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NEWSLETTER

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

EDITORIAL AND EXECUTIVE OFFICE:
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COVER PHOTOGRAPH: Phil Wilkinson was recently awarded the Order of the Silver Crescent, South Carolina's highest award for volunteer and/or community service, for his continuing work in alligator research and management in South Carolina more than 10 years following his retirement from the South Carolina Department of Natural Resources. See pages 4-6. Photograph: Thomas Rainwater.

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Editorial

The 16th Meeting of the Conference of the Parties to CITES (CoP16) will be convened in March 2013, in Bangkok, Thailand. Three amendments proposals involving crocodilians have been submitted for consideration at CoP16. Thailand, the host country, is seeking to transfer the Thai populations of both *Crocodylus porosus* and *C. siamensis* from Appendix I to Appendix II. Colombia is seeking to transfer the *C. acutus* population in Cispata Bay, where there has been a very active conservation effort, from Appendix I to Appendix II. Various comments on these proposals were provided by CSG members, and advice has been forwarded to the IUCN for consideration in their analysis of the proposals. All three proposals have difficulties satisfying the conditions of Resolution Conf. 9.24 (Rev. CoP15), especially the Thai proposals, and so their acceptance or rejection by the Parties may well depend on last minute annotations that provide further clarification and safeguards.

The CSG extends its congratulations to life member Phil Wilkinson, who received The Order of the Silver Crescent, South Carolina's highest award, in January 2013. Full details are on pages 4-5.

The CSG Executive Officer, Tom Dacey, undertook a CSG mission to Lao PDR in December 2012. A summary of the report is included on pages 4-6. A CSG mission to Indonesia has long been planned, to discuss *C. siamensis* conservation and generally update our understanding of how crocodile management and the industry have changed since the early 1990s, but as yet no final arrangements have been made.

For the second year in a row, 2012 saw heavy rains in Thailand and Vietnam, resulting in the escape of crocodiles from farms in both of those countries. An unknown number of crocodiles escaped from a crocodile farm in Rayong, Thailand, and over 100 crocodiles escaped from a crocodile farm in Ca Mau City, Vietnam. Authorities in the respective countries have taken necessary action to protect the public and recover the crocodiles.

I provided a letter of support for the proposed Cambodian Siamese Crocodile Reintroduction and Reinforcement Plan, developed by the Ministry of Agriculture, Forestry & Fisheries and Fauna & Flora International. The challenge of ensuring wild populations of *C. siamensis* have a secure future in Cambodia, has long been a CSG priority. Once populations are lost, as occurred in Thailand, and local people become used to wetlands without crocodiles, the chances of successfully re-establishing them become less and less as time passes.

The CSG funds manager, the International Association of Crocodile Specialists Inc. (IACS), held its Annual General Meeting at the end of October 2012, to receive the audited financial report for the 2011/12 financial year and elect office bearers. Due to the kindness of our donors, in both cash and kind, the CSG is gradually building sufficient resources to sustain its core activities, despite the costs of doing so escalating annually.

With the permission of image owners, the CSG provided images of the 23 species of crocodilian to the "Man and the Biosphere" project. These will be used in articles the journal is proposing about the conservation of the Chinese alligator and the evolution, taxonomy, biology and conservation of all of the 23 species.

Sarawak has implemented crocodile-free zones (CFZs) in rivers with high human usage in an effort to minimise human-crocodile conflict. The Sarawak Forestry Corporation (SFC) has established the Swift Wildlife Action Team (SWAT) to catch and relocate Saltwater crocodiles found in CFZs, which include the Kuching Waterfront and the Miri Waterfront.

An American Crocodile Workshop will held on 15 February 2013 at the Keys Gate Golf and Country Club, Homestead, Florida, to discuss the current situation and conservation needs for the species in Florida and Jamaica. The meeting will bring together experts and responsible institutions to review the situation and propose steps for conservation action. The workshop is being sponsored by the CSG, Florida Light and Power Company, Lacoste-Save Our Logo, the Crocodile Conservation Institute, and an anonymous donor.

"A Night for the Crocs" evening gala and fundraiser for the CSG's Tomistoma Task Force will return to Zoo Miami on 16 February 2013. Since 2003, funds raised by the CSG-TTF have been used to fund Tomistoma population assessment surveys and ecological studies throughout Kalimantan, Indonesia, as well as surveys that are soon to commence in Peninsular Malaysia.

I would like to remind members again that the 22nd CSG Working Meeting will be held in the Goldi Sands Hotel, Negombo, Sri Lanka, from 20-23 May 2013. Details can be found on the meeting website (www.csgsrilanka.com), including a diversity of field trips in a remarkable country with a rich and ancient culture. The closing date for Early Bird registrations is 31 March 2013, so I suggest that intending participants register early. The meeting will also be preceded by a hands-on-training workshop on veterinary techniques at the Dehiwala Zoological Gardens, Colombo, on 19 May.

Professor Grahame Webb, *CSG Chairman*

Obituary

Alfonse Mava (1954-2012)

Alfonse was born in his local village of Bruknowi, in Ambunti District, East Sepik Province, Papua New Guinea. He had a limited education, going as far as Year 6 in 1974. He spent most of his lifetime in the local community and was an enthusiastic supporter of crocodilian conservation,

He made a name for himself within the local communities and visitors from abroad, working with educational institutions or as a tourist guide in his early days, who were eager to learn more about the culture and the environment of the Sepik people of Papua New Guinea.

He hunted and wrestled wild rogue crocodiles underwater that were a threat to local communities and forced them into submission. He had a vast traditional knowledge of crocodiles and their existence, amalgamating that with limited science he gained working with various knowledgeable people. He was the PNG equivalent of Australia's "Crocodile Dundee".

He contributed immensely towards the crocodile program in the Sepik with the late Jack Cox through the UNDP/FAO program, and later was very much involved in the establishment of the local Community Based Organization (CBO) - Sepik Wetlands Management Initiative (SWMI), which is still in existence. He also contributed towards the wild harvest program initiated by Mainland Holdings and was very much part of the team effort to bring value-added sustainable benefits in conservation to his local communities.

He gained a lot of respect both externally and from within the communities along the Sepik Wetlands that he lived amongst and worked with over the years. Let me put it this way "A simple villager who has a big heart for the crocodile industry and its conservation in the whole of the Sepik River". He was very much interested in everything natural, and even assisted the late Jack Cox to carry out a biodiversity study on the summit of PNG's Hunstein Range. Losing Alfonse is a loss for all of us locally and for crocodile conservation. There is a large group of people scattered around the world who can recall truly enjoyable times with Alfonse in the field, carrying surveys or just having a beer. The type of work with which Alfonse was passionately involved is usually done under somewhat trying conditions (boats/motors breaking down, running out of food, hot and humid beyond belief, the mosquitoes are hell), but unfazed by all these, at the end of the day Alfonse still had a sense of humor and was positive to the very end.

Alfonse was truly a gentleman and will greatly be missed by his SWMI team mates, DEC, MHL and his immediate family in Ambunti, Papua New Guinea. Rest In Peace.

Godfrid Solmu, Mainland Holdings, Lae, Papua New Guina

22nd CSG Working Meeting

Colombo, Sri Lanka, 20-23 May 2013

The 22nd CSG Working Meeting will be held in Colombo, Sri Lanka, from 20-23 May 2013. This represents a slight deviation from normal CSG practice, in that this meeting will take place 12 months after the 21st Working Meeting (Manila, May 2012).

With a "Living with Crocodilians" theme, we encourage people to participate in what will be the first CSG Working Meeting in the South Asia and Iran region since 1978. Details on the meeting are available at <csgsrilanka.com>.

CSG Member Receives South Carolina's Order of the Silver Crescent

Phil Wilkinson, CSG life member, has been recognized by the Governor of South Carolina, Nickky Haley, for his continuing contributions to research on the American alligator and for his collaborative efforts with the Medical University of South Carolina at the Yawkey Wildlife Centre. The Order of the Silver Crescent is South Carolina's highest award, only given to individuals who have contributed extraordinary community service to the state. The award recognises Phil's long-standing work as a wildlife biologist at South Carolina Department of Natural Resources (SCDNR), managing wildlife resources.

The award ceremony was held at the newly refurbished auditorium of the school that Phil attended from first grade through high school (12 years) in Georgetown, South Carolina. This is less than a kilometre from the house where he currently lives.

Phil's long-time friend and classmate at the same school, Danny Brabham, presided over the ceremony. When Phil and Danny when were in high school, Danny was the quarterback on the football team and Phil was the full back (running back). This was around 1952. Their football coach, who must now be in his late 90s, was in attendance at the ceremony and seated on the front row.

Danny opened with a few words about Phil, the old days at the school, and then about Phil's long career with the SCDNR

and his accomplishments and contributions as an alligator biologist for the state. He also noted that Phil continues his work today, over a decade following his retirement.

Danny then turned the floor over to Professor Lou Guillette of the Medical University of South Carolina and Hollings Marine Laboratory in nearby Charleston. Lou pointed out that in addition to his work in South Carolina, Phil has also had numerous national and international collaborations in crocodilian research and management over the years. He commented that Phil was part of the generation of alligator biologists who worked to prevent the species' extinction during the 1960s and 1970s. He then emphasized that Phil's early work on the reproductive ecology of alligators in South Carolina was the foundation for much of the current knowledge and research on this topic, and his continued studies on the same alligator population for over 30 years is now beginning to provide valuable insights into long-term growth, site fidelity and senescence. Lou went on to explain his current collaboration with Phil, and how Phil's knowledge and long-term research has provided the basis for their ongoing studies examining the influence of environmental stressors (eg pollution, climate change) on alligator health, and how this may relate to human health. But perhaps Phil's greatest contribution has been his role as a mentor to so many people. This was evidenced by the crowd of around 70 people attending the ceremony, including five generations of collaborators, co-workers, students, friends and family.

Jack Scoville, the Mayor of Georgetown, on behalf of the Governor of South Carolina, then presented Phil with the Order of the Silver Crescent, which is awarded to a resident of South Carolina for exemplary performance, contribution and achievement within the community. It is the state's highest award for volunteer and/or community service. Phil's continuing work in alligator research and management in South Carolina for more than 10 years following his retirement was the basis for his nomination and eligibility for the award.

Figure 1. Phil Wilkinson (right) receives the Order of the Silver Crescent from the Mayor of Georgetown (left) while long-time friend Danny Brabham (middle) looks on. Photograph: Thomas Rainwater.

