, the term of the exhibit has been extended until at least March 2006.

The exhibit also features photographs and information about the natural history of the Tomistoma, threats to its survival in the wild and the conservation efforts being initiated by the CSG's Tomistoma Task Force (TTF).

The Virginia Aquarium is providing financial support to the TTF at the Partner Donor Level. In addition, a donation station, located in front of the exhibit, has provided an opportunity for the general public to make additional contributions to the TTF. So far, these public donations have reached a total of \$US800.

Located in Virginia Beach, the Virginia Aquarium and Marine Science Center is an accredited member of the American Zoological Association, and the Alliance of Marine Mammal Parks and Aquariums.

William Harshaw (Chip), *Curator Mammals, Reptiles and Animal Training Supervisor*, <[charshaw@virginiaaquarium.com](mailto:charshaw@virginiaaquarium.com)>; and, Bruce Shwedick, *US Regional Coordinator, CSG Tomistoma Task Force*, <[shwedick@aol.com](mailto:shwedick@aol.com)>.

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## Science



### What's New in Crocodilian Research

Welcome to a new feature of the CSG Newsletter. Those of us in the research field are pleased, if not somewhat overwhelmed, by the enormous increase in scientific publications over the past few years that feature crocodilians. In 1976 Carl Gans and Tony Pooley wrote a scathing commentary on the appalling slaughter of African crocodiles for so-called research. They listed publications in which several thousand crocodiles had been killed and the only “scientific” information supplied was stomach contents (Gans and Pooley 1976). When I organized the first symposium on the biology of the Crocodylia in 1988 I bemoaned the fact that nearly all of the information on crocodilians was in the “gray literature” - unpublished reports to state wildlife agencies and the like. Today, in 2005, a simple search of the internet using either “crocodile” or “alligator” will reveal many hundreds of publications. Crocodilian research has come of age. In virtually all academic disciplines one will find crocodilians involved in some area of research. Alligators or crocodiles are the living exemplars for paleontologists studying fossil crocodilians and dinosaurs (Brochu 2001 and references therein). They are increasingly the focus of laboratory studies in comparative physiology (Franklin and Seebacher 2003; Seebacher and Franklin 2004; Munns *et al.* 2005), and with the revolution in molecular biology, crocodilians are the focus of studies on multiple paternity and mating systems (Davis *et al.* 2001; Isberg *et al.* 2004), molecular systematics (see the entire special issue of *Experimental Zoology: Molecular Development and Evolution* 294(4): 301-396), and gene expression studies in alligator embryos (Western *et al.* 2000).

The National Science Foundation of the USA has identified the alligator as a species of interest, and is supporting studies aimed at eventually sequencing the entire genome [see Travis Glenn's website ([www.reptilegenome.com/](http://www.reptilegenome.com/)) who is leading this endeavor]. Alligators have even featured in academic studies on marketing (Xu *et al.* 2004).

The number of graduate students working on crocodiles, alligators and caimans, in Australia, Mexico, Argentina, Brazil, Colombia, Venezuela, South Africa and the USA (if I have left out some countries, please let me know) continues to grow - a healthy sign for any field of research. This column's main focus will be to discuss one or two recently published papers in the scientific literature and list current publications. As it is almost impossible to track everything that is published any help here will be welcome. Two recent studies of particular interest used the latest in analytical technology to study lead accumulation in

crocodile and alligator bone. The first paper by Orlic *et al.* (2003) used microprobe analysis to study lead distribution in osteoderms of *Crocodylus porosus*. As far as I am able to understand the technology of this technique it involves bombarding the specimen (bone in this case) with high-energy particles and analyzing the resulting X-rays that are generated. For a review of the method see Trocellier (1997), but to understand this review a background in physics is required. This analysis is referred to as PIXE (proton-induced X-ray emission).

Dr. Michael Seltzer, an analytical chemist working for the US Navy, and an expert on trace elements, agreed to look at some bones from the captive-reared alligators from the Rockefeller Refuge that had inadvertently been fed nutria meat contaminated with lead. The evidence indicated that the alligators had been ingesting lead-contaminated meat for many years. We suggested that it might be possible to get an indication of the history of lead accumulation in alligator femurs if the lead was laid down in concentric rings, similar to the growth rings used in age studies (Erickson *et al.* 2004). The instrument Dr. Seltzer used to conduct this study is known as a Laser Ablation, Inductively Coupled Plasma Mass Spectrometer (laser ablation ICP-MS). This instrument can give an analysis of the make-up of rocks, diamonds, metals, etc., while leaving the sample essentially intact. All that is required for analysis is a virtually invisible cloud of sample material from the surface of the specimen of interest by a pulsed laser. In our case, a laser beam was tracked across the cleaned surface of a cross-section of the bone (femur) from the outer rim towards the center (Fig. 1). The stream of vaporized bone sample was fed into the inductively coupled plasma where individual elements were atomized and ionized. The component elements were separated according to atomic mass, and the concentration of various elements estimated based on a comparison between the measured ion intensity of a given element and that of calcium, an internal standard of known concentration. This analytical technique can detect with great accuracy elements at concentrations in the parts-per-billion range.

