

**CROCODILE  
SPECIALIST  
GROUP  
NEWSLETTER**

VOLUME 24 No. 2 • APRIL 2005 - JUNE 2005



IUCN - World Conservation Union • Species Survival Commission

# CROCODILE

# SPECIALIST

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Species Survival Commission

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Printed by: Uniprint NT  
Charles Darwin University, NT 0909, Australia

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COVER PHOTO. Adult Broad-nosed caiman (*Caiman latirostris*). Photo: Adam Britton.

## CSG Newsletter Subscriptions

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The CSG NEWSLETTER provides information on the conservation, status, news and current events concerning crocodilians, and on the activities of the CSG. The NEWSLETTER is distributed to CSG members and, upon request, to other interested individuals and organizations. All subscribers are asked to contribute news and other materials.

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Payment may be made by cash (\$US40), credit card (\$AUD55) or bank transfer (\$AUD55). Due to increased bank costs associated with cheques, this method of payment is no longer recommended. A Subscription Form for the Newsletter can be downloaded from "www.wmi.com.au/csgnewsletter".

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Alian Ruswan, Medan, Indonesia.  
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Wayne Sagera, Vermilion Farms, Louisiana, USA.  
Rene Hedegaard, Danish Krokodile Zoo, Eskilstrup,  
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[Editor's note: Our apologies to St. Augustine Alligator  
Farm Zoological Park, which was accidentally omitted from  
the Donor list in Newsletter Volumes 23(3) and 24(1)].

## Editorial

The last three months have seen a number of important  
issues addressed by the CSG. Additional Steering  
Committee members were confirmed, and with the  
exception of the African and West Asian regions, most  
regions are now complete.

The CSG received Mexico's draft proposal for the delisting  
of *Crocodylus moreletii* from the US Endangered Species  
Act. The proposal presents detailed information from recent  
surveys undertaken throughout the species' range, and all  
contributors to this proposal are to be commended.  
Notwithstanding the quality of the proposal, most CSG  
reviewers felt that the proposal could still be improved,  
thus enhancing its chances of success. Although there is  
sufficient evidence presented to support the removal of *C.  
moreletii* from the "Endangered" status, the reclassification  
to "Threatened" was felt to have a better chance of success,  
particularly in view of uncertainty of future population  
monitoring and enforcement.

Rich Fergusson, Alejandro Larrierra and Perran Ross  
completed and submitted a review of 24 crocodile ranching  
programs established under Resolution Conf. 11.16 (or its  
precursors) or general Appendix-II listings, to the CITES  
Secretariat. The compliance of each program with respect  
to reporting requirements was assessed, and a simplified  
reporting system that would meet the needs of CITES is  
proposed.

A successful CSG regional meeting (Latin America and  
Caribbean) was held in Santa Fe, Argentina, and readers  
are directed to a summary on page 4. The minutes of a  
Steering Committee meeting held at the regional meeting  
are also presented in this Newsletter (page 5).

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

## CSG Regional Meeting

From 17-20 May 2005, around 100 participants (CSG  
members and non-members) joined in Santa Fe City,  
Argentina, to participate in the meeting of the Latin  
American and Caribbean region.

Participants came from Australia, Bolivia, Brazil,  
Colombia, Costa Rica, Cuba, Ecuador, Mexico, Paraguay,  
Peru, Uruguay and the USA. Representatives from all  
Argentinian Provinces involved in caiman management  
and conservation were also present. The meeting was  
organized by Proyecto Yacaré, Ministerio de la Producción  
(Santa Fe Province) and the CSG, and was supported by  
Yacaré Santafesinos de MUPCN, Caimanes de Formosa,  
Yacaré Porá, Universidad Nacional del Litoral and  
Fundación Biodiversidad. An anonymous donation to the

CSG provided some financial support for key people to attend the meeting.



Photograph 1. Opening ceremony: from left, Alejandro Larriera, Bernardo Ortiz (TRAFFIC), Marcelo Terencio (Ministry of Environment), Daniel Costamagna (Ministry of Agriculture), Alvaro Velasco and Tom Dacey. Photo: Pablo Siroski.

The meeting was opened with welcome addresses from Alejandro Larriera (CSG Deputy Chairman), Alvaro Velasco (CSG Regional Chairman for Latin America and the Caribbean), Marcelo Terencio (Environment Secretariat) and Daniel Costamagna (Agriculture Secretariat). Over the 4-day period, there were 37 oral presentations and 17 posters covering topics such as crocodilian biology, management (including program reviews) and genetics. Two workshops were also convened: Crocodilian Management in Latin America, coordinated by Alvaro Velasco; and, Sustainability Indices for Management Programs, coordinated by Maria Elena Zaccagnini (Vice Chairman, IUCN-SSC Sustainable Use Specialist Group). In the afternoon of the first day, a productive Steering Committee Meeting took place (see minutes on page 5).

The Proceedings of the meeting are in the form of a CD. The organisers thank all the people who made provided their presentations in advance of the meeting, which allowed the CD to be compiled and distributed to participants at the beginning of the meeting. This is the first time that this has been possible, and was appreciated by all participants. Proceedings of the meeting are now available for downloading at “www.wmi.com.au/csgarticles”.

Participants enjoyed the welcome dinner, and the provision of a special hospitality rooms on several nights. At the farewell dinner, presentations were made for best presentation and poster.