Phil, not one for being in the limelight, then briefly took the floor. He thanked the Mayor and Governor for the award and everyone for attending the ceremony. He then humbly stated that all of his accomplishments over the years have been the result of a team effort, and he thanked his many co-workers and collaborators, many of whom were in attendance. Finally, he said it was gratifying and exciting that the work he has done and continues to do seems to be opening new doors for research in crocodilian biology, referring to his current collaborative work on long-term growth, site fidelity, senescence, ecotoxicology and population genetics. Though everyone was hanging on the edge of their seat for a few of Phil's famous colloquialisms, or perhaps a story or two, he kept things concise and professional and ended with that.

Figure 2. From left, Thomas Rainwater, Phil Wilkinson, Lou Guillette and Satomi Kohno, at the award ceremony. Photograph: Brenna Dohenny.

Figure 3. From left, "Woody" Woodward, Christy Wilkinson and Phil Wilkinson capture a female alligator (Yawkey Wildlife Centre, 2010). Photograph: Thomas Rainwater.

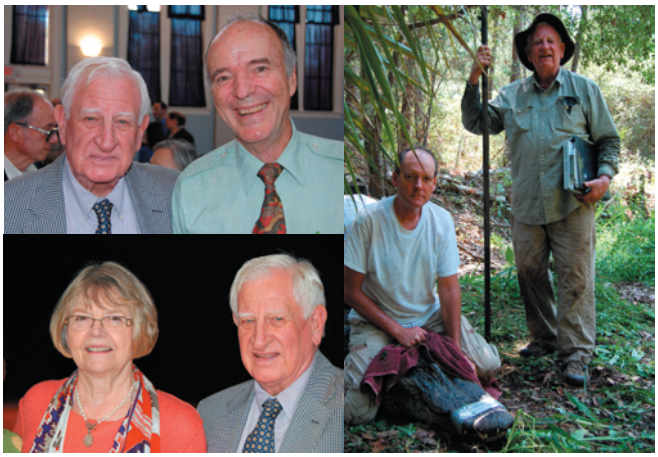

Figure 4. Phil Wilkinson with "Ab" Abercrombie (top left), Steve Platt (right), and partner Libby Bernardin (bottom left). Photographs: Thomas Rainwater.

The ceremony was followed by an on-site reception, at which time attendees came down to greet and congratulate Phil.

Thomas Rainwater, *CSG Regional Vice Chair for North America, <trrainwater@gmail.com>.*

Summary Report on Visit to Lao PDR

At the invitation of the Lao Department of Forest Resource Management (DFRM), Ministry of Natural Resources, and with logistic support provided by the Wildlife Conservation Society - Lao Programme, I visited Lao PDR from 2-10 December 2012. It was unfortunate that Yosapong Temsiripong and Dr. Parntep Ratanakorn had to withdraw from the mssion at the last minute.

The aim of the visit was to provide the Crocodile Specialist Group (CSG) with a better understanding of the local threats to conservation and the opportunities for collaboration in crocodile conservation in Lao PDR. Specific objectives were to:

1. Meet with relevant Government authorities to review current status of and understand government policies and needs regarding crocodile management.
2. Visit the Lao Zoo and view the captive breeding program and meet with zoo representatives to discuss ongoing support.

3. Visit the Ramsar Champhone wetlands to view critical remaining crocodile habitat and village-based conservation.

During the visit I had the opportunity to meet with and have discussions with a range of representatives in Vientiane, Lao Zoo, Savannakhet, and Tansoun and Ban Noa Nua villages in Savannakhet Province.

Institutional Structure

The Wildlife Management Section, Department of Forest Resource Management, Ministry of Natural Resources, is responsible for crocodiles. It is also the CITES Management Authority. The CITES Scientific Authority is the Biotechnology and Ecology Institute, Ministry of Science and Technology.

Legal and Regulatory Procedures

All wildlife in Lao PDR is subject to the "*Wildlife and Aquatic Law, 2007*". Under this legislation, wildlife is classified into three groupings, namely: General use; Managed use; or, Restricted use. Crocodiles are classified under "Restricted use", which stipulates that there will be no hunting, collection or use or sale of products. There are no crocodile farms in Lao PDR.

Historically, there was trade in crocodiles between Lao PDR and neighbouring countries (eg Thailand, Cambodia) (Bezuijen *et al*. 2006). Whilst I was not made aware of any current illegal trade in crocodiles in Lao PDR, given that Laos borders countries with extensive trade in crocodiles and the lack of understanding of the legal status of crocodiles by rural communities in the country, the potential for illegal trade exists, and efforts with public education and enforcement will be important in mitigating it. In a patisserie shop in Vientiane I saw a small jar of "crocodile pate" for sale.

Captive Management

The privately-owned Lao Zoo is located 80 km outside of Vientiane. It holds around 250 crocodiles, which are housed in five large outdoor pens (adults) and three smaller outdoor pens (juveniles and hatchlings). Diet consists mainly of freshwater fish.

Eggs are incubated in polystyrene boxes containing media (rice husk?), with heat provided through a heating lamp. Water on the floor of the "incubation room" provides an unknown level of humidity.

Most of the adults are considered to be hybrids, as their origin is uncertain (see Platt 2012). However, 3 male and 5 female adults, held separately from the other adults, are believed to be pure *C. siamensis*. DNA testing is currently underway on these animals, and the results are due in January 2013. These adults currently produce 3 nests per year (approximately 100 eggs). Should testing confirm that these 8 adults are indeed pure *C. siamensis*, their progeny could be used in the head-starting program (see later). Nest production from the hybrid adults (>50) is about 10 nests per year, but hatchling production is low, mainly due to high egg infertility.

The zoo also maintains a separate raising facility, where in cooperation with WCS, *C. siamensis* hatchlings derived from wild eggs incubated at the zoo (see above) are raised as part of the head-starting program. In 2011, 33 wild eggs were incubated producing 20 hatchlings (one died recently). In 2012, 28 wild eggs were incubated, producing 17 hatchlings. At the time of the visit 19 yearlings and 17 hatchlings were being raised as part of the head-start program.

Figure 1. Hatchling *C. siamensis* produced from wild eggs incubated at Lao Zoo.

Wild Populations and Habitats

In Savannakhet, I was briefed by the WCS Crocodile Management Team on its activities in the Ramsar Champhone wetlands. An objective of the WCS program in this area is to assist Government to conserve the wetlands and ensure the conservation of wildlife species, including crocodiles, through involvement of community-based crocodile conservation teams. Most project sites are located in the floodplain of the Champhone River, a tributary of the Xe Banghiang River, which in turn flows into the Mekong River. The headwaters of the Champhone River originate in northern regions of Savannakhet Province.

WCS have developed and successfully conducted two crocodile workshops with village-level participants. Through such workshops WCS works closely with established community-based crocodile conservation teams to ensure development of suitable skill sets, and the collection of biological data at crocodile conservation sites.

In Savannkhet Province we visited:

- Tansoum Village: In 2012 the majority of eggs from a wild *C. siamensis* nest were transported to Lao Zoo for incubation (see above), but 5 eggs from were retained for incubation at Tansoum Village. Similar incubation methods were used as in Lao Zoo.

  The four resulting hatchlings are now being raised in the village for the WCS head-start program. Based on visual observation, growth rates of these hatchlings appear to be higher than those of sibling hatchlings being raised at Lao Zoo. The former are fed small live freshwater fish and eels. The villagers indicated that the hatchlings prefer the baby eels.

  We travelled by canoe through Champhone Wetlands, where regular population surveys are undertaken by trained villagers, and where nesting is known to occur. Eggs have been collected from here in 2011 and 2012 for the head-start program. The main threat to these wetlands is the encroachment by agricultural activities (eg rice is the principal crop produced in the lowlands of Savannakhet Province).

  Discussions with village elders revealed their knowledge of crocodiles and their aspirations with respect to tourism. They indicated that there have always been crocodiles nesting in this area and they wish to maintain the wetlands and wildlife to support the proposed development of eco-tourism, with guided tours of the wetlands. WCS is assisting the villagers through capacity building workshops and training (see above).

- Ban Nao Nua Village: Together with Mr. Chanthone Phothitay (Deputy, Wildlife Management Section, DFRM) and the WCS Crocodile Management Team, I met with village elders and a district official at Ban Nao Nua.

  Here, I was privileged to witness a tradition of the calling of a large (3 m TL) *C. siamensis* (Fig. 2) from the lake, which is undertaken for cultural purposes. Whenever the villagers are contemplating any major decisions, they have the senior village elder go to the edge of the nearby lake and "call" the crocodile out of the water by imitating the vocalizations of a hatchling and offering food (either pork or chicken). The crocodile comes out of the water and the elder "seeks" the advice of the crocodile on the relevant issue and advises the villagers of the outcome. On the occasion of my visit the elder performed the ceremony, but only offered watermelon (which the crocodile ate), as the "calling" was not on an issue of importance.

  The crocodile appears to be the only one in the lake, and its sex (female) is based on the production of a nest each year containing infertile eggs. The villagers are currently considering a suggestion to introduce a male *C. siamensis* from Lao Zoo into the lake; however, consultation by the elder with the crocodile has not supported this proposal to date.

Such strong religious beliefs among the local communities regarding crocodiles appear to provide a high degree of protection to the animals at these two locations.

Figure 2. Female *C. siamensis* at Ban Nao Nua village.

Village elders indicate that there has not been any major human-crocodile conflicts in either area, despite the regular activities of the villagers in the waters of these areas. Only one incident was cited, that of a local fisherman being bitten by a crocodile whilst fishing in waist-deep water in the lake, about 6 years ago. It is not uncommon to see families bathing in the lake and children playing at the water's edge. The

villagers also produce a range of handicrafts that would be saleable items, should eco-tourism develop.

Prior to departing Lao PDR I met with DFRM and WCS representatives in Vientiane, and gave a brief presentation on the outcomes of my visit, including the following recommendations:

1. WCS, with the support of DFRM, should maintain and strengthen efforts to identify remnant *C. siamensis* populations and suitable sites for the release of head-started *C. siamensis*, through continuation of regular surveys for crocodiles and their nests in the wild. Such surveys will also assist in gaining a clearer understanding of the size of the wild *C. siamensis* population in Lao PDR.

2. Carry out DNA testing of crocodiles in Lao Zoo, that are proposed for release back into the wild, to ensure that they are pure *C. siamensis*.

3. DFRM continue to support the WCS head-start program for the release of *C. siamensis* back into the wild to re-establish and boost the wild populations.

4. Work should continue with the involvement of local communities in the collection and incubation of eggs, the establishment of village hatchery/raising facilities, and future head-starting activities.

5. All *C. siamensis* released into the wild should be marked (eg scute-clipped) to enable future identification.

6. DFRM should continue to support the development of ecotourism projects at Tansoum and Ban Nao Nua villages, involving local knowledge of the wetlands, crocodiles, traditional beliefs and sale of handicrafts.