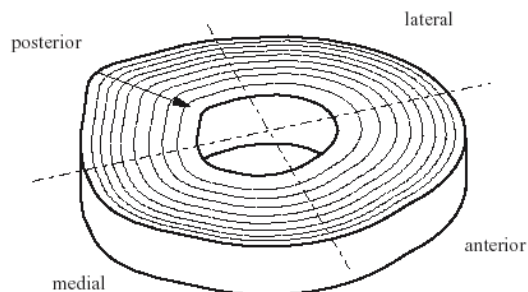


Figure 1. Notional drawing of femur section. The approximate location of the laser ablation is indicated by an arrow.

The results did indeed reveal what we had anticipated, peaks of high concentrations of lead could be seen at



regular intervals indicating long-term, periodic accumulation of the metal (Fig. 2.).

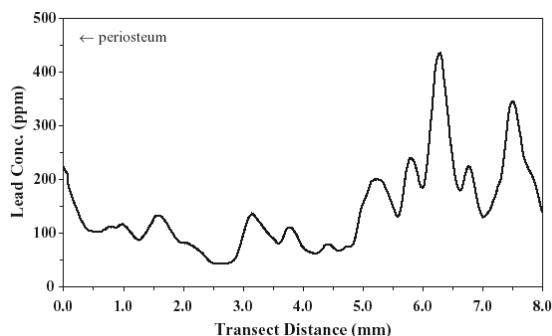


Figure 2. Transect profile of lead concentration in femur section from captive-reared alligator C4.

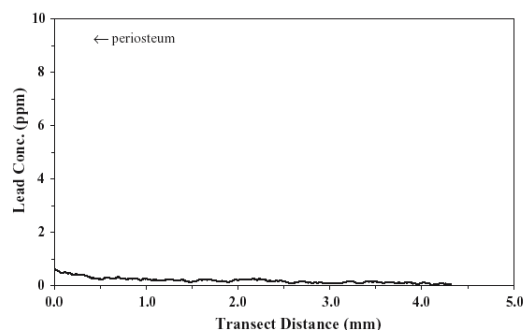


Figure 3. Transect profile of lead concentration in femur section from wild alligator W90.

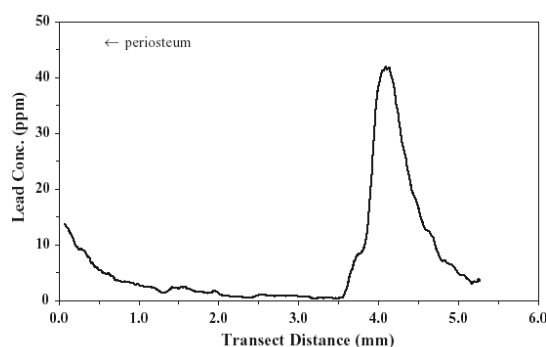


Figure 4. Transect profile of lead concentration in femur section from wild alligator W98.

One sample from a wild alligator showed a small peak of lead, less than one tenth the concentration seen in the bones of captive alligators, probably from an ingested a fishing weight, while other wild samples showed none (Figs. 3 and 4). One interesting additional item derived from this work was the differences in strontium concentration between bones of wild and captive alligators. Strontium levels in the bone of wild alligators were close to three times higher than those of captive alligators. A diet high in meat results in lower bone strontium than a diet high in

crustaceans and fish, known sources of strontium. For a copy of the paper please write to michael.seltzer@navy.mil.

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Dr. Val Lance, CSG Vice Chairman for General Research, <lvalenti@sunstroke.sdsu.edu>.

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Clem Tisdell, Hemanath Swarna Nantha and Clevo Wilson (2005). Australian tropical reptile species: ecological status, public evaluation, attitudes to their conservation and commercial use. Pp. 1-40 in *Trends in Biodiversity Research*, ed. by A.R. Burk. Nova Science Publishers: New York.

One marine turtle (*Eretmochelys imbricata*), one freshwater turtle (*Chelodina rugosa*), one snake (*Oxyuranus scutellatus*) and two species of crocodile (*Crocodylus porosus*, *C. johnstoni*) were considered in this study. Two serial surveys of a sample of 204 residents in Brisbane (Queensland, Australia) were undertaken; the first survey was based on the knowledge of respondents on the different species, and in the second survey the knowledge available to participants was experimentally increased.