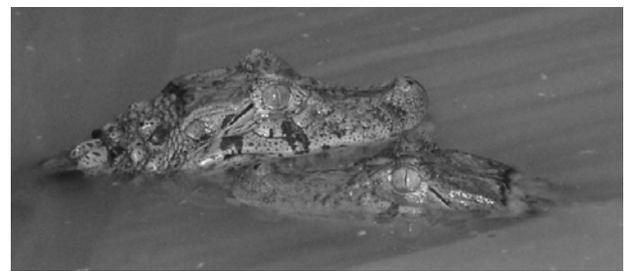
The prize for best poster went to:

- Josefina Iugman, Carlos I. Piña and Pablo Siroski. Embryo development of *Caiman latirostris*.

The prize for best presentation was shared equally by:

- Giovanni A. Ulloa-Delgado, Clara L. Sierra-Díaz and Denis Cavanzo-Ulloa. Experimental pilot project for the conservation of *Crocodylus acutus* by local communities in the mangroves of Bahía de Cispata, Córdoba Department.
- Roberto Soberón. Crocodilian conservation in Cuba.
- Fernando Zamudio. Mayan ecological knowledge and management of caiman in Quintana Roo, Mexico.

On Saturday, 21 May, there was a field trip to Estancia ‘El Estero’ to see many broad-snouted caimans (*Caiman latirostris*) basking in the sun and impressive birdlife. Participants also enjoyed an Argentinian barbecue and a typical ‘Locro’ (gaucho stew) with wonderful Argentinian red wine. Some participant took the opportunity to experience horse-riding at the border of the marsh lands.



Photograph 2. Hatchling *Caiman latirostris* at Proyecto Yacaré's rearing facilities in Santa Fe. Photo: Tom Dacey.

## **Reunión Regional del Grupo de Especialistas en Cocodrilos**

Entre el 17 y el 20 de mayo de 2005, alrededor de 100 participantes (miembros y no-miembros del CSG) se reunieron en la ciudad de Santa Fe, Argentina, para participar en la reunión del CSG de la región de América Latina y el Caribe. Los asistentes provenían de Australia, Bolivia, Brasil, Colombia, Costa Rica, Cuba, Ecuador, México, Paraguay, Perú, Uruguay, EEUU y de todas las provincias argentinas involucradas en el manejo y la conservación de los caimanes. La reunión fue organizada por el Proyecto Yacaré, el Ministerio de la Producción (Provincia de Santa Fe) y el Grupo de Especialistas en Cocodrilos, y fue auspiciada por Yacaré Santafesinos de MUPCN, Caimanes de Formosa, Yacaré Porá, Universidad Nacional del Litoral, y Fundación Biodiversidad. Una donación anónima al CSG proporcionó una cierta ayuda financiera para la gente clave para asistir a la reunión.

La reunión se inició con un mensaje de bienvenida de Alejandro Larriera (CSG Deputy Chairman), Alvaro Velasco (CSG Regional Chairman for Latin America and the Caribbean), Marcelo Terencio (Secretario de Medio Ambiente) y Daniel Costamagna (Secretario de Agricultura

y Ganadería). Inmediatamente después se iniciaron las presentaciones de 37 exposiciones orales y 17 posters que cubrieron diferentes tópicos sobre la biología, genética y manejo (incluida la revisión de programas) de los cocodrilos. Además, al atardecer del primer día, se desarrolló una productiva reunión del Steering Committee de CSG (vea la página 5).

Durante la reunión, se desarrollaron también dos talleres; "manejo de los cocodrilos en América Latina", coordinado por Alvaro Velasco; y, "criterios e indicadores de sustentabilidad de los programas de manejo", coordinado por María Elena Zacagnini (Vice Chairman de IUCN-SSC Sustainable Use Specialist Group). Tanto los resúmenes de la reunión como las conclusiones de los talleres, estarán pronto disponibles en la página web del CSG.

La organización desea agradecer a la gente que realizó presentaciones orales o en posters, el haber entregado previamente sus manuscritos, permitiendo que al momento de inicio, fuera posible incluir entre los materiales de registración, un disco compacto con los anales completos de la reunión, lo que fue muy apreciado por todos los participantes. Los resúmenes y las exposiciones presentadas en la reunión están disponibles en "www.wmi.com.au/csgarticles".

Durante el curso de los cuatro días de reunión, los participantes tuvieron la ocasión de disfrutar un banquete de bienvenida; la provisión de servicios de hospitalidad en los días siguientes, aprovechando la ocasión de la cena de clausura para la entrega de premios a:

- Josefina Iungman, Carlos I. Piña y Pablo Siroski. Desarrollo embrionario *Caiman latirostris*, como mejor poster.

El premio a la mejor presentación oral fué compartido entre:

- Giovanni A. Ulloa-Delgado, Clara L. Sierra-Díaz and Denis Cavanzo-Ulloa. Proyecto experimental para la conservación de *Crocodylus acutus* por las comunidades locales en los manglares de la Bahía de Cispata, Provincia de Córdoba;
- Roberto Soberón. La conservación de los cocodrilos de Cuba; y,
- Fernando Zamudio. Conocimiento ecológico y sistema de manejo Maya del lagarto en Quintana Roo, México.