7. DFRM should strengthen enforcement activities to mitigate against illegal trade. Close collaboration with neighbouring countries (Thailand, Vietnam and Cambodia) is critical in this regard.

8. Government and NGOs maintain involvement in the CSG Siamese Crocodile Task Force (established in May 2012), and the implementation of recommendations of the First CSG Regional Species Meeting (2011) on the conservation and management of *C. siamensis*.

9. Levels of public awareness of the legal and conservation status of crocodiles within local communities should be increased.

The full version of the report will be posted on the CSG website in due course.

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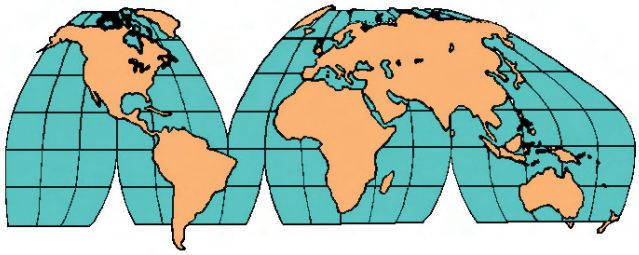
Tom Dacey, *CSG Executive Officer, <csg@wmi.com.au>*.

Regional Reports



Latin America and the Caribbean

Colombia

PALMARITO FOUNDATION JOINS EFFORTS FOR ORINOCO CROCODILE CONSERVATION IN COLOMBIA. *Crocodylus intermedius* is the most threatened crocodile in the Americas, with a global wild population of less than 2000 individuals (Antelo 2012). Between 1929 and the 1960s, the species was subjected to intense commercial hunting throughout its range in the Colombian and Venezuelan Llanos (Medem 1981). Hunting depleted the population from at least 3 million individuals (Antelo 2008) to the current levels (Godshalk 1978; Medem 1981).

On the basis of the first surveys conducted in Colombia in 1974-76, the total population was estimated as 780 individuals (Medem 1981). Surveys carried out between 1998 and 2012 reported smaller populations and a more restricted distribution (Lugo 1998; Barahona and Bonilla 1999; Ardila-Robayo *et al*. 2002; Castro *et al*. 2012). Antelo (2012) estimates that the total wild population in Colombia to be less than 200 individuals.

Although commercial hunting ceased during the 1960s and the species was legally protected at the end of the 1960s, wild populations were still declining in both Colombia and Venezuela. The reasons for this are not clear, although illegal hunting (O. Hernández, pers. comm.) and habitat contamination (Seijas 2010) have been postulated. On the other hand strategies such as captive breeding, head-starting and reintroduction have proved to be effective conservation tools for this species (Antelo *et al*. 2010).

In Colombia, the captive breeding program began in 1970 (Lugo 1995), at the Estación de Biología Tropical Roberto Franco (EBTRF). The first clutch was reported in 1986 and the first hatchlings in 1991 (Lugo 1995). After 40 years of continuous work this institution maintains around 500 crocodiles (C. Ardila and W. Martínez, pers. comm.).

In 2001 the local government of the Casanare Department established another breeding center in the Parque Ecotemático Wisirare, Orocué. Wisirare is a *Saliva* indigenous word that means "Good Place". The initial breeding stock comprised 6 females and 2 males [5 from EBTRF and 3 from El Picón Farm (Casanare)]. In 2006 another adult female from a private property in Maní, Casanare, was added to the breeding stock. At Wisirare the first eggs were probably laid in 2003, but for unknown reasons there were no hatchlings. For breeding seasons between 2005 and 2011, all eggs were moved to EBTRF for incubation, possibly due to the lack of appropriate incubation facilities at the former.

In December 2011 the Palmarito Foundation signed an agreement with the local government of Casanare, seeking to obtain the management of Wisirare for the next 5 years. The first actions were to: a) provide appropriate sand for the nesting beaches of the two enclosures where the adult crocodiles are kept; b) rebuild the incubator; c) repair the hatchling enclosures; and, d) construct new enclosures for sub-adult crocodiles.

Five of the 7 females laid 221 eggs between 30 December 2011 and 17 January 2012, 165 (74.6%) of which were fertile. All eggs were collected and incubated in the new incubator room. The clutches were not moved to the incubator as soon as they were laid, as the incubator was not ready. Ninety-seven (97) crocodiles hatched between 26 March and 11 April (mean TL= 29.3 cm) (see cover photograph). The incubation process was the same for all the eggs, but two of the clutches had very low hatching rates. The eggs of one of these nests were buried by the female at 5 cm depth, and the eggs remained there for more than 24 h before we were aware of the situation and buried them at a suitable depth. These eggs were exposed for a long time to inadequate temperatures, which may have caused embryonic death. The other clutch was partially predated by a tegu lizard (*Tupinambis nigropunctatus*) and the next day an iguana (*Iguana iguana*) dug up several of the eggs as it was laying its own eggs. Again, these eggs were exposed to inadequate temperatures for several hours.

It is proposed that these hatchlings form the nucleus of stock to be released into the wild to establish new wild populations, but reintroductions of this species have not yet been undertaken in Colombia. Palmarito Foundation has a proposal to the National Committee for the release of crocodiles at Caño Caimán, a watercourse in Palmarito Natural Reserve, a 2600-ha private area located in the historical range of the species.

In conclusion, we believe that the establishment of a new captive breeding center in Colombia is great news and we hope that in a few weeks the reintroduction protocol will be ready, and once crocodiles have reached an appropriate size (around 1 m) they can be released into the wild.

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Rafael Antelo, *Fundación Palmarito Casanare, Calle 118 No 6A-45, Apto 101, Bogotá, Colombia (palmaritocasanare@gmail.com.*

Argentina

ARGENTINE CROCODILIANS RE-ASSESSED AFTER 12 YEARS. Assessments for the first Red List of the Herpetofauna of Argentina were carried out in 2000. Recent reassessment of *Caiman latirostris* and *C. yacare,* based on new records about their geographic distribution and populations densities, has resulted in both species being placed in the "Not Endangered" category. The development of management programs of crocodilians in Argentina has improved the knowledge of both species and made a great and wide contribution to several aspects of their biology. The sustainable use of both species has proved to have had a minimal impact on wild populations and has generated new values for the wetlands inhabited by these reptiles. See Prado *et al*. (2012) for details.

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Carlos Piña, *CSG Regional Chairman for Latin America and the Caribbean (Human Resources Development), <cidcarlos@infoaire.com.ar>.*

Mexico

MONITORING PROGRAM FOR MORELET'S CROCODILE MEXICO-BELIZE-GUATEMALA - 2011 SEASON. Since 2009, Mexico's National Commission for Knowledge and Use of Biodiversity (CONABIO) has been coordinating the Monitoring Program for *Crocodylus moreletii* in Mexico with a tri-national scope (Mexico, Guatemala and Belize). The main objective of the program is to provide long-term information on population status and trends for wild *C. moreletii* and its habitats. This effort falls within the framework provided by the Tri-national Strategy for Conservation and Sustainable Use of Morelet's Crocodile, adopted in 2006.

CONABIO works together with four institutions and organizations which are responsible for implementing the program each year within the four Coordination Regions in Mexico. The results of the Monitoring Program's first season (2011) are summarized here.

Data collection was carried out following the methods established by the Program's Procedures Manual, which derived from a tri-national workshop of experts (Mexico City, January 2010) and which was published in 2011 (Sánchez *et al*. 2011; Benitez 2011). The manual is currently available in PDF format at http://www.conabio.gob.mx/institucion/cooperacion_internacional/doctos/manualf_monitoreo_cocodrilo.pdf.

During the 2011 season of the program implementation in Mexico, 165 surveys were carried out at 82 sites, comprising a total of 1545.8 km of survey distance. Of the monitored sites, 78.9% showed 'good' or 'very good' conservation status. At these sites, fishing, stock breeding, tourism and settlement were the human activities most frequently observed.

A total of 885 individuals was sighted, with an average encounter rate of 3.12 ind/km, which is similar to the 3.16 ind/km encounter rate reported by the CoPan Project in 2002-2004 (Sanchez and Alvarez-Romero 2006). The estimated population size for the species in Mexico is 78,633 individuals, similar to the previous estimate of 79,188 individuals by the CoPan Project.

In terms of population structure, the majority of individuals were young (39.1%), followed by juveniles and sub-adults (37.4%), adults and large adults (25.5%). These figures represent a good proportion of young and juveniles, and reproductive individuals; and therefore suggest a healthy population structure.

Of the 114 individuals captured, 27.2% of them were marked and released. The sex ratio was 1.15 males to 1 female. The size-class structure from captured individuals was roughly similar to that of sighted individuals, namely: 44.1% young individuals; 36.3% juveniles and sub-adults; and, 19.6% adults and large adults.

Up to 90% of the females and 92.1% of the males captured were in good physical condition; based on the relationship between tail perimeter, total length and bodyweight. Due to the timing of surveys (June 2011 to January 2012), no nests were sighted.

The Monitoring Program's first season (2011) closed with a workshop (Mexico City, March 2012), which aimed to: analyze and evaluate the season results at regional and

national levels; share lessons learned; identify opportunities for improvement; and, to draw specific guidelines for the 2012 season. Thirty-eight participants attended the workshop, including the Mexican regions' coordinators and field teams, experts and authorities from Mexico and Guatemala, and a representative from the CSG.

The workshop's key agreements included: identification of permanent monitoring sites; establishment of an optimal season for further monitoring activities (ie April to August); minor modifications to Procedures Manual methods, to field formats and to the database; and, the need to acquire smaller tags for juvenile and sub-adult crocodiles.

The final report of the 2011 season (Sánchez *et al*. 2012) is available in PDF format at: http://www.biodiversidad.gob.mx/planeta/cites/Pdf/InformeTemp2011_MX_Final.pdf.

The 2011 results reaffirm previous estimations on *C. moreletii* population size, and suggest the recovery of the species in the wild. As further data become available, the monitoring program will allow estimation of population trends and will support decision-making processes in favor of the species' conservation, management and sustainable use. The results of season 2012, currently in progress, are expected by early 2013. Additionally, the platform provided by the Program is being considered for future monitoring of other two crocodilian species that occur in Mexico, *C. acutus* and *Caiman crocodilus*.

Derived from the collaboration with Guatemala, and within the Monitoring Program's framework, in September 2012 four Mexican experts attended a workshop in Guatemala in order to train future field teams who will implement the program in that country. For this purpose, 40 Procedures Manuals were delivered to the participants (see following article).