Most respondents knew the crocodilians (96% and 95% for *C. porosus* and *C. johnstoni* respectively), compared to 82 for the snake, 65% for the freshwater turtle and 42% for the marine turtle.

Respondents were ranked on how much they knew about the species (knowledge rating: 3 (very good) to 0 (non-existent)) and the extent to which they liked the species [likeability rating: -2 (strongly dislike) to 2 (strongly like)]. In the first survey the knowledge and likeability indices for *C. porosus* were 1.66 (poor-good) and 0.3 (uncertain) respectively, and for *C. johnstoni* they were 1.51 (poor-good) and 0.4 (uncertain) respectively. In the second survey, the knowledge index increased slightly for both *C. porosus* and *C. johnstoni* (to 1.77 and 1.69 respectively), and likeability decreased (to 0.18 and 0.32 respectively). In contrast, with greater knowledge the likeability index for the Hawksbill turtle increased, for the freshwater turtle it remained the same, and for the snake it improved slightly. The snake remained the least-liked species, followed by the crocodiles.

With decreasing likeability there was an increased proportion of respondents who were in favour of sustainable commercial harvesting. When respondents were asked to apportion a certain amount of funding to

each of the five species, the snakes and crocodiles received a low proportion (about 10% each), in line with their likeability index. Again, when given a hypothetical amount of funding, respondents indicated that they would give about 50% to reptile conservation and 50% to a charity.

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**MOVEMENT OF CAIMANS IN SEARCH OF FOOD IN THE SOUTH PANTANAL.** Various studies have shown that animals move around in search of food, and that the availability of this food can also be the cause of directed movements. Crocodiles move for many reasons. *Caiman crocodilus yacare* are found in high densities in habitats that are flooded seasonally in the Brazilian Pantanal, and the food supply during the dry season probably influences their movement.

In 10 nocturnal studies, between 1989 and 1999, crocodiles and frogs were counted in an alkaline lake (pH 9.0-9.9) on the Nhumirim Ranch, belonging to Embrapa Pantanal. The results demonstrated that high densities of crocodiles (>500 individuals) were reported in only two studies, which coincided with high densities of frogs (>100 adults and large tagpoles per square metre). In other studies that detected low densities of tadpoles, few crocodiles remained in the lake. During the period of high concentrations of frogs, crocodiles were tagged. After the density of frogs had decreased, the total number remaining in the lake decreased drastically, and some crocodiles were recaptured 5 km away.

The explosive reproduction of the frog *Pseudis paradoxa* in the lake apparently resulted in the high concentrations of crocodiles, and when the density of frogs decreased, the number of crocodiles was also reduced to only a few individuals. It can be said that the movement of the crocodiles was stimulated by the variations in the concentration of the food supply in the lake, suggesting that crocodiles move in response to change in the density of their prey.

For more information, please consult the complete article: *Caiman crocodilus yacare* (Pantanal Caiman). Food-related movement. *Herpetological Review* 34(2), 2003.

Zilca Campos, *Embrapa Pantanal*, CP 109 Corumbá, MS 79320-900 Brazil, <zilca@cpap.embrapa.br>.

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**THE ROLE OF TEMPERATURE IN THE LIVES OF CAIMANS IN THE PANTANAL.** Temperature is an environmental variable that plays a fundamental role in the life history of crocodilians, as it determines the sex of individuals, embryonic growth, and the pattern of thermoregulation. The temperature selected by crocodilians is affected by their nutritional status, age, presence of infection, social relations, and the temperature at which the individual was incubated as an embryo.

The incubation temperature of the eggs determines the sex of the embryos of the Pantanal caimans, *Caiman crocodilus yacare*. Nests incubated at low temperatures (<31.5°C) produce females, while those incubated at high temperatures (>31.5°C) produce mainly males. The temperature of the nests varies in response to sun exposure, rain, and air temperature. The location of the nests, in forest or floating vegetation, is subject to various environmental conditions, which is reflected in sex ratio of the young. The temperature variation in nests located in the forest is smaller than in nests in floating vegetation. In addition, the temperature affects the embryonic development and the survival of the eggs. The newly hatched young are larger in warm nests than in cool nests, and have a greater chance of survival in their natural habitats.

Crocodylians are ectothermic animals that regulate their body temperatures through their environment, since the metabolic production of heat is insignificant. The body temperature of crocodylians is regulated by behavioral and physiological mechanisms, which can be adjusted through solar radiation and water temperature. The body temperature of the *Caiman crocodilus yacare*, in nature, varies considerably throughout the year in virtue of the variations in environmental temperatures. In the cold months, with alternating hot and cold days, the average body temperature (25°C) was lower than during the hot months of the year (30°C).