El sábado 21 de mayo, se realizó un viaje al campo, a la Estancia "El Estero", en el que fue posible ver numerosos ejemplares de Yacaré Overo (*Caiman latirostris*) silvestres asoleándose, y una impresionante avifauna. El viaje se completó con un típico asado argentino, y un abundante "locro" (tradicional guisado), todo regado con los excelentes vinos argentinos. Asimismo, algunos de los participantes aprovecharon para experimentar cabalgatas en la costa del estero.



Photograph 3. From left, Melina Simoncini, Carlos Piña, Virginia Parachú, Phil Wilkinson, Pablo Siroski, Verónica Tarragona. Photo: Roberto Soberón.

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

## **Minutes of CSG Steering Committee Meeting, Santa Fe, Argentina, 17 May 2005**

Members: Alejandro Larriera, Alvaro Velasco, Tom Dacey, Giovanni Ulloa, Manuel Muñiz, Roberto Soberón, Luciano Verdade, Bernardo Ortiz, Eric Silberstein, Don Ashley, Phil Wilkinson

Observers: Carlos Piña, Pablo Siroski, Luis Bassetti, Gisela Poletta, Josefina Iungman, Jaime Ramírez, Melina Simoncini, Virginia Parachú, Germán Chávez, Gianmarco Rojas, Jerónimo Domínguez Laso, Luis Sigler, Libby Bernardin, Pam Ashley

### General Business:

1. Steering Committee Appointments. A list of appointments confirmed by the CSG Chairman to date was circulated. Tom Dacey advised members on progress with appointments to the various Regional and Thematic Groups, and outstanding appointments.
2. CSG General Membership. The seven (7) Regional Chairs have been requested to review their respective regional CSG membership, in liaison with Regional Vice Chairs, and to provide recommendations to the Chairman. The criterion for determining who should be recommended was "What can they do for the CSG, not what the CSG can do for them". Alvaro Velasco reported that a number of current Latin American and Caribbean region members, particularly in central Latin America, Brazil and the Caribbean, had not responded to e-mail requests. It was suggested to proceed with

the agreed nominations and any additional recommendations could be added progressively, as contact and confirmations are received.

3. Progress Report on Recent Activities. Tom Dacey provided briefings on the following matters, as reported in the recent CSG Newsletter [Vol. 24(1)]:
    - a. Terms of Reference for Specialist Groups;
    - b. Draft CSG Operating Guidelines;
    - c. Cambodia Review;
    - d. Report of the 2004 CSG-Tomistoma Task Force survey in Kalamantan, Indonesia;
    - e. Establishment of the CSG Commercial Live Trade Task Force under the direction of Perran Ross;
    - f. Possible development of a peer-reviewed electronic journal, devoted to crocodylian biology and conservation, as suggested by Frank Seebacher;
    - g. Proposed development of mechanisms to identify "Farmed vs Wild Skins". (Alejandro Larriera made a presentation on a possible method at the Regional Meeting the following day);
    - h. Proposed CSG review of Paraguay, Ecuador, Boliva and Peru;
    - i. Recent visit by CSG Executive Officer to Cuba and Mexico; and,
    - j. Need for CSG action and resources in Africa.
  4. Proposed establishment of a CSG Latin American Office in Caracas, Venezuela. Alvaro Velasco and Tom Dacey briefed members on this proposal, which was favorably received. Bernardo Ortiz raised some points on the proposed operation of this innovative scheme within the group, and asked whether it would be extended to other regions. Tom Dacey responded that similar arrangements were under consideration for Africa, but it was dependant upon finalisation of Regional Steering Committee appointments.
  5. Proposed update and enhancement of the CSG website is to be undertaken by linking the current Florida and Darwin websites, with the intention of encouraging its use as the prime communication linkage between CSG members, Steering Committee and the Executive Officer, and the general dissemination of information.
  6. Mexico's *Crocodylus morletii* Downlisting Proposal and the US Endangered Species Act. Manuel Muñiz advised that the data/information provided in the Mexican draft proposal was considered to be very good and the research program should be continued. Mexico has sought CSG support for the proposal. Steering Committee members were requested to provide comments on the document and suggest any areas where the document could be improved. There was some discussion on the need to address the enforcement aspects, particularly in regard to neighboring countries such as Belize and Guatemala.
  7. Argentina's *Caiman latirostris* Downlisting Proposal and the US Endangered Species Act. Alejandro Larriera provided an overview of the history of this proposal and indicated that Argentina would be seeking CSG support in seeking resolution of this long outstanding issue.
  8. Proposed meeting of Brazilian CSG members. Luciano Verdade provided a briefing on the current situation with CSG membership in Brazil, and the lack of coordination of between those involved in conservation, management and sustainable use of crocodylians in Brazil. The suggestion of a local meeting of Brazilian specialists, coordinated by the CSG Regional Chairman, was supported. It was proposed that a meeting take place in October/November 2005. The purpose of the meeting is to update available information on the various crocodylian species, population statistics in each of the Brazilian States, and to propose possible changes to Brazilian laws, with a view to improving the conservation of crocodylians in Brazil. Luciano will submit a proposal to San Paulo's Science Foundation (FAPESP) seeking funding for the meeting.
  9. Farmed vs Wild Skins. Alejandro Larriera provided an overview of the paper he was to present on this issue during the Regional Meeting. The paper suggests that scarring caused from scute-clipping of farm-bred juveniles could be a possible means of identification of skins from wild animals.
  10. CSG Newsletter Subscriptions. Tom Dacey briefed members on the cost to produce and mail out the quarterly CSG Newsletter, and drew attention to the "Subscription Renewal" form in the latest newsletter.
  11. Trade Industry Issues. Don Ashley reported that the CSG Industry Committee met in Bologna, Italy, on 28 April, and discussed priority issues including Personal Effects, Enforcement, Live Trade, ESA downlistings, need for an updated Skin Identification Manual, advance planning for 2006 CSG meeting in France, and other issues. The Industry Committee will try to initially meet every 6 months to timely address important trade topics. The next meeting is tentatively scheduled for October 2005, again in Bologna, during the Lineapelli Leather Fair that many members attend.
- The Personal Effects Resolution was recognized by the Industry Committee as the most important CITES deregulation to date and deserved careful consideration to establish standards for listing additional Appendix-II species to the list. The CITES Standing Committee will discuss Personal Effects in June during the Geneva meeting, and recommend CSG input should be to include criteria for the listing process to ensure trade is legal, sustainable and verifiable. A timeframe to submit