Acknowledgements

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Hesiquio Benítez, *CONABIO (CITES Scientific Authority of Mexico), Mexico City <ac-cites@conabio.gob.mx>.*

Guatemala

FIRST OFFICIAL POPULATION SAMPLING OF MORELET'S CROCODILE IN GUATEMALA UNDER THE TRINATIONAL PROJECT MEXICO-BELIZE-GUATEMALA "COPAN". Thanks to the binational partnership between Mexico and Guatemala, in September 2012 we were able to integrate a team of Mexican crocodilian experts, comprising: Jerónimo Domínguez Laso (Director, Regional Zoo "Miguel Álvarez del Toro"); Marco López Lunathe (Unit Responsible for Environmental Management at the Universidad Juárez Autónoma de Tabasco); Gualberto Pacheco Sierra (responsible for crocodilian DNA project in Mexico); and, José Guadalupe Ruíz Vidal (Technician, Association for the Conservation, Management and Sustainable Use of Wild Flora and Fauna; COMAFFAS). All participants and implementers of COPAN Project Mexico, who were given the task of making an official visit to Guatemala, supported and financed by the Ministry of Foreign Relations and the National Commission for the Knowledge and Use of Biodiversity (CONABIO), as well as the Guatemalan counterpart and San Carlos University Center for Conservation Studies and the Commission on Protected Areas of the same country.

The event began on 21 September with the bi-national opening and development of a theoretical course on the management of Morelet's crocodile (*Crocodylus moreletii*) and experiences in Mexico with the implementation of the Manual of Methods for monitoring the species, all taught in the installations of the University of San Carlos with the assistance of guests, and interested students from other universities such as del Valle and other assistants and private conservation organizations.

After this course participants moved to the western region of Guatemala for the practical workshop, specifically in the Peten region, in Lagoon Yaxha, which is one of the sites considered in the tri-national monitoring program COPAN. The lagoon is located on the Ecological Center "El Sombrero" of Mrs. Gabriela Moretti. This meeting was attended by 38 participants (see Fig. 1), including other rangers from CONAP areas and researchers of institutions and associations such as ARCAS conservation, FUNDAECO and universities, including San

Carlos, del Valle and the Center for Conservation Studies (CECON).

Figure 1. Particpants of workshop.

The workshop began with historical information about the work in Guatemala with crocodiles, undoubtedly standing out was the first record of the species (type specimen) in 1851, and also highlighting other papers dealing with aspects of ecology (Tres 1983; Lara 1987; Castaneda 1998; Madrid 2006). From other works came records of the species at around 20 other sites (eg Schmidt 1924; Stuart 1935, 1937, 1948, 1957, 1963; Lee 1980; Ponciano 1981, 1982; Cabrera 1989, 1992; Nations *et al*. 1989; Lara 1990; Dix and Dix 1992; Lara *et al*. 1990, 1997; Campbell 1998; Garcia and Radachowsky 2004; Ixcot *et al*. 2005), from which could be obtained a basis for the proposed sampling in the country, through application of the four basic methods of habitat assessment and monitoring, night detection, marking and recapture of individuals, and location and monitoring of nests.

It is worth noting the presence of relevant authorities in environmental issues in Guatemala, through Francisco Castañeda Moya (CECON Director), Dr. Hiram Ordoñez Chocano (CITES Scientific Authority and Wildlife Director for Guatemala) and Julio Madrid-Montenegro (Department of Wildlife, Peten Region VIII, CONAP), and representatives of Mexico, through two of the four coordinators of Mexico COPAN (Jerónimo Domínguez Laso and Marco Lopez Luna, Coordinators of Regions 3 and 2 respectively, COPAN Project Mexico).

The official launch of the first national tour and official count of Morelet's Crocodile Project for Guatemala, starting on the night of 23 September 2012, yielded a count of 83 crocodiles; Class I= 34; Class II= 11; Class III= 12; Class IV= 9; Class V= 6 and 11 EO (Eyes only). All crocodiles were located in 15.6 km, giving an encounter rate of 5.3 ind/km. Four potential nesting sites were also recorded, evidenced by the presence of groups of newly hatched hatchlings. Twelve specimens between 25 cm and 2.5 m TL were captured. All were in good condition. The sex ratio was 1:1. All animals were measured, and marked by scute-clipping - and thus representing the first officially marked crocodiles in the country's database (CECON in coordination with CONAP).

In conclusion, the workshop established commitments to follow up on: the establishment and formalization of a national team to monitor wild populations of Morelet's crocodile complying with all requirements for management; to systematize existing information on the species for the preparation of techinical and/or scientific articles and continue training with the preceding information of Morelet's crocodile in Guatemala; and to establish future meetings with authorities and specialists from Mexico, and to contribute to the continued strengthening of Guatemalan specialists and continue the bilateral relationship with the presentation of monitoring progress of the species for the program COPAN Guatemala.

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Brazil

DEAD *PALEOSUCHUS* ON ROADS IN BRAZIL. Roads have caused fragmentation of habitat and are considered a threat to conservation of biodiversity through isolation of populations (Eigenbroad *et al*. 2008), facilitating access for hunters (Nagendra *et al*. 2003) and/or by individuals being killed (roadkill; Trombulak and Frissel 2000). Crocodilians being killed by vehicle collision in others countries has been reported as a threat for species (eg Brien *et al*. 2008; Vyas 2011).

In Brazil, roads that pass through the Pantanal and Amazon have been a controversial topic in the assessment of negative effects for wildlife through roadkill (Fearnise and Garça 2006; Catella *et al*. 2010). Crocodilians are known to occupy artificial ponds created by paved or unpaved roads (BR 262 - *Caiman crocodilus yacare* - Santos *et al*. 1994; BR 319 - *Paleosuchus palpebrosus* - Botero-Arias 2007).

Of the 6 species of crocodilians that occur in the Brazil, two (*P. palpebrosus* and *P. trigonatus*) live in streams with running water in tropical rainforest (Medem 1981). According to Magnusson and Campos (2010a,b) there are many threats for *Paleosuchus,* and their conservation is dependent on maintaining the forest and headwaters of the watersheds.

On the paved BR 364 near Porto Velho City, Amazonia (9º15' S, 64º22' W), we found three specimens that were roadkills. All appeared to have died as a result of vehicle collision as they were moving across the roads to access habitat.

1. May 2010: adult male *P. trigonatus* (SVL= 76.0 cm; Fig. 1).
2. January 2012: *P. palpebrosus* (SVL= 79.0 cm, Fig. 2).
3. June 2012: pre-ovulatory adult female *P. trigonatus* (SVL= 81.0 cm, Fig. 3).

Figure 1. Roadkill *P. trigonatus,* May 2010.

Figure 2. Roadkill *P. palebrosus,* January 2012.

Figure 3. Roadkill *P. trigonatus*, June 2012. Post-mortem examination revealed a pre-ovulatory condition (inset).

In January 2010, on paved BR 262 that crosses the South Pantanal, near the city of Corumbá (19°08' S, 57°34' W), we found two roadkilled juvenile *P. palpebrosus* (SVL estimated <50 cm).

The roadkills of *P. palpebrosus* and *P. trigonatus* reflect a loss of connectivity between habitats, and occur as they use the roads to move between habitats of the surrounding Pantanal and Amazon. In case of the adult female *P. trigonatus*, she may have been moving to a nesting area. Although crocodilians have the ability to occupy fragmented habitats, fragmentation may represent a threat in the case of *Paleosuchus*.

In Amazonia, the project of extension and paving of highway BR 319 between Humaitá and Manaus, approved by the Brazilian Ministry of Transportation, could increase the frequency of roadkills of *Paleosuchus*.

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Zilca Campos *(Embrapa Pantanal, CP 109, Corumbá/MS Brazil, 79320-900, zilca.campos@embrapa.br)*, Fábio Muniz *(Universidade Federal do Amazonas, Manaus/AM, Brazil)* and William Magnusson *(INPA CBIO CP 487 Manaus/AM Brazil, 69011-900)*.

East and Southeast Asia

Myanmar

DOES THE GHARIAL (*GAVIALIS GANGETICUS*) SURVIVE IN MYANMAR? *Gavialis gangeticus* is a longirostrine species of crocodilian currently restricted to the Ganges, Brahmaputra, Indus and Mahanadi River drainages of the Indian subcontinent (Ross 1998; Stevenson and Whitaker 2010). Fossil material and scattered historical records indicate that *G. gangeticus* also once occurred in Myanmar (formerly Burma), but the species is now considered extinct in the country (Stevenson and Whitaker 2010), although the causes underlying this extinction are poorly understood (Thorbjarnarson *et al*. 2006). Here, we first review previous evidence for the occurrence of *G. gangeticus* in Myanmar, and then present new information suggesting extant populations may yet survive in remote regions of the country.

An abundance of fossils dating from the late Pleistocene (ca. 2 to 3 million years ago) unequivocally attests to the prehistoric occurrence of *G. gangeticus* in Myanmar. Most such fossils have been unearthed in the Ayeyarwady plain of central Myanmar. These include a partial mandible collected near Yenang Yaung (= Yenangyaung) in 1923 and housed in the American Museum of Natural History (VP-1918), as well as a variety of material unearthed more recently near Me Gyaung Ye (19.90° N, 95.10° E) and now displayed in a small museum at the Yangon Zoological Garden (Fig. 1). Additionally, a French paleontological team reportedly collected Gharial fossils near Me Gyaung Ye during the 1990s, although we have been unable to trace the ultimate disposition of this material.

Figure 1. Mandible fragment and teeth of *Gavialis gangeticus* excavated from Me Gyaung Ye excavation site near Yenangyaung, central Myanmar, and housed in museum at the Yangon Zoological Garden. Photograph: Win Ko Ko.

The few available literature reports describing the historic occurrence of *G. gangeticus* in Myanmar are for the most part inconclusive and not well supported (Thorbjarnarson *et al*. 2006). A basking crocodile shot near the mouth of the Kaladan River (Rakhine State in western Myanmar) in 1851 by Captain S.R. Tickell, a British military officer and sportsman, may well have been a Gharial. According to Tickell (1854) this crocodile was a species "... distinct ... from the 'mugger', 'koomhir' or 'boach' of Bengal; ... longer in proportion, with a slender muzzle, and like the 'gavial' of the Ganges, ... adapted for more rapid swimming." Theobald (1868) cited Blyth as stating *G. gangeticus* occurred in Burma (= Myanmar), but provided nothing to support this contention. Smith (1931) maintained that *G. gangeticus* was found in the Kaladan River of northwestern Arakan (= Rakhine State); however, the basis for this claim is unstated (possibly Tickell 1854), and Salter (1983) found nothing to suggest that Gharials were present in this river system during the early 1980s.

The only unequivocal record of a living Gharial in Myanmar is an adult (5.03 m TL) collected in July 1927 from the Shweli River. According to Gresswell and Huxley (1965), the Shweli River arises in Yunnan Province, China and flows approximately 650 km south-southwest into Myanmar before meeting the Ayeyarwady at Inywa (Fig. 2).