In Pantanal, the cold fronts generally last two to three days, with a fall in temperature of up to 20°C from one day to the next. During the cold season, the caimans lie in the sun on hot days, but their body temperatures rarely exceed the temperature of the air. On cold days, when the air temperature is lower than the temperature of the water, the caimans remain in the water and their body temperature approximates that of the water. In the hot season, which coincides with the dry period in the Pantanal, the caimans remain longer in shady areas than exposed to direct sun, on land as well as in the water. During this period, their body temperature is near the temperature of the water, even though they alternate between the land and the water.

The pattern of thermoregulation of the young is normally to expose themselves to the sun, when on land, the water surface, the shores of the lakes, or on aquatic vegetation, during the early hours of the morning and the late afternoon. Normally the body temperature of the young approximates the temperature of the environment in which they find themselves, mainly because they are able to warm up and cool down rapidly. High temperatures accelerate digestive processes and, consequently, cause an increase in appetite and improve the nutritional status of the young and the adults.

Environmental temperatures also regulate social and reproductive interactions. Caimans move around during the times of the day with more moderate temperatures

(early morning, late afternoon), and disputes for the females and vocalizations occur in the morning.

The implications of temperature on the lifestyle of the Pantanal caiman, the young as well as the adults, should be considered in conservation programs and species management programs in the Pantanal.

More information can be obtained from the complete articles: Campos, Z. (1993). Effect of habitat on survival of eggs and sex ratio of hatchlings of *Caiman crocodilus yacare* in the Pantanal, Brazil. *J. Herp.* 27: 127-132; Campos, Z., Coutinho, M. and Magnusson, W. (2005). Field body temperature of caiman in the Pantanal, Brazil. *Herp. J.* 15: 97-106.

Zilca Campos, *Embrapa Pantanal, CP 109 Corumbá, MS 79320-900, Brazil*, <zilca@cpap.embrapa.br>.

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Platt, S.G., Sovannara, H., Khemg, L., Thorbjarnarson, J.B. and Rainwater, T.R. (2004). Population status and conservation of wild Siamese crocodiles (*Crocodylus siamensis*) in the Tonle Sap Biosphere Reserve, Cambodia. *Natural History Bulletin of the Siam Society* 52(2): 133-149. (Reprints of this paper are available from Steven G. Platt, splatt@gwtc.net).

**Abstract:** We investigated the conservation status of the Siamese crocodile (*Crocodylus siamensis*) in the Tonle Sap Biosphere Reserve (TSBR), Cambodia, from June 2000 through September 2001. Tonle Sap is the largest freshwater lake in Southeast Asia and together with the surrounding wetlands comprises an area of 300,000 ha. We used a combination of daylight surveys, nocturnal spotlight surveys, and interviews of knowledgeable local persons to determine the status of wild crocodile populations. Our survey results indicate that small numbers of *C. siamensis* persist in several areas of TSBR, although the viability of these populations is questionable. Although earlier reports indicated that as many as four species of crocodylians (*C. siamensis*, *C. porosus*, *Gavialis gangeticus*, *Tomistoma schlegelii*) occur or formerly occurred in the Tonle Sap ecosystem, we found nothing to suggest that any species other than *C. siamensis* is currently present. Anecdotal evidence indicates that significant population declines in *C. siamensis* populations have occurred throughout TSBR, which we attribute to chronic over-harvesting to stock crocodile farms in Cambodia. While illegal, this practice continues, and market demand provides a strong incentive for villagers to harvest the last remaining wild crocodiles. We therefore recommend careful oversight of the farming industry coupled with in situ protection of wild populations. If adequate protection can be achieved, reintroduction into the secure core areas of TSBR is warranted. Finally, a rigorous monitoring program should be implemented to evaluate recovery efforts and detect future population trends.

Steven G. Platt, Alan Resetar, and Bryan L. Stuart. (2004). Maximum clutch size of the American alligator. *Florida Field Naturalist*, 32(2):102-106.

Abstract: We present data on a clutch of American alligator (*Alligator mississippiensis*) eggs that exceeds the previously reported maximum clutch size. This clutch consists of 75 eggs collected by Leon L. Walters and Herbert L. Stoddard in 1925 at Lake Miccosukee, Jefferson County, Florida, USA, and deposited in the Field Museum of Natural History (FMNH 8219). Fifty-seven intact eggs from the original clutch remain. Although the complete clutch is no longer extant, we accept the record of 75 eggs as it is independently reported in several contemporary sources. Egg width measurements indicate that a single female alligator produced this clutch. Some confusion surrounds the total length of this female, but an earlier report of 294 cm is accepted. Estimates of relative clutch mass and relative egg mass suggest this female maximized her reproductive output by producing a large clutch of small eggs relative to her body size.