listing or delisting proposals will also be recommended (90-120 days prior to COP was discussed) to ensure reasonable time for affected Parties to review and comment. The criteria and regular review (monitoring) of species listed under the Personal Effects Resolution could be a first step toward a trade certification program within CITES that could endorse sustainable trade of crocodilians and verify conservation value.

Enforcement and compliance are currently important CITES concerns, and follow-up meetings by the Industry Committee Chair in Cambridge with WCMC, TRAFFIC and the IUCN Sustainable Use Group Chair (Jon Hutton) will focus on improving the process for collecting, analysing and acting upon information concerning infractions or illegal trade. The consensus was that a much better process was needed, involving CITES, CSG, WCMC, TRAFFIC and others in a clearinghouse approach that identified "hotspots" and initiated appropriate action. Consensus of the CSG Steering Committee in Santa Fe was these ideas should be pursued with the CITES Secretariat in cooperation with WCMC and TRAFFIC (probably concurrent with the June CITES Standing Committee in Geneva).

Some concern was expressed about alleged illegal traffic of crocodilian skins through Mexico, from other Latin American countries.

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

## Regional Reports



### West Asia

#### **India**

RECENT NOTABLE INCIDENTS OF CONFLICT BETWEEN MUGGER AND HUMANS IN GUJARAT STATE. The increasing human population, unchecked growth of urbanization, industrialization and encroachments on forests land for agricultural practices has an impact on wildlife - especially shrinkage of habitat. That finally has resulted in wild animals versus human conflict or vice versa.

Nowadays, these kinds of conflicts are common and are noticed in many parts of India, including Gujarat State.

During the last decade, such conflicts have increased in the State, more so between human and leopard (*Panthera pardus*) (Sharma and Gavali 2005) and mugger crocodile (*Crocodylus palustris*) than other wild animals.

The mugger crocodile is one of the crocodile species that is widely distributed and commonly found in most water bodies of the Indian subcontinent. The mugger has adapted to all kinds of habitat, from small puddles to large water bodies, and from river to estuarine habitat. It has also been observed that they use highly polluted waterbodies for shelter (R. Vyas, unpubl. observ.). The food of mugger ranges from insect to large mammals, and although occasional attacks on humans have been reported, man-eating is uncommon in India (Daniel 2002).

Gujarat State is one of the states that has a large number of mugger crocodiles. According to the last survey, there are over 429 crocodiles recorded in various large waterbodies and an estimated 1600 crocodiles in the entire state (Vijaya Kumar *et al.* 1999). This survey indicates that the mugger population is rising in the state. This increased population of mugger is due to conservation efforts of the State Forest Department and conscientious local people. Also because the species is legally protected by the Indian Wildlife Protection Act 1972 as a Schedule-I species.

I have collected details about such incidents related to Mugger Crocodiles on the basis of local newspapers, wildlife enthusiasts and local people. With this information, I have personally visited the spot/waterbody where the incident occurred, talked to victims and their relatives, and collected information from people living around the waterbody. I have thus studied such situations, along with past history of the waterbodies and related mugger (Table 1).

During last ten years (ie 1995 to 2004), a total of eight instances of human-mugger conflict were recorded, including four fatal attacks in Vadodara and Narmada districts of south Gujarat. In all, the incidents involved very low income people who depended on nearby waterbodies either for drinking water, washing clothes or fishing. Two incidents involved young boys, who were playing close to the water. Interestingly, people were aware about the presence of the muggers in the waterbodies.

Cases of mugger attack on humans have been recorded in the past and recent past in the state. Earlier reports show a total of five humans eaten by crocodiles in various parts of the state between 1960 and 1991, two at Ahmedabad and one each at South Gujarat, Kutch, and Surashtra (Vyas 1993).

Records of such notable numbers of crocodile attacks and loss of human life show that it is high time to redefine and reconsider conservation policy and management plans for the species in the state, especially those crocodile

Table 1. Summary of recent Mugger attacks on humans in Gujarat State, India (1995-2004).