The Gharial was shot approximately 65 km upstream of the Shweli-Ayeyarwady confluence. The skull was recovered and later sent to officers of the Bombay Natural History Society who confirmed its identification as *G. gangeticus* (Barton 1928). Local villagers claimed a second Gharial was also present in the same area and the two animals moved downstream into the Ayeyarwady River at the beginning of every wet season (Barton 1928). This unusual record represents an isolated occurrence of *G. gangeticus* more than 1500 km (by water) from the nearest currently known population, which is found in Bangladesh (Thorbjarnarson *et al*. 2006). Because no additional records of *G. gangeticus* were forthcoming from the Shweli or upper Ayeyarwady Rivers, Thorbjarnarson *et al*. (2006) suggested the report of

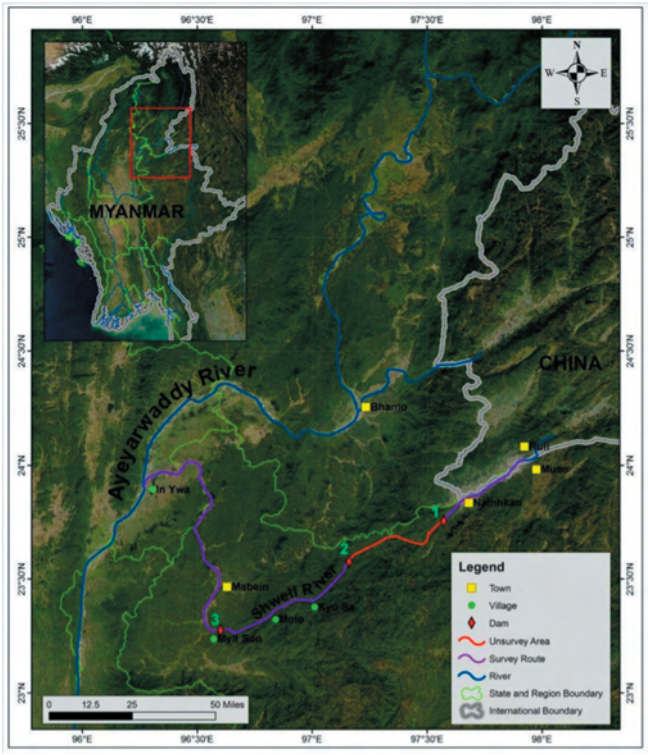

Figure 2. Map of northeastern Myanmar showing the Shweli and Ayeyarwady Rivers, villages, and larger towns. Numbers 1 to 3 denote hydropower dams currently under construction along the Shweli River. A remnant population of *Gavialis gangeticus* is reported to occur in the Shweli River between dam sites 1 and 2. Inset shows approximate location of this area in Myanmar.

Barton (1928) documented the regional extinction of a small, disjunct population that was likely a Pleistocene relict.

In 1990, one of us (WKK) initiated an investigation into the possible occurrence of *G. gangeticus* in Myanmar after encountering a Yangon apothecary with a Gharial maxilla reportedly obtained in Rakhine State. The apothecary was selling pieces of the bone as an ingredient in various medicinal concoctions. Traditional Burmese folk medicine is replete with zootherapies, and crocodile bone is used to treat various unspecified internal ailments. An attempt to purchase the complete bone as a voucher specimen proved unsuccessful.

A number of visits were subsequently made to Rakhine State, during which WKK questioned villagers concerning the local occurrence of crocodiles. Without exception, villagers were familiar with *Crocodylus porosus*, which until recently was common in mangrove swamps along the coast of western Myanmar (Platt *et al*. 2001; Thorbjarnarson *et al*. 2006). Interestingly, a few older villagers described a second species of crocodilian characterized by a narrow, elongated snout. This species was referred to locally as Nga Htaung Kyin Me Gyaung (= garfish crocodile) or Nga Phaung Yoe Me Gyaung (= skinny fish crocodile) owing to the resemblance of its snout to a species of longirostrine fish common in area waters. According to our informants, this narrow-snouted crocodilian was once found in local rivers, but none had been encountered in many years. Although equating vernacular names with biologically recognized taxa is fraught with difficulties (Platt *et al*. 2004), the descriptions provided by some elderly villagers are certainly suggestive of *G. gangeticus*.

We also investigated the continued survival of *G. gangeticus* in the Shweli River as part of a recent survey (8 February to 2 April 2012) to determine the conservation status of the critically endangered Burmese Roofed Turtle (*Batagur trivittata*; Win Ko Ko *et al*. 2012). During this survey we conducted numerous unstructured interviews (Martin 1995) of villagers and artisanal fishers, during which we enquired about the local occurrence of both turtles and crocodiles. Most interviewees professed no knowledge of crocodiles; however, according to Buddhist monks at Manpu (23°42.06' N; 97°34.30' E), an ethnic Palaung village along the upper Shweli, longirostrine crocodilians could be found downstream from the village (Fig. 2). The Palaung refer to these crocodilians as Lan, although the specific meaning of this word could not be determined. This boulder-strewn stretch of the Shweli is swift-flowing and access is difficult because of steep banks. The area is said to be inhabited by Gharials has long been controlled by Shan insurgents, and for this reason we were warned against proceeding further. Indeed, the presence of anti-government insurgents may have facilitated the survival of *G. gangeticus* in this stretch of the Shweli River. Because non-combatants rarely venture into "war zones", resource exploitation is usually minimal and contested areas often harbor wildlife populations that might not otherwise exist (Martin and Szuter 1999). Elsewhere in Myanmar contested areas have provided safe havens for critically endangered chelonians and contributed to the continued persistence of these populations (Kuchling *et al*. 2006; Platt *et al*. 2008).

In conclusion, a single literature record accompanied by voucher material (Barton 1928) leaves little doubt that *G. gangeticus* occurred in northeastern Myanmar as recently as the early 1900s; however, its continued survival anywhere in the country remains to be conclusively verified. Whether *G. gangeticus* ever occurred in western Myanmar is an open question, but our surveys found nothing to indicate populations are currently present in the region. The situation along the Shweli River is less clear. The Shweli is the source of the only authenticated specimen of *G. gangeticus* from Myanmar (Barton 1928) and recent interview data suggest a small population may continue to survive in the river. This scenario is not wholly implausible as Gharials reportedly occur in an area where few people dare venture due to an on-going armed conflict. Assuming *G. gangeticus* still survives in the Shweli River, three dams currently under construction (Fig. 2) threaten to radically alter the ecology of the river (Dudgeon 2000) and could ultimately doom any remaining population to extinction. *Gavialis gangeticus* requires large, deep rivers with seasonally fluctuating water levels (Whitaker and Basu 1983), and dam impoundments are likely to prove unsuitable as foraging and breeding habitat.

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Win Ko Ko and Steven G. Platt, *Wildlife Conservation Society-Myanmar Program, Office Block C-1, Aye Yeik Mon 1st Street, Hlaing Township, Yangon, Myanmar (sgplatt@gmail.com).*

South Asia and Iran

India

GHARIAL INFORMATION DATABASE. The Gharial Information Database is an open-access repository of Gharial

(*Gavialis gangeticus*) literature, developed to facilitate the work of those interested in this unique crocodilian. The database is now online (http://www.gharial-info.com/), providing an alphabetical and chronological bibliography, and even allows access to our personal library upon request. Although we've tried to put together every Gharial paper out there, this database may not yet be exhaustive, and we will continue to source relevant material and update the site regularly. We also encourage users to submit any Gharial-related literature that is not available in this database to <gharial.info@gmail.com>.

We believe and also hope that open access to such information will trigger participatory biodiversity monitoring initiatives, and in the process, spur public support and participation in Gharial conservation, and more information on the site.

Tarun Nair, *Gharial Conservation Alliance (Madras Crocodile Bank Trust), Post bag No.4, Mamallapuram - 603104, Tamil Nadu, India.*

GHARIAL HATCHLINGS IN THE YAMUNA. Eight Gharials (*Gavialis gangeticus*), comprising 7 hatchlings and one yearling, were detected during a recent survey for Gangetic Dolphins in the Yamuna River, India. All 8 individuals were detected in a 12-km segment immediately downstream of the Ken-Yamuna confluence (Fig. 1). The survey covered approximately 220 km, from Chilla Ghat (Ken-Yamuna confluence) to Allahabad Sangam (Ganga-Yamuna confluence), over a 3-day period (5-7 October 2012).

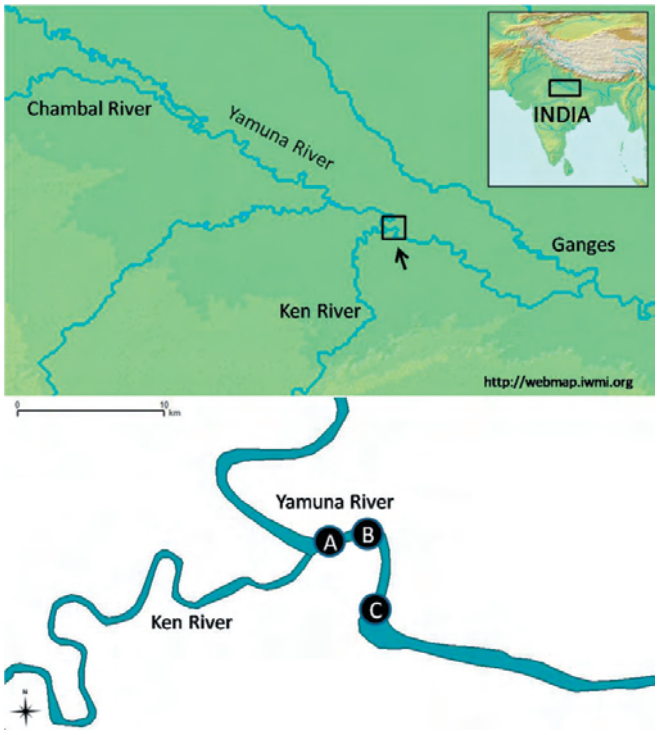

Figure 1. Locations of Gharials ighted in the Yamuna River. A - 3 hatchlings (25°46'49.10" N, 80°32'42.00" E); B - 3 hatchlings and 1 yearling (25°47'02.20" N, 80°33'34.10" E); C - 1 hatchling (25°43'49.80" N, 80°33'43.10" E).

There are no recent records of Gharials from this stretch of the Yamuna River, and these individuals could very well have been washed down from the National Chambal Sanctuary (NCS) (~240 km upstream) which supports the nearest known breeding population of Gharials. The only other known (supposedly non-breeding) population of Gharials nearby is in the Ken Gharial Sanctuary (~150 km upstream of Chilla Ghat on the Ken River).