[The complete paper can be downloaded at [www.wmi.com.au/csgarticles](http://www.wmi.com.au/csgarticles).]

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Kpera, G.N., Mensah G.A. and Sinsin, B. (2004). Crocodile products and by-products use in traditional medicine in northern Bénin. *Bulletin de la Recherche Agronomique de Bénin* No. 44, 12 pp.

Abstract: The study is carried out during 5 months in Borgou, Atacora and Alibori districts, located in the soudano-guinean zone in Northern Bénin. It permitted to make an inventory of crocodile products and by-products available on local markets of the study zone, on two Nigerians' markets (Samia and Babana) and on Niger's market (Gaya). In total 17 products and by-products were inventoried on the markets. It is composed of the skin, the muzzle, legs, the bone, the oil, the egg, the egg's shell, the anus, droppings, teeth, the bile, the liver, lungs, the heart, the penis, stones contained in crocodile stomach and the alive animal. These products result from poached wild crocodiles and cost twice less expensive in Bénin's than Nigeria's and Niger's markets, which are the large poles of marketing of wild animals products and sub-products. The products and by-products of crocodile are used in traditional medicine like remedies to cure diseases as the asthma, the inguinal hernia, the jaundice, the measles, the rheumatism, the otitis, the whitlow, the pain, etc. They are also look for obtaining certain supernatural capacities like the bad fates, sorcery, etc. So, the crocodile is regarded as a providential animal for the rural populations of northern Bénin because all its parts are used to cure diseases and to obtain supernatural capacities.

[The full version of article (in French) is available at [www.wmi.com.au](http://www.wmi.com.au)].

14 METRE LONG FOSSIL CROCODILE FROM THE AMAZON. An expedition of Peruvian researchers has found fossils of a 14 m long crocodilian, the greatest predator seen in the Amazon 15 million years ago, when it was a vast tropical sea instead of thick forest.

The gigantic skeleton of the crocodile, as well as the jaw and the set of teeth, were found under mud about 480 km northeast of Lima. Researchers determined that the crocodile weighed 9 tons, the head had was 1.3 m long, and the body was about 14 m long. This is the second fossil of this size and characteristics that has been discovered by scientists in the last 30 years, confirmed Rodolfo Salas, Head of Paleontology at the Museum of Natural History of Peru. The expedition that has found the rest of the reptile is financed by the University of Toulouse and the French company Devanlay.

Experts think that the crocodile fed on giant turtles, and in the Lima Museum of Lima there is a fossil of a turtle with the bearing the bite marks of the predator. "The finding of the fossil will help to reconstruct its environment and thus recover a little of the lost time of the past", said Salas.

Near the fossil crocodile the scientists also found fossils of other smaller reptiles, as well as of sluggish, giant armadillos. "Perhaps we will return to the zone next year, because at the time at which this crocodile lived the Andes began to rise with more force and began to produce the biological diversity of the Amazon", explained the paleontologist.

Source: El Mundo, Madrid, 6 September 2005.

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Cedeño-Vázquez, J.R., Ross, J.P. and Calmé, S. (2006). Population status and distribution of *Crocodylus acutus* and *C. moreletii* in southeastern Quintana Roo, México. *Herpetological Natural History* 10(1): 53-66.

Abstract: We conducted spotlight surveys and a mark-recapture program from February-October 2002 to determine the population status of the American and Morelet's crocodiles (*Crocodylus acutus* and *C. moreletii*, respectively) in southeastern Quintana Roo, México. We detected 645 crocodiles (46 *C. acutus*, 599 *C. moreletii*) along 205.2 km of survey route. *Crocodylus acutus* occurred in coastal saltwater habitats, and *C. moreletii* inhabited freshwater systems. In brackish creeks located in northern Chetumal Bay, *C. moreletii* occurred syntopically with *C. acutus*. The *C. acutus* population was largely composed of subadults (53.1%), followed by adults (34.3%), and juveniles (6.25%); whereas *C. moreletii* was equally represented by subadults (27.9%), juveniles (27.6%), and adults (25.9%), while hatchlings and yearlings constituted only 9.0% and 9.4%, respectively. Encounter rates for *C. acutus* were lower than for *C. moreletii* (0.13-2.69 and 0.87-7.57 crocodiles/km



respectively). Population sex ratio was not significantly different from parity for *C. moreletii*. At present, there are no major threats to the continued survival of Morelet's crocodile in the study area. On the other hand, the small population of *C. acutus* is threatened by accidental drowning in fishing nets and future development of nesting habitat for tourism.