Date	Waterbody	Location/District	Name (age)/Injury	Activity
12 Jul 1995	Narmada River	Varkhad, Rajpipla, Narmada District	Nandlal V. Sadariya (42 y) Injury on left hand	Fishing
5 Dec 1995	Vishwamitri River	Vadodara City, Vadodara District	Firoz Ibrahim (7 y) Injury on right hand	Playing near river bank
31 Jul 1997	Narmada River	Mandava, Sinor, Vadodara District	Santilal K. Vasava (25 y) Injury on legs	Bathing, swimming
1 May 1998	Vishwamitri River	Thikariya-Mubark, Padra, Vadodara District	Woman (30 y) Injury on right hand	Washing utensils
5 Jul 1998	Karjan Dam	Rajpipala, Narmada District	Man (Fatal)	Fishing
1 Aug 1998	Dhadhar River	Surwada, Dobhoi, Vadodara District	Boy (8 y) Fatal	Playing
7 Nov 2004	Narmada Dam	Suka, Keyadiya, Vadodara	Champak B. Tadavi (28 y)	Bathing, swimming
15 Nov 2004	Narmada Dam	Suka, Keyadiya, Vadodara	Ukardi K. Tadavi (60 y) Fatal	Washing utensils

populations that are found in non-protected areas and close to human habitat. Such incidents have a negative impact on conservation programs for this and other species that are directly or indirectly in conflict with human life and property.

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## Latin America & Caribbean

### Belize

TRIATHLON CHAMPION ATTACKED BY CROCODILE IN BELIZE. Increasing numbers of attacks

by Morelet's crocodiles (*Crocodylus moreletii*) on humans have been reported in Belize over the last decade (Marlin *et al.* 1995; Rainwater 2000; Finger *et al.* 2002; Mazzotti and Windsor 2002). This is likely the result of a combination of factors including increasing human and crocodile populations, residential development of crocodile habitat, deliberate or unintentional feeding of crocodiles in human-populated areas, and increased efforts to maintain records of attacks (Finger *et al.* 2002; Mazzotti and Windsor 2002). While few fatal attacks by *C. moreletii* in Belize have been confirmed (Abercrombie *et al.* 1982; Lee 1996; Finger *et al.* 2002), these crocodiles are still considered a threat to humans, pets, and livestock, and non-fatal attacks on humans are not uncommon (Marlin *et al.* 1995; Rainwater 2000; Mazzotti and Windsor 2002). Attacks by American crocodiles (*C. acutus*) on humans have been reported from other countries within the species' range (Lee 1996; Jimenez 1998; Sigler 2000), but to our knowledge none have been reported in Belize. Here, we report a recent attack by an unidentified crocodile on an adult human in Belize.

The attack occurred in the Flowers Estate/Lake View area of Ladyville, approximately 11 miles northwest of Belize City (Mile 11, Northern Highway). Within this residential development are many man-made finger canals and ponds. A few years prior to the attack, a canal was dug to connect these residential wetlands to a mangrove swamp along the coast. The incident took place in a pond (ca. 75 x 30 m wide, 3 m deep) connected to this canal. The pond is commonly used by area residents for swimming and is equipped with a stairway and railing leading down into the water for easier access.

On the morning of 29 July 2004, at around 0600 h, Hubert

Johnson, an adult male (42 years; height 180 cm; weight 79 kg), arrived at the pond to train for the swimming portion of an upcoming triathlon. Mr. Johnson, the reigning Belize triathlon champion at the time of the incident, had trained in the pond for 10 years, and although he had been warned by other residents that crocodiles had been spotted in the pond, he had never seen one there himself. A few days before, construction workers at a site adjacent to the pond said they had recently seen a crocodile in the pond. Before entering the water, Mr. Johnson scanned the area for any sign of crocodiles but saw none and began his workout.

At around 0630 h, while on the last of three laps across the pond, Mr. Johnson said he felt a “current” underneath him, but at the time thought nothing of it and continued. On his return, with his right arm extended forward, he felt something grab his right side, followed by sharp pains in his shoulder and back as something squeezed the area, gave a soft grunt/hiss, and then released him. He did not look to see what had bitten him and focused on getting out of the water as quickly as possible. He made it to shore, and upon climbing out of the water and looking back at the pond he saw no sign of the crocodile. Blood was running from his back and shoulder and down his leg. He held his shirt against the wounds and drove to the hospital where he received six stitches and was released.



Figure 1. View of the crocodile bite wound on the right shoulder and scapula of the victim. Photo taken at the site of the incident in Ladyville, Belize.

All six stitches were to one puncture on the back (Figure 1). Mr. Johnson later mentioned that the most painful wound was one on the front of his shoulder. Likely due to prompt medical treatment, no infection or necrosis often associated with crocodilian bites (Webb and Manolis 1989) developed from the wounds. Mr. Johnson has since fully recovered, but has not swum in the pond since the incident.

A few days after the attack, a 206 cm long male *C. moreletii* was captured in the same pond (Figure 2), and about one

week later a 270 cm long male *C. moreletii* was captured in the pond. Both animals were transported to more remote areas and released. The bite wound pattern on Mr. Johnson’s shoulder was compared with the maxilla and mandible of a skull of a 240 cm *C. moreletii*, and it was determined that the wound came from a smaller crocodile, likely 180-210 cm TL. Because *C. moreletii* and *C. acutus* are both found in the coastal zone of Belize (Platt and Thorbjarnarson 1997), the crocodile species that attacked Mr. Johnson cannot be definitively determined. However, the capture of two adult male *C. moreletii* in the pond shortly following the attack strongly suggests the attacking crocodile was a *C. moreletii*.