The lower Yamuna is severely disturbed, over-fished (gill-nets and long-lines) and is not conducive to long-term Gharial survival. However, it may be worthwhile to monitor a 300-350 km section of the Yamuna downstream of Panchhnada (Sindh-Yamuna confluence), including the Betwa and Ken Rivers. This area possibly provides seasonal habitat to Gharials, especially during the monsoonal floods, probably acts as a population sink to emigrating recruits from the NCS, and may throw light on the hundreds of 'missing' head-started Gharials.

Tarun Nair, *Gharial Conservation Alliance (Madras Crocodile Bank Trust), Post bag No.4, Mamallapuram - 603104, Tamil Nadu, India.*

Science

Recent Publications

Mazzotti, F.J., Cherkiss, M.S., Brandt, L.A., Fujisaki, I., Hart, K., Jeffery, B., McMurry, S.T., Platt, S.G., Rainwater, T.R. and Vinci, J. (2012). Body condition of Morelet's crocodiles (*Crocodylus moreletii*) from northern Belize. Journal of Herpetology 46(3): 356-362.

Abstract: Body condition factors have been used as an indicator of health and well-being of crocodilians. We evaluated body condition of Morelet's Crocodiles (*Crocodylus moreletii*) in northern Belize in relation to biotic (size, sex, and habitat) and abiotic (location, water level, and air temperature) factors. We also tested the hypothesis that high water levels and warm temperatures combine or interact to result in a decrease in body condition. Size class, temperature, and water level explained 20% of the variability in condition of Morelet's Crocodiles in this study. We found that adult crocodiles had higher condition scores than juveniles/subadults but that sex, habitat, and site had no effect. We confirmed our hypothesis that warm temperatures and high water levels interact to decrease body condition. We related body condition of Morelet's Crocodiles to natural fluctuations in air temperatures and water levels in northern Belize, providing baseline conditions for population and ecosystem monitoring.

Campos, Z., Sanaiotti, T., Muniz, F., Farias, I. and Magnusson, W.E. (2012). Parental care in the dwarf caiman, *Paleosuchus palpebrosus* Cuvier, 1807 (Reptilia: Crocodilia: Alligatoridae). Journal of Natural History 46 (47-48): 2979-2984.

Abstract: Post-hatching parental care is common in crocodilians, but the little information available for Cuvier's dwarf caiman (*Paleosuchus palpebrosus*) indicates that they show little post-hatching parental care. During surveys undertaken between 2005 and 2011, we counted and captured groups of hatchlings and observed the presence or absence of attending adults in streams around the Pantanal, along the Guaporé-Madeira River and flooded forest in central Amazonia, Brazil. We found 37 groups of hatchlings, of which 29 were accompanied by adults. We captured 13 of these adults and all were females. The groups of hatchlings remained with adults for up to 21 months. We monitored females and hatchlings in streams around the Pantanal using captures and with radiotelemetry and showed that females and hatchlings frequently remained together in burrows, especially during the dry season.

Yoon-Yee Chong, A., Atkinson, S.J., Isberg, S. and Gongora, J. (2012). Strong purifying selection in endogenous retroviruses in the saltwater crocodile (*Crocodylus porosus*) in the Northern Territory of Australia. Mobile DNA 3: 20 (doi:10.1186/1759-8753-3-20).

Abstract: Endogenous retroviruses (ERVs) are remnants of exogenous retroviruses that have integrated into the nuclear DNA of a germ-line cell. Here we present the results of a survey into the ERV complement of *Crocodylus porosus*, the saltwater crocodile, representing 45 individuals from 17 sampling locations in the Northern Territory of Australia. These retroelements were compared with published ERVs from other species of Crocodylia (Crocodilians; alligators, caimans, gharials and crocodiles) as well as representatives from other vertebrates. This study represents one of the first in-depth studies of ERVs within a single reptilian species shedding light on the diversity of ERVs and proliferation mechanisms in crocodilians. Analyses of the retroviral pro-pol gene region have corroborated the presence of two major clades of ERVs in *C. porosus* and revealed 18 potentially functional fragments out of the 227 recovered that encode intact pro-pol ORFs. Interestingly, we have identified some patterns of diversification among those ERVs as well as a novel sequence that suggests the presence of an additional retroviral genus in C. porosus. In addition, considerable diversity but low genetic divergence within one of the C. porosus ERV lineages was identified. We propose that the ERV complement of *C. porosus* has come about through a combination of recent infections and replication of ancestral ERVs. Strong purifying selection acting on these clades suggests that this activity is recent or still occurring in the genome of this species. The discovery of potentially functional elements is an interesting development that warrants further investigation.

Rivera, S., Nevarez, J.G., Maxwell, L.K. and Barker, S.A. (2012) Pharmacokinetic of tetracycline after single-dose oral administration in the American alligator (*Alligator mississippiensis*). Journal of Zoo and Wildlife Medicine 43(4): 858-863.

Abstract: The major objective of the study was to assess the pharmacokinetics of tetracycline administered orally to fasted and nonfasted American alligators (*Alligator mississippiensis*) at 50 mg/kg. Plasma levels of tetracycline were determined using high-performance liquid chromatography with ultraviolet detection. The concentration versus time curve was analyzed using a compartmental modeling technique. A one-compartment model with first-order absorption and elimination, as well as a lag time to absorption, best described the data. The area under the curve and mean residence time values differed significantly between the fasted and nonfasted groups. Based on the results of this study, tetracycline suspension administered once orally at 50 mg/kg to American alligators is not expected to reach plasma concentrations above the breakpoint minimum inhibitory concentration of 4 μg/ml for susceptible organisms.

Chamero, B., Buscalioni, A.D. and Marugan-Lobon, J. (2012). Pectoral girdle and forelimb variation in extant Crocodylia: the coracoid-humerus pair as an evolutionary module. Biological Journal of the Linnean Society (doi: 10.1111/j.1095-8312.2012.02037.x).

Abstract: To date, all statements about evolutionary morphological transformation in Crocodylia have essentially been based on qualitative observations. In the present study, we assessed the morphological variation and covariation (integration) between the scapula, coracoid, humerus, radius, and ulna of 15 species of Crocodylidae, Alligatoridae, and Gavialis + Tomistoma using three-dimensional geometric morphometrics. The results obtained reveal that the variation of elements within species (intraspecific) is large. However, despite this variability, variation across species (interspecific) is mainly concentrated in two dimensions where the disparity is constrained: 'robusticity' and 'twist' (forelimbs) and 'robusticity' and 'flexion' (pectoral girdle). Robusticity (first dimension of variation) embodies a set of correlated geometrical features such as the broadening of the girdle heads and blades, or the enlargement of proximal and distal bone ends. The twist is related to the proximal and/or distal epiphyses in the forelimb elements, and flexion of the scapula and coracoid blades comprises the second dimension of variation. In all crocodylians, forelimb integration is characterized by the strong correlations of a humerus-ulna-radius triad and by a radius-ulna pair, thus forming a tight forelimb module. Unexpectedly, we found that the humerus and coracoid form the most integrated pair, whereas the scapula is a more variable and relatively independent element. The integration pattern of the humerus-coracoid pair distinguishes a relatively robust configuration in alligatorids from that of the remainder groups. The patterns of variation and integration shared by all the analyzed species have been interpreted as an inherited factor, suggesting that developmental and functional

requirements would have interacted in the acquisition of a semi-aquatic and versatile locomotion at the Crocodylia node at least 65 Mya. Our findings highlight the need to incorporate the humerus-coracoid pair in biodynamic and biomechanical studies.

Pinheiro, A.E.P., Fortier, D.C., Pol, D., Campos, D.A. and Bergqvist, L.P. (2012). A new Eocaiman (Alligatoridae, Crocodylia) from the Itaboraí Basin, Paleogene of Rio de Janeiro, Brazil. Historical Biology: An International Journal of Paleobiology (doi: 10.1080/08912963.2012.705838).

Abstract: A new small species of Eocaiman is described on the basis of three anterior left mandibular rami and one isolated tooth. The specimens came from the middle-upper Paleocene Itaboraí Basin (Rio de Janeiro State, Brazil; Itaboraian South American Land Mammal Age). The new taxon differs from the other two Eocaiman species, such as its small size, likely participation of the splenial in the mandibular symphysis, a reduced angle between the longitudinal axis of the symphysis and the mandibular ramus, and enlarged ninth and tenth dentary teeth (in addition to the large first and fourth dentary teeth). The participation of the splenial in the mandibular symphysis is a unique character among caimanines (with the only possible exception being *Tsoabichi greenriverensis*). The new taxon provides new information on the taxonomic and anatomical diversity of the genus Eocaiman, a taxon of prime importance to understand the evolutionary origins of caimans given its position as the basalmost member of Caimaninae. Furthermore, the new taxon has a relatively small body size in comparison with other species of Eocaiman, a case paralleled by other Itaboraian reptilian groups (eg snakes), suggesting that this ecosystem provides critical data to test the relationship between reptilian body size and climate.

Campos, Z. and Magnusson, W.E. (2013). Thermal relations of dwarf caiman, *Paleosuchus palpebrosus*, in a hillside stream: Evidence for an unusual thermal niche among crocodilians. Journal of Thermal Biology 38: 20-33.

Abstract: Body temperatures of 13 *Paleosuchus palpebrosus*, 7 males and 6 females, were monitored by radio-telemetry during cold periods (dry season) and warm periods (wet and dry seasons) in a stream draining into the Brazilian Pantanal. The mass of the caimans varied from 2.5 to 20.0 kg, and snout-vent length from 47.5 to 95.0 cm. Mean monthly body temperature was 21.6ºC, and varied from 20.1 to 25.6ºC throughout the year. Body temperature was correlated with air and water temperature but did not differ between males and females. Unlike all other crocodilians investigated in detail to date, the caimans did not show evidence of attempts to obtain higher body temperatures when ambient temperatures were low, and had low and generally constant temperatures in relation to the surrounding air and water throughout the year. The caimans remained in burrows during cold periods in the dry season, which may explain why they did not seek higher temperatures. Tolerance of relatively low and constant body temperatures may be a key adaptation of species of *Paleosuchus*, allowing them to occupy environments inhospitable to other crocodilians.

Bona, P., Degrange, F.J. and Fernández, M.S. (2012). Skull anatomy of the bizarre crocodylian *Mourasuchus nativus* (Alligatoridae, Caimaninae). Anatomical Record (doi: 10.1002/ar.22625).