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HOW LONG DOES IT TAKE FOR A CROCODILE TO ADAPT TO A NEW HEMISPHERE? In a past article I discussed the importation of a pair of adult saltwater crocodiles *Crocodylus porosus* from Australia [CSG Newsletter 2004, 23(1)]. I have always wondered how long it would take a female crocodile from one hemisphere to switch seasons and start laying eggs in a different hemisphere. I generally assumed that it would take a couple of years or more for her to make the transition.

The St. Augustine Alligator Farm Zoological Park imported a pair of adult saltwater crocodiles from Australia on October 24, 2003. The female was gravid at the time of importation and laid a clutch of eggs in the water within a month of arriving at our facility. The eggs were fertile, as evidenced by the opaque band that developed on each egg.

One and a half years after her arrival, our female saltwater crocodile made the transition to our spring season, and on 25 May 2005 she laid 35 eggs. These eggs also banded. This time she laid most of the eggs on land. She was most unfortunately interrupted by the male crocodile that is on exhibit with her. While she was laying her eggs, I snuck in the exhibit to video the event. The male notice me and started approaching. I attempted to push him back with a bamboo pole, but he reached up and grabbed her by the tail and pulled her in the water. She seemed pretty shocked by this, but did not let it slow her down. She laid several more eggs in the water and then crawled back to her nesting location and laid the rest of her eggs. She covered the nest as a good crocodile should and is very defensive of that entire nest location. You can see a short video clip of Sydney (our female saltwater crocodile) being pulled off the nest by Maximo [our 15' 3" (4.65 m) male Saltwater crocodile] on our website: [www.alligatorfarm.com](http://www.alligatorfarm.com). He outweighs her by more than 1000 pounds (455 kg). Even so, she seems unharmed by the event.

John Breuggen, *Director, St. Augustine Alligator Farm Zoological Park, St. Augustine, Florida, USA*, <[Jbreuggen1@aol.com](mailto:Jbreuggen1@aol.com)>.

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TRANSVAAL GEM IS A LIMITED EDITION. As reprinted in Branch and Bauer (2005), the species *Alligator cowieii* was described by Smith (1831), and Smith (1836) mentioned the same crocodiles. Although Smith (1836) did not utilise a Latin name for the animal, and Smith (1849) called it *Crocodylus marginatus* Geoffroy, the

locality data makes it certain that the three papers (Smith 1831, 1836, 1849) were referring to the same animal, which at present is on the IUCN's list for CITES as *Crocodylus niloticus cowieii*.

#### Literature

Branch, W.R. and Bauer, A.M. (2005). The herpetological contributions of Sir Andrew Smith, with an introduction, concordance of names, and annotated bibliography. SSAR: USA. 80 pp.

Smith, A. (1831). Contributions to the natural history of South Africa. South African Quarterly Journal 2(5): 9-24. [Reprinted in Branch and Bauer (2005)].

Smith, A. (1836). Report of the Expedition for Exploring Central Africa. Cape of Good Hope Assoc. for Expl. Cent. Afr., 64 pp.

Smith, A. (1849). Illustrations of the Zoology of South Africa: Reptilia. Smith & Elder: London.

Franklin D. Ross, *Dept. Vertebrates, National Museum of Natural History, Leiden, the Netherlands*.

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MORE THAN THE SPELLING WAS DEFICIENT. Since it is widely agreed that Fuchs (1971) produced two empty names when he failed to correctly describe and distinguish *matogrossoi* and *paraguayensis* as names of South American caymans, it then follows that when Fuchs (1974) changed the spellings to *matogrossiensis* Fuchs, and *paraguayensis* Fuchs, he had empty names also, because again no holotype was designated, and not enough distinguishing characters were presented. Also, changing the spelling of *paraguayensis* to *paraguayensis*, by someone else later, did not fix the problem. However, somehow the two Fuchs subspecies have gotten onto the IUCN approved list of crocodilian taxa regulated by CITES.

The rules of zoological nomenclature say that a species group name can not be proposed in one paper, and then have the type material designated in a later paper. This did not happen in the case of the Fuchs names, but if it had happened, they still would not count. There is a temptation to list these two Fuchs names as junior synonyms of *Caiman crocodilus* (Linnaeus), or as junior synonyms of *Caiman yacare* (Daudin), but I warn against both. If we knew enough about the animals to be able to assign them to species, the names would not be empty.

#### Literature

Fuchs, K. (1971). Die südamerikanischen Reptilhäute. Das Leder 22(9): 197-213.