Figure 2. Attack victim with a 206 cm long male *C. moreletii* captured a few days after the attack in the pond where the incident occurred.

The cause of the attack remains speculative. Crocodile attacks on humans may result from females defending nests, males defending breeding territories, and hunger (Pooley *et al.* 1989). The man-made pond where the attack occurred is a highly disturbed area with very little nesting habitat along its banks. Shortly following the attack, the entire shoreline and adjacent areas were searched, and no evidence of nesting was found. Based on this information and the fact that a 206 cm male *C. moreletii* was captured in the pond shortly following the attack, we suspect the attack was the result of a hungry *C. moreletii* biting a prey item that was too large for it to subdue.

Mazzotti and Windsor (2002) provided multiple recommendations for reducing negative human-crocodile

interactions in Belize, including public education, a problem crocodile program, and proactive planning related to commercial and residential development of crocodile habitat. Cooperation among various Belizean entities (eg Ministry of Natural Resources, non-Governmental organizations (NGOs), ecotourism operators, the public, etc.) is necessary to incorporate these recommendations into an effective management plan. If implemented, such a plan will likely reduce crocodile attacks on humans in Belize.

#### Acknowledgments

We sincerely thank Mr. Hubert Johnson for allowing us to interview him regarding the attack and for permitting us to use the photograph of his injury in this account.

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## East and Southeast Asia

### **Singapore**

A zookeeper at Singapore Zoo was bitten by a 1.7 m long False gharial in early April 2005. The gharial was being chased by another gharial when it accidentally bit Jamaludin Abdul Wahid through his left boot, on the shin, as he was cleaning the enclosure. There were seven puncture holes in his leg, and a 2 cm tooth was embedded in his shin.

*Source:* Yvonne Ang, Channel News Asia.

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### **Indonesia**

The final report for the 2004 surveys of the False Gharial (*Tomistoma schlegelii*) in West Kalimantan, Indonesia, is now available at: [www.tomistoma.org/pa\\_contents/2004surveys.html](http://www.tomistoma.org/pa_contents/2004surveys.html). A summary report on these surveys was included in CSG Newsletter 23(3).

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### **Lao PDR**

SIAMESE CROCODILE SURVEYS IN LAO PDR FIND HATCHLINGS. Lao People's Democratic Republic has emerged as a globally important region for conservation of the Siamese Crocodile (*Crocodylus siamensis*). In 2005, the first national survey program for the Siamese Crocodile was initiated. Ranked as "Critically Endangered" by IUCN-The World Conservation Union, the species is now very

rare or locally extinct in the Southeast Asian countries where it historically occurred, including Thailand and Vietnam (most populations extinct), Lao PDR and Indonesia (status unclear), and Cambodia (considered to support the largest remaining wild populations). In Lao PDR, unconfirmed local reports in the 1990s indicated that globally important populations might still occur, and the need for baseline surveys was considered urgent by the Crocodile Specialist Group.

Preliminary Siamese Crocodile surveys in Lao PDR were first conducted in 2003 and 2004, by the Government of Lao (Living Aquatic Resources Research Centre, LARReC) and Wildlife Conservation Society Lao Program (WCS) (Thorbjarnarson *et al.* 2004). Few wild crocodiles were seen, but local reports confirmed that breeding populations persisted. In 2005, a detailed survey program (March to June) was initiated by LARReC/WCS, with timely funding from the Mekong Wetlands Biodiversity Programme (MWBP)\*. The Siamese Crocodile is one of four “flagship” species for the MWBP’s conservation activities in Lao PDR, Cambodia, Vietnam and Thailand.

The current surveys have already revealed some exciting findings. In March 2005 a small breeding population of Siamese Crocodiles was found in a small (11 ha) swamp in Savannakhet Province (central Lao PDR). Seven hatchlings and their mother were observed in the wild, and two hatchlings were caught, measured and released. One old (2004) nest site was documented. This appears to be the first time that Siamese Crocodile hatchlings have been documented in the wild in Lao PDR.

From March to May, 20 wetlands in central and southern Lao PDR were surveyed, including day-time searches for crocodile tracks and other signs, night-time spotlight surveys, and interviews with local communities. Local information indicated that crocodiles historically occurred in 14 of 20 sites, but the team could only confirm the continued presence of crocodiles (direct observation of crocodiles, dung or other sign) in 4 sites. In the remaining 16 sites, local people reported that crocodiles do still occur (6 sites), used to occur but no longer (4 sites), or never occurred (6 sites). In Lao PDR, the Siamese Crocodile may historically have occupied a range of wetland habitats; of the 14 sites where Siamese Crocodiles historically occurred, 10 sites are permanent or seasonal freshwater ponds or lakes (including thickly vegetated swamps and open waterbodies) and four sites are perennial, flowing rivers. Local communities only reported crocodile nesting at three sites, which was confirmed at two sites by team members in the current and previous WCS surveys. Nesting sites were all permanent standing waterbodies (two thickly vegetated swamps with floating vegetation mats and one open lake).