Abstract: *Mourasuchus* is a Miocene alligatorid endemic to South America, and is represented by four species. Together with the closely related *Purussaurus*, it is a peculiar crocodylian taxon of neogene Caimaninae and one of the most bizarre forms among eusuchian crocodiles. The phylogenetic relationships between *Mourasuchus* species have not been explored, and detailed skull descriptions are scarce. The goal of this study is to provide new data on skull morphology and cranial recesses in *Mourasuchus nativus*, including a new tomography analysis (3D modeling). We observed that several diagnostic characters of *Purussaurus*, such as lack of contact between the nasal and lacrimal, separation of the nasal and frontal by the prefrontals, and the posterior dorsal margin of the skull table, are shared with *Mourasuchus*. *M. nativus* is characterized by the presence of solid transverse squamosal eminences, large posttemporal fenestrae, and a quadrate laterocaudal bridge separating V2-V3 trigeminal openings. Compared with other crocodylians, the endocast of *M. nativus* is similar in shape but quite sigmoid in lateral view, the canal of the supraorbital ramus of V2 is more vertically oriented, the thick tympanic branch canal opens in a large foramen aligned with trigeminal foramen, and the canal of the vagal (X) tympanic ramus is also very wide. Contrary to extant alligatorids, the median pharyngeal recess remains paired throughout its course and only connects its opposite fellow near the external ventral opening. The knowledge of the internal skull anatomy of *Mourasuchus* contributes to the understanding of the general morphology of alligatorids, Caimaninae, and their variation.

Milinkovitch, M.C., Manukyan, L., Debry, A., Di-Poi, N., Martin, S., Singh, D., Lambert, D. and Zwicker, M. (2012). Crocodile head scales are not developmental units but emerge from physical cracking. Science (doi: 10.1126/science.1226265).

Abstract: Various lineages of amniotes display keratinized skin appendages (feathers, hairs, and scales) that differentiate in the embryo from genetically controlled developmental units whose spatial organization is patterned by reaction-diffusion mechanisms (RDM). We show that contrary to skin appendages in other amniotes (as well as body scales in crocodiles), face and jaws scales of crocodiles are random polygonal domains of highly keratinized skin, rather than genetically controlled elements, and emerge from a physical self-organizing stochastic process distinct from RDM: cracking of the developing skin in a stress field. We suggest that rapid growth of the crocodile embryonic facial and jaw skeleton, combined with the development of a very keratinized skin, generates the mechanical stress that causes cracking.

Espinosa, M.I., Bertin, A., Gomez, J., Mejia, F., Guerra, M., Baez, L., Gouin, N. and Patino, E. (2012). A three-year mark-recapture study in a remnant population of *Crocodylus acutus* Cuvier in Portete Bay (Guajira, Colombia). Gayana 76(1): 52-58.

Abstract: The American crocodile, *Crocodylus acutus*, has experienced important population declines worldwide due to human persecution, overexploitation and habitat loss. *C. acutus* remains critically endangered in some countries such as Colombia where the lack of detailed surveys on its ecology and distribution constitutes a major barrier to the development of effective conservation strategies. We conducted a three-year capture-recapture study to investigate the demographic status of *C. acutus* and to identify environmental variables likely to infl uence its distribution in Portete Bay (Colombia). We estimated the crocodile population to be relatively small (<140 animals), to include very few adults, and to demonstrate a very strong deficit in females in the juvenile class. Both mean air temperature and relative humidity were positively correlated with the number of sightings. In contrast, mean water salinity was found to decrease the probability of observing a crocodile, presumably due to juvenile preference for low salinity areas. Our fi ndings suggest that the population of *C. acutus* in Portete Bay is at risk and may require human intervention to assure its persistence.

Jogayya, K.N., Meganathan, P.R., Dubey, B. and Haque, I. (2012). Mitochondrial 16S ribosomal RNA gene for forensic identification of crocodile species. Journal of Forensic and Legal Medicine (dx.doi.org/10.1016/j.jflm.2012.09.018).

Abstract: All crocodilians are under various threats due to over exploitation and these species have been listed in Appendix I or II of CITES. Lack of molecular techniques for the forensic identification of confiscated samples makes it difficult to enforce the law. Therefore, we herein present a molecular method developed on the basis on 16S rRNA gene of mitochondrial DNA for identification of crocodile species. We have developed a set of 16S rRNA primers for PCR based identification of crocodilian species. These novel primers amplify partial 16S rRNA sequences of 6 crocodile species which can be later combined to obtain a larger region (1290 bp) of 16S rRNA gene. This 16S rRNA gene could be used as an effective tool for forensic authentication of crocodiles. The described primers hold great promise in forensic identification of crocodile species, which can aid in the effective enforcement of law and conservation of these species.

Macip-Riosi, R., Fernandez-Aguilar, M., Barrios-Quiroz, G. and Casas-Andreu, G. (2012). Indirect morphological measures to infer body size in a wild population of the Chiapas Spectacled caiman, *Caiman crocodilus chiapasius* (Bocourt, 1876). Herpetological Conservation and Biology 7(3): 367-375.

Abstract: Several indirect measures (photographs, tracks, skulls) and remote techniques (nocturnal spotlight surveys) have been suggested as ways to estimate body size in crocodilians; however, the analysis of this kind of data does not fit the basic assumptions of the statistical allometric approach. We tested the utility of these techniques to infer body size from head and left foot measurements from a wild population of a subspecies of the Spectacled Caiman (*Caiman crocodilus chiapasius*) in Chiapas, Mexico, using an allometric approach. We also tested for sexual size dimorphism using total length and snout-vent length. We only found sexual size dimorphism between males and females in total length. We also found that the snout length, inter-orbital width, and foot length have an isometric correlation with body size (total length or snout-vent length). Snout length and foot length measurements explained 65 to 74% of the body size variance when we analyzed overall data or only data from males, and seem to be useful to infer body size in this species. We suggest a conservative and species-specific use of indirect or remote measurements to estimate body size in crocodiles.

Garcia-Grajales, J., Buenrostro-Silva, A. and Charruau, P. (2012). Growth and age of juvenile American crocodiles (*Crocodylus acutus*) in La Ventanilla Estuary, Oaxaca, Mexico. Herpetological Conservation and Biology 7(3): 330-338

Abstract: We analyzed growth rates of wild American Crocodiles (*Crocodylus acutus*) of the Oaxacan coast from 2000-2009. We also estimated the age of crocodiles at the study site based on their total length (TL), using growth rates and the von Bertalanffy model. Growth rates for TL and body weight were 0.056 ± 0.049 cm/day (n= 45) and 1.092 ± 0.47 g/day (n= 16), respectively. Individuals with the highest growth rates in length did not necessarily have the highest growth rates in weight. For the von Bertalanffy model, we used growth rate data for 23 individuals with mean TL from 700 to 1352 mm between capture and recapture. Thus, the model pertained only to young individuals. Based on model estimates, American Crocodiles from the coast of Oaxaca are larger than crocodiles of the same age from two other sites in Mexico (Banco Chinchorro and Puerto Vallarta). Although results of this study seem to agree with patterns found in other regions for this species, it is necessary to evaluate the factors influencing growth of *C. acutus* inhabiting Oaxaca's coast, especially salinity, environmental temperature variations, and precipitation.

Nie, C., Zhao, J., Li, Y and Wu, X. (2013). Diversity and selection of MHC class IIb gene exon3 in Chinese alligator. Mol. Biol. Rep. 40: 295-301.

Abstract: Our study used MHC class IIb gene exon3 complete sequence as markers to investigate genetic variability, selection and population differentiation in Chinese alligator. In this study, 282 bp MHC IIb exon3 complete sequence was got, none of the sequences contained insertions/deletions or stop codons, suggesting that all sequences might come from

functional molecules in the genome. The neighbor-joining (NJ) tree revealed that Xuangzhou and Changxing populations were genetically close related, while wild population showed the most diverse from the other. Gene flow (Nm) was very higher than one, suggesting that inter-group gene flow may have occurred. Furthermore, the results showed that MHC IIb gene might be a good molecular marker, we think that this technology could be used for Chinese alligator breeding and releasing in future.

Frank, A.K. (2013). Grappling with tradition: The Seminoles and the commercialization of alligator wrestling, Chapter 8, Pp. 131-141 *in* The Native American Identity in Sports - Creating and Preserving a Culture, ed. by F.A. Salamore. Scarecrow Press: Lanham, Maryland.

Submitted Publications

MARK VAN TOMME DIED AT AGE 30. Mark Phillipe Aponte Van Tomme, born on 28 June 1982 in Belém, Pará, Brazil, and grew up there (including volunteering at its famous natural history museum), and passed away recently on 1 November 2012, in Brussels, Belgium, after months of hospital treatment for an abdominal tumor. His contribution to the study of the living Crocodylia is remarkably large, considering that he was studying dinosaurs and was focusing on the pterosaurs (large flying reptiles such as the pterodactyl of the Cretaceous) when in 2005 he began work on crocodiles. This happened because Dr. Edio-Ernst Kischlat had finished his PhD on the archosaurian reptile group including the crocodilians two years before, and Mark accepted Edio's invitation (phrased at the time as a challenge) in 2005 to help his vertebrate paleontology and cladistics friend to collaborate by e-mail and translate from Portuguese to English (and also expanding) the most newsworthy chapter from the Kischlat (2003) dissertation, namely resolving the sometimes contradictory details of the old and technically persisting *Crocodilus* (as in *Crocodilus vulgaris*) and *Crocodylus* (as in *Crocodylus niloticus*) spelling dilemma.

Thus, from 2005 to 2007, Mark in Europe and Edio in southern Brazil worked together at preparing a "*Crocodilus* and *Crocodylus* can be reconciled" (paraphrased title) paper with expanded references, and in 2007 they showed their manuscript to me, and I joined the collaboration because they were very close to having the whole problem solved. But there were still a very few troublesome questions, among them the Adanson's "Crocodile noir" (black or Black) and "Crocodile vert" (green or Green) quagmire and dilemma that has plagued crocodile taxonomy and systematics ever since it was first published in 1757, the year before the 10th edition of Linnaeus and the official 1758 start of zoological nomenclature.

Much confusion in the early history of the modern genus *Crocodilus* and *Crocodylus* (and also confusion associated with *Gavialis gangeticus*) has been caused by the 1757 error about Adanson's Black being more "longirostrine" (longer snouted) than his Green, and the simultaneous mistake alleging that there were only these two kinds of crocodilians in Senegal, where he should have said three. There is really Adanson's black brevirostrine (today *Osteolaemus*), and secondly his green mesorostrine (today *Crocodylus*), and thirdly his longirostrine species that has become known as "the Senegal gavial" (sic) and is *Mecistops cataphractus* today. This Adanson's black-longirostrine error has caused more nomenclatural confusion and pages of misleading speculation than probably any other inaccuracy in the scientific and vernacular names of the living Crocodylia. It is today clear that Adanson's longirostrine is not a Gharial, and it is not ordinarily black.