## Blast from the Past



Ruth Elsey (LFWS) came across this old photograph from the 1976 Crocodile Specialist Group meeting held in Maningrida, Northern Territory, Australia. From left: Vic Onions, F. Wayne King, Howard Campbell (dec), Robert Chabreck, Hugh Cott (dec), René Honnegger and Tony Pooley (dec). Photograph: Ted Joanen.

Fuchs, K. (1974). *Die Krokodilhaut*. Eduard Roether: Darmstadt.

Franklin D. Ross, *Dept. Vertebrates, Nationaal Natuurhistorisch Museum, PO Box 9517, Leiden 2300-RA, the Netherlands*.

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## Obituary

It is with deep sorrow that we announce that long-time CSG member Phil Hall passed away on 11 December 2005 at the Palm Garden Rehabilitation Centre, where he was building up his strength after surgery on a spinal cyst. We extend our sincerest condolences to Phil's wife, Marilyn, and family.

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## 18th CSG Working Meeting

Location: Hotel du Monard, 5km out of Montélimar, France  
Hosted by: La Ferme aux Crocodiles at Pierrelatte

Dates: 19 June - CSG Steering Committee meeting  
20-23 June - Working meeting  
24 June - field trip (optional)

Registration: Online registration can be done at <[www.lafermeauxcrocodiles.com/reservation-fr.php](http://www.lafermeauxcrocodiles.com/reservation-fr.php)>. Downloadable registration forms are available at <[www.lafermeauxcrocodiles.com](http://www.lafermeauxcrocodiles.com)>, and can be faxed to the organisers (see below).

Papers: Submit through <[www.lafermeauxcrocodiles.com/meeting](http://www.lafermeauxcrocodiles.com/meeting)>.

Accommodation: All accommodation is being handled through the Montélimar tourist office (congres@montelimar-tourisme.com; Tel 33 4 75 010 020; Facs 33 4 75 52 33 69). Price ranges of hotels are available from the website, and additional details on hotels will be posted soon.

Additional information is available from: Samuel Martin (info@lafermeauxcrocodiles.com; Tel: 33 4 75 960931; Facs: 33 4 75 963907).

## Steering Committee of the Crocodile Specialist Group

Chairman: Professor Grahame Webb, P.O. Box 530, Sanderson, NT 0813, Australia

For further information on the CSG and its programs, on crocodile conservation, biology, management, farming, ranching, or trade, contact the Executive Office (csg@wmi.com.au) or Regional Chairmen

**Deputy Chairmen:** Dr. Dietrich Jelden, Bundesamt für Naturschutz, Konstantin Str. 110, D-53179 Bonn, Federal Republic of Germany, Tel: (49) 228 849 1453, <JeldenD@bfn.de>; Alejandro Larriera, Pje. Pvd0. 4455, Centeno 950, Santa Fe, Argentina, Tel: (543) 42 4531539, Fax: (543) 42 558955, <yacare@arnet.com.ar>.

**Executive Officer:** Tom Dacey, P.O. Box 98, Clifton Beach, QLD 4871, Australia, Tel/Fax: (61) 7 40553060, Cell: (61) 419704073, <csg@wmi.com.au>.

**Treasurer:** Dr. Perran Ross, Department of Wildlife Ecology and Conservation, P.O. Box 110430, University of Florida, Gainesville, FL 32611, USA, Tel: (1) 352 392 7137, <rossp@wec.ufl.edu>.

**Regional Chairman, Africa:** Dr. Richard Fergusson, 8 Maiden Dr., Highlands, Harare, Zimbabwe, Tel/Fax: (263) 47 76203, Cell: (263) 91 285103, <zehtco@zol.co.zw>. **Regional Vice Chairmen:** Madagascar, Olivier Behra <OlivierBehra@MATE.mg>; West Africa, Ekkehard Waitkuwait <Waitkuwait@aol.com>.

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**Regional Chairman, Australia and Oceania:** Charlie Manolis, P.O. Box 530, Sanderson, NT 0813, Australia, Tel: (61) 8 89224500, Fax: (61) 8 89470678, <cmanolis@wmi.com.au>. **Regional Vice Chairmen:** David Wilken <crocfarm@mainland.com.pg>; Steve Peucker <steve.peucker@dpi.qld.gov.au>.

**Regional Chairman, West Asia:** B.C. Choudhury, P.O. Box 18 Chandrabani, Dehra Dun, Uttaranchal, India, <bcc@wii.gov.in>. **Regional Vice Chairmen:** Harry Andrews <mcbtindia@vsnl.net>; Dr. Tirtha Man Maskey <maskey@gausala.wlink.com.np>; Jayantha Jayawardane <romalijj@eureka.lk>; Abdul Aleem Choudhury <mhaleemi@isb.iucnp.org>; Ashgar Mobaraki <amobaraki@hotmail.com>; Dr.S.M.A. Rashid <carinam95@yahoo.com>.