These findings indicate that Siamese Crocodiles may still occur in several regions of central and southern Lao PDR, but that remaining populations appear to be small and

fragmented. The maximum number of crocodiles observed by the team at a single site, in a single visit, was 9, and in most other sites local people reported infrequent sightings of 1-3 individuals/year. In three waterways, local communities stated the species occurred until the 1950s-60s but had not been seen since.

Current threats to remnant crocodile populations include loss of nesting habitat due to swamp drainage for agriculture, weed invasion (especially *Mimosa pigra* and *Eichornia* spp.) and burning of wetland vegetation and fringing forest. No current commercial hunting has yet been recorded during surveys, although the species was once intensively hunted for the skin trade.

The current program will end in June 2005, and new funding will be critical to develop a national conservation plan for the species, and begin management actions in high-priority sites for Siamese Crocodile conservation. National conservation efforts for this species will probably require at least two approaches, involving protection of breeding sites, and landscape-level management of seasonal and permanent wetlands. The project is also generating awareness of the species among local agencies, and forestry staff who accompany surveys are trained in crocodile survey techniques.

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[\*The Mekong Wetlands Biodiversity Conservation and Sustainable Use Programme (MWBP) is a joint programme of the four riparian Governments of the Lower Mekong Basin - Cambodia, Lao PDR, Thailand and Vietnam - managed by UNDP, IUCN-The World Conservation Union and the Mekong River Commission, with funding from the Global Environment Facility, UNDP, The Royal Netherlands Government, MRCS and the Water and Nature Initiative. This National Survey Program for the Siamese Crocodile is a collaboration with the Government of Lao PDR, MWBP and WCS].

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## Africa

### Uganda

A 5 m (16 feet) long Nile Crocodile (*Crocodylus niloticus*)

which residents report to have eaten 83 people over the last 20 years has been caught in Uganda. Most victims were fishermen working on Lake Victoria. Wildlife authorities trapped the crocodile, and although residents wanted the crocodile killed, it was relocated to Buwama Crocodile Farm, west of the capital of Kampala.

Source: Reuters, 8 March 2005.

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## **Australia and Oceania**

### **Australia**

Workplace Health and Safety Queensland (Queensland Department of Industrial Relations) has finalised its safety guidelines for working with captive crocodiles (February 2005). Although not legislation, the guidelines will assist employers to fulfill their legal obligations under the *Work Health and Safety Act 1995*, to ensure the health and safety of employees.

The guidelines apply to wildlife parks and zoos, crocodile farms, universities and other research institutions. In developing the guidelines, Workplace Health and Safety Queensland consulted widely with industry groups and other relevant stakeholders. A draft version of the guidelines was available for comment at the CSG working meeting in May 2004.

The guidelines establish that crocodile enclosures are off limits to the public and untrained employees. Of particular interest, the guidelines specify that the involvement of children in “crocodile performances is severely restricted to ensure their safety”. The latter specification is in response to a well-known television personality holding his one-month-old baby son close to a crocodile in January 2004 (Cairns Post, 24 February 2004).

The “Workplace Health and Safety Guidelines for Working with Crocodiles in Captivity” can be located at [www.whs.qld.gov.au/guide/gde70.pdf](http://www.whs.qld.gov.au/guide/gde70.pdf).

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### **Palau**

LOCAL KNOWLEDGE ABOUT CROCODILES IN PALAU. The Palau Conservation Society was contracted by The Nature Conservancy to conduct interviews with people knowledgeable about Palauan saltwater crocodiles (*Crocodylus porosus*), known locally as *ius*. The goal of the interviews was to obtain local knowledge about the habits, status and uses of crocodiles in Palau. What resulted from these interviews are some of the commonly held perceptions about crocodiles in Palau, as well as some information about their preferred habitats and recent behaviors. The history of crocodile hunting and use was

also a subject of the interviews, enabling a comparison of some of the changes that have occurred over time. The results of these interviews are meant to complement a biological survey of crocodiles that was conducted in Palau in June 2003 (Brazaitis 2003; Brazaitis and Eberdong 2003).

Palau has the only population of saltwater crocodiles in Micronesia. The first recorded capture of a crocodile occurred in Ngatpang around 1900, during the German administration. In 1916, Japanese surveys documented crocodiles in Palau (see Messel and King 1991).

A Palauan legend recounts the relatively peaceful coexistence between people and crocodiles in earlier times. The legend describes how a man named Ksau overcame a crocodile’s hunting magic with stronger protective magic that allowed his children to swim in the Ngerdorch River safely. The crocodile agreed not to harm children if they were rubbed with a new coconut leaf, which was then tied around their necks.

Early in the 20th century, Palauan crocodiles were extensively killed for their skins. Some crocodiles were also imported from the Philippines and Papua New Guinea to be raised on a farm in Palau for their skins. Many of these crocodiles were eaten by Japanese soldiers during World War II.

In 1965, a man was killed by a crocodile. This led the Trust Territory Government to institute a trapping program and then a bounty program in order to remove all crocodiles from Palau. Crocodiles were hunted for their skins so extensively that by 1980 there were so few crocodiles left that the trade was halted.

There are no Palauan laws that explicitly prohibit the killing of crocodiles. There is a national ban on firearms that effectively removed from use the most popular weapon for hunting crocodiles. Palau is now a signatory to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). However, there is confusion about the laws, and many people believe that it is illegal to kill crocodiles in Palau.