Through internet, Mark worked from his grandfather's home in Brussels, and by e-mail enthusiastically informed Dr. Kischlat and me about Michel Adanson's trip to Senegal, including the fact that Adanson's "Niger" is really the Senegal River. Thus, the "Niger" (sic) type-locality sometimes applied to *Crocodilus suchus* Geoffroy-Saint-Hilaire, 1807, is a compound error, because its real type-locality is Egypt, and secondarily because "Niger" means the Senegal River in this case. The way that Mark proved this for crocodiles was by finding pages of Michel Adanson's actual drawings and notes, including sketch maps of the rivers and towns in the region where his crocodiles originated. Some of these places make it absolutely certain that Adanson's specimen of Green crocodile from "Niger" is really from inland on the Senegal River, and thus the 1757 employment of "Niger" is merely and clearly a mistaken or outdated name for that river. The specimen of Adanson's Green crocodile was the northwestern African (Green Cape) physical content included in *Crocodilus suchus* Geoffroy-Saint-Hilaire, 1807, and thus the original geographic range of *C. suchus* was the temple at Thebes in Egypt, and secondarily also persisting in the Senegal River region. This distribution reflected climate change, and in earlier times there were *C. suchus* (and similarly also Cuvier's *C. vulgaris*) living in rivers and lakes all across today's Sahara.

Asking a favor from an old friend (the curator of reptiles at the Museum National d'Histoire Naturelle - MNHN) in Paris, Mark obtained photographs of Adanson's Green crocodile specimen, which interestingly and unexpectedly exhibits a damaged rostrum. The whole region of the premaxillary bones is missing (Fig. 1). This individual anomaly did not seem significant when I first saw it, but later Mark found Adanson's drawings of the Green crocodile being killed in Senegal, and the pictured anatomy of the premaxillary region of the rostrum is wrong for the genus *Crocodylus* and for all living crocodilians in general.

However, the fact that Adanson invented the tip of the snout in his picture is convincing circumstantial evidence that the depicted animal was the same individual as the collected specimen. In this case, given the absence of real premaxillary bones, he invented an imaginary rostral tip (Fig. 2). The picture is misleading about the pointedness of the tip of the upper jaw, and Mark's contribution by finding the hitherto unpublished drawings, and enabling me to compare them

with the photos of the specimen, is that today I am confident in asserting that the specimen in Paris is indeed from the Senegal River and was collected by Michel Adanson. It is correctly his "Diasik" or "vert" or green crocodile of the "Niger" (=Senegal River). In Figures 1 and 2, compare also the arms and legs, and notice that their shapes and directions are exactly the same in both pictures. The proportions of the whole animal match precisely.

Figure 1. Michel Adanson's Green crocodile specimen from the Senegal River, MNHNP-7524, lacks its premaxillary region in this photo sent from Dr. Roger Bour (Paris) to Mark Van Tomme, and this is the first publication of any picture of it.

Figure 2. This Green Crocodile (Diasik) drawing by Michel Adanson is believed to be MNHNP-7524, because the premaxillary region (the nostrils and the tip of the snout) is invented fiction, as shown in this selected part of Adanson's larger unpublished plate, the whole of which was sent by Madame Lenoir (MNHN library, Paris) to Mark Van Tomme.

Similarly, it was Mark's e-mail contact with the Zoology Museum in Berlin, Germany (formerly the ZMB), that produced photographs of the specimen (and its damaged region) that served as the model for the plate 105, fig. 3 "male" *Paleosuchus* picture in Seba's famous book. This new evidence provided the proof of individual identity reported by Ross *et al. (*2012), and Figure 3 is one of the color photos from Berlin. To a big part directly through the efforts of Mark Van Tomme, it is newly clear that Seba's "male" and "female" pictures actually represent two (the "male" in Berlin, and the "female" in Paris), rather than one individual animal. Also it was Mark who showed pictures of a specimen in the MNHN in Paris (thought by MNHN to be a syntype of *Crocodilus vulgaris*) to me, thus enabling my re-identification of MNHNP-0.7515 as not *Crocodylus niloticus* from Africa, but rather *Crocodylus acutus* from somewhere in the Americas. This new identification is based primarily on the specimen's dorsal and lateral scales, and is reasonably confident. We (Kischlat, Ross and Van Tomme) have advised the museum in Paris to revise their type-list about this individual.

Figure 3. Supplementing Ross (2010a), this photo sent by Dr. Mark-Oliver Rödel (Humboldt University) to Mark Van Tomme is the first photograph ever published of ZMB-243, and clearly shows that it is a juvenile.

It was Mark who located and obtained the first photograph that has ever been published of the *Crocodilus suchus* Geoffroy-Saint-Hilaire, 1807, skull from a mummy collected in a storage vault (grotto) under the ancient Egyptian temple at Thebes (see Ross 2010b).

Peripherally related to Adanson, because it involved the *Crocodylus suchus* (bogus type-locality "Niger") from Senegal problem, another example of Mark Van Tomme's e-mail successes was researching the crocodile of Israel and obtaining photographs of most or all of the relevant remaining specimens. Part of these results were reported early in Ross (2010) but the majority of the new data was set aside in favor of pursuing other projects. Thus, from my collected e-mails from Mark, detailed provenance news about the Israeli museum material, and what the dead crocodiles look like, can be expected sometime soon and with M.P.A. Van Tomme as a posthumous author. These records from the Kishon, Zerka and Yarkon Rivers along the Mediterranean Sea coast, especially the Zerka River breeding population, are the famous old "Syria" and "Palestine" crocodile that we today assume has the same genetics as the *Crocodylus niloticus* of the Nile River delta, but their ("Nilekroko-Israel") DNA has yet to be reported. All that can be said at the moment is that various local specimens exist in Israeli museums, and that Mark was recently able to contact people in Israel who have them and know their provenance data.

The finding of Adanson's unpublished plates of the Green (Diasik) and the Black (Maï-Maï) kinds of Senegalese crocodilians was only one aspect of solving the Green Cape crocodiles problem, because only two (Black and Green) of the three kinds were illustrated, but Mark additionally found a Michel Adanson paper published posthumously after Adanson's death that made it clear that there were three, namely the brevirostrine Black, the mesorostrine Green, and additionally a longirostrine species that accidentally he had earlier mixed together with the black kind, thereby unintentionally creating the so-called Black-longirostrine mistake that has plagued the *Crocodilus* versus *Crocodylus* spelling and identity subject since 1757. There is no black-longirostrine crocodilian species in Senegal, and the Adanson pictures and texts that Mark obtained clearly confirm Cuvier's belief in 1807 that the "crocodile noir du Niger" was not yet understood, but the "crocodile vert du

Niger" (Adanson's Green) was so remarkably similar to the Crocodile of the Nile that only some future technique (such as DNA) would possibly separate the two. Interestingly, the DNA of the Adanson's Green specimen was recently sampled and reported, and surprisingly it clusters with wild Egyptian crocodiles from the flowing Nile River (and also eastern and southernmost Africa).

This new and perplexing DNA result in Hekkala *et al*. (2011) could be easily overlooked, because in their Table 2 it is called "SENEGAL 1768" while in Table 3 it is "verTYP1768" (meaning "Crocodylus vert TYPE" from Table 2), and then it reverts to "SENEGAL_1768" in their appended Table S3, where it clusters with individuals from Egypt, Sudan, Kenya and Madagascar. The 1768 date is peculiar because they said in table 2 that Adanson collected it in "1749-1754" (which I express as "shortly before 1757"). The Hekkala *et al*. (2011) application of the name "Crocodylus vert" in their Tables 2 and 3 is probably wrong because "Crocodile vert" is vernacular French, as opposed to a latinized binomen. None-the-less, MNHNP-7524 remains an important specimen, and if Hekkala *et al*. (2011) are correct about its DNA, and if Kischlat, Van Tomme and I are correct about it really being collected in Senegal shortly before 1757, then Cuvier was correct in 1807 about the Adanson's Green physical specimen in the Paris museum being conspecific with the Egyptian crocodile of the flowing Nile. It still remains possible that *C. suchus* as a species (type-locality: grotto beneath ancient Thebes temple) also occurs in the Green Cape region, but Geoffroy-Saint-Hilaire's 1807 argument that the second *Crocodylus* in the Senegal River region is the Adanson's Black is now firmly refuted.

As detailed by VanTomme *et al*. (2012a), Michel Adanson's Maï-Maï or Black crocodile (Crocodile noir du Niger) from the Senegal River region has scale counts and other characters identifying it as *Osteolaemus*, and as shown in Figure 4, the mandubular symphysis is far too short for *M. cataphractus*.

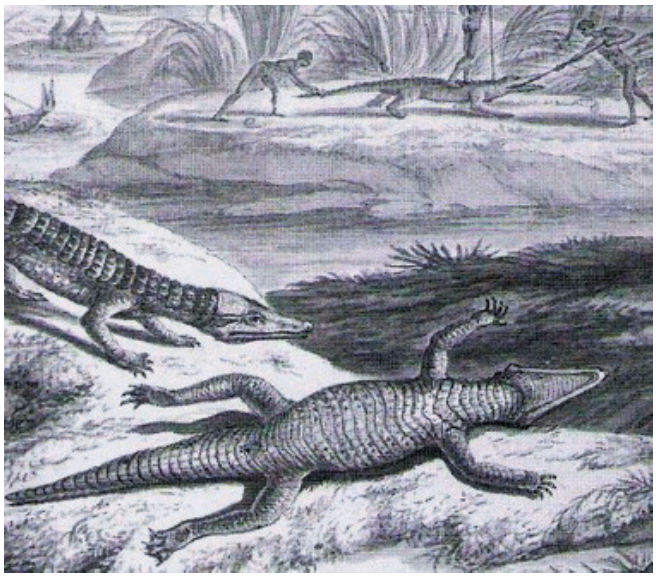

Figure 4. This Black crocodile (Maï-Maï) drawing by Michel Adanson is part of an unpublished plate sent by the MNHNP library to Mark Van Tomme.

Because of Mark Van Tomme's extraordinary ability to access obscure literature and obtain pictures, Dr. Kischlat awarded him the nickname "Mark the Magician", and the continuing collaboration between Edio and myself is significantly indebted to this persevering and successful young scientist whose new contributions to crocodiles will have lasting and positive value.

Of special relevance to the CSG Newsletter, the punctuation change from Van Tomme to VanTomme, for example in VanTomme *et al*. (2012a,b), was unwise because although intended to create alphabetical ordering clarity about Van Tomme (with a V) versus Tomme with a T, he is M.P.A. Van Tomme (1982-2012), and today should be corrected (my error). Similarly, the punctuation "van Tomme" (sic) was, in hindsight, an unnecessary confusion in Ross *et al*. (2010a,b, 2012).

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Franklin D. Ross, *NCB Naturalis, box 9517, Leiden 2300RA, the Netherlands*.

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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

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