**Regional Chairman, Latin America and the Caribbean:** Alvaro Velasco, Apartado Postal 66597, Caracas, Venezuela, Tel: (58) 414 254 6054, <velascoalvaro@tutopia.com>. **Regional Vice Chairmen:** Central America, Manuel Muñiz <moreletii@prodigy.net.mx>; Caribbean, Roberto Soberón <soberon@ffauna.sih.cu>; northern South America, Giovanni Ulloa <croco\_mangle@hotmail.com>; southern South America, Luciano Verdade <lmv@esalq.usp.br>; Regional Trade, Bernardo Ortiz <bernardo.ortiz@traffic.sur.iucn.org>.

**Regional Chairman, Europe:** Dr. Jon Hutton, Fauna & Flora International, Africa Programme, Great Eastern House, Tenison Rd., Cambridge CB1 2DT, UK, Tel: (44) 1223 571000, Fax: (44) 1223 461481, <jon.hutton@fauna-flora.org>. **Regional Vice Chairman:** Ralf Sommerlad, Roedelheimer Landstr. 42, Frankfurt Hessen, Germany 60487, <crocodilians@web.de>.

**Regional Chairmen, North America:** Dr. Ruth Elsey, Louisiana Wildlife

and Fisheries Department, 5476 Grand Chenier Way, Grand Chenier, LA 70643, USA, Tel: (1) 337 5382165, Fax: (1) 337 4912595, <relsey@wlf.louisiana.gov>; Allan Woodward, Florida Fish and Wildlife Conservation Commission, 4005 S. Main Street, Gainesville, FL 32601, USA, Tel: (1) 352 9552230, Fax: (1) 352 3765359, <allan.woodward@myfwc.com>. **Regional Vice Chairmen:** Noel Kinler <kinler\_n@wlf.state.la.us>; Harry Dutton <harry.dutton@myfwc.com>.

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**Vice Chairman for IUCN:** Dr. Perran Ross, Department of Wildlife Ecology and Conservation, P.O. Box 110430, University of Florida, Gainesville, FL 32611, USA, Tel: (1) 352 392 7137, <rossp@wec.ufl.edu>.

**Vice Chairman, Industry:** Don Ashley, Belfast Dr., Tallahassee, FL 32317, USA, Tel: (1) 850 893 6869, <Jdalligator@aol.com>. **Deputy Vice Chairmen:** Yoichi Takehara <official@horimicals.com>; C.H. Koh <henglong@starhub.net.sg>; Kevin Van Jaarsveldt <kvj@mweb.co.za>; Philippe Roggwiler <proggwiler@aol.com>; Enrico Chiesa <enricochiesa@italhide.it>; Jorge Saieh <jsaieh99@yahoo.com>; Thomas Kralle <Thomas@Kralle.com>; Chris Plott <cjp@amtan.com>; Eric Silberstein <caifor@ciudad.com.ar>.

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**Vice Chairman, Zoos and Community Education:** Kent Vliet, University of Florida, Gainesville, FL 32611, USA, Tel: (1) 352 3928130, Fax: (1) 352 3924738, <kent.vliet@zoo.ufl.edu>.

**Vice Chairman, General Research:** Dr. Valentine Lance, Graduate School of Public Health, San Diego University, San Diego, CA, USA, <lvalenti@sunstroke.sdsu.edu>.

**CSG Red List Authority:** Dr. John Thorbjarnarson, Wildlife Conservation Society, P.O. Box 357625, Gainesville, FL 32635-7625, USA, Tel: (1) 352 2647775, <jthorbjarnarson@wcs.org>.

**Honorary Steering Committee Members:** Prof. Harry Messel (Australia), Ted Joanen (USA), Romulus Whitaker (India), Phil Wilkinson (USA), Prof. F. Wayne King (USA).

**Ex-Officio Members:** Tomme Young, IUCN (Vice Chair for Legal Affairs), <TYoung@elc.iucn.org>.

**Task Force/Working Group Chairmen:** Indian Gharial, Nikhil Whitaker <kachuga21@hotmail.com>; Chinese Alligator, Jiang Hongxing <hxjiang@forestry.ac.cn>; Tomistoma, Ralf Sommerlad <crocodilians@web.de>; Philippine Crocodile, Chris Banks; **Commercial Live Exports,** Dr. Perran Ross <rossp@wec.ufl.edu>; **Human-Crocodile Conflict,** Dr. Richard Fergusson <zehtco@zol.co.zw>.



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