Palauan crocodile populations appear to be rebounding after their near extinction. Although they are seen more often, there have been few recent incidents where someone was hurt by a crocodile. This has not changed people’s perceptions - crocodiles are still not popular in Palau. They are generally viewed as both a threat to people as well as competition for mangrove crabs and reef fish. There may be increased interactions between people and crocodiles as their numbers increase and as they move closer to human habitations. Conservation of crocodile populations in Palau will depend upon reducing the perceived and actual threats to people.

This study on local knowledge of crocodiles provided some insight into the perceptions held by some people in Palau about crocodiles. The people interviewed were locally known to have some knowledge about crocodiles. Their observations about crocodile behavior and perceived threats provided depth to the biological surveys that were conducted to assess the status of crocodiles in Palau.

Forty-six (46) men were interviewed between December 2002 and February 2003. All were hunters, either presently or in the past, of crocodiles. Interviews were conducted in 13 of Palau's 16 states, where crocodile populations are known to exist (ie crocodiles were sighted in the past year). The lead interviewer, Joshua Eberdong, is a trained and skilled crocodile breeder and is locally known as the person who knows most about Palauan crocodiles (see Photograph 1).



Photograph 1. Joshua Eberdong, National Government Turtle, Crocodile and Dugong Coordinator in Palau, was the lead interviewer for the survey. Photo: Julian Dendy.

#### Distribution, Movements, Habits and General Behaviour

- Most crocodiles sighted have been observed in coastal mangroves, but also in rivers, lakes, bays, old mining pits and islands.
- Crocodiles are sighted during the day and night.
- On the question of how long crocodiles stay in an area, the responses varied. 24% of respondents said animals migrated, but most responses suggest that crocodiles tend to stay in a particular place for a great deal of the time, although they do move from one area to another. It was not clear from the interviews whether there was any seasonality to their movements.
- The overall average size of crocodile sighted was 10 ft (3 m), with individual means ranging from 7 to 15 ft (2.1-4.6 m). Most of the crocodiles recorded by Brazaitis and Eberdong (2003) were in the 2 to 10 ft (0.6-3.0 m) range - they saw no animals larger than 12 ft (3.7 m) during their brief survey.

- 59% of respondents said that the crocodiles were seen in different areas at different times of the month and year. One respondent noted that only the large individuals swim around Palau, and that the young tended to stay in one place.
- Young crocodiles had been sighted in all 13 states, nests and eggs in 6 states, and sick or dead crocodiles in 4 states.
- Mean estimates of crocodile numbers in each state ranged from 10 to 86, with a mean total of around 400 crocodiles. This is a very rough estimate.

#### Changes Over Time

- Most respondents felt that there are more crocodiles now than 5, 10 or 50 years ago. However, 13% of them also felt that there were more crocodiles in Palau 50 years ago than there are now.
- The most common behavioral changes mentioned were that crocodiles were not afraid of people (33% of responses) or not wild (23% of responses). Many of the men also noted that crocodiles were seen closer to shore, docks and ports (15% of responses). Most responses (44%) regarded the reason for these behavioral changes was that there was less or no hunting.
- Some responses (19%) suggested that there are too many crocodiles (overpopulation), and 10% of the responses suggested that a lack of food has caused the animals to move closer to people and human habitation.

#### Historical and Contemporary Uses

- Crocodile hunting was common in the past in most the states where interviews were conducted.
- Food (52%), skin (4%) or both food and skin (20%) were the reasons given for crocodile hunting in the past.
- The majority of respondents (72%) said that crocodile hunting was still occurring.
- The most common responses about hunting methods were: spear, net (in Peleliu), and fishing line and hooks. Others mentioned rifles, mangrove crab traps (for small crocodiles), *kadiosang* (a large spear) or their bare hands as other hunting tools. Most of the men interviewed said that crocodiles could be hunted at any time, day or night - 17% said that they are best hunted at night.
- Most respondents (83%) said that crocodiles were eaten in the past, and many (67%) indicated that it still occurs in Palau, but not as commonly as it once was.
- Frequency of crocodile meat consumption varied: most men said it was eaten when crocodiles were caught (46%), and many said it was eaten once in a while or not often.
- Most men (87%) said that not everyone could eat crocodile. This was due to individual taste preferences, rather than cultural taboos or restrictions as is the case for other animals and fish in Palau.

- Most of the respondents said that young people, children, women, or those who were afraid to eat them, did not eat crocodiles.
- Crocodiles were not considered to be "valuable" in Palauan culture today. There are no customs that traditionally used crocodile meat, so they are not seen as being useful or important as other animals are (eg pigs).

#### Other Comments

- Most respondents felt that crocodiles were threatening and dangerous to people, or were competitive for fish and mangrove crabs. Some women were afraid to go to their taro patches because of the threat of crocodiles, and some fishermen felt that there were fishing areas that they could no longer visit because of increased numbers of crocodiles now.
- Many of the men believed that crocodiles should be killed or removed. Some thought that the "laws" should be amended to allow hunting of crocodiles. This is an interesting response, as there are no laws banning the hunting of crocodiles in Palau. There is a national law that bans firearms, removing one weapon from the arsenal of crocodile hunters. A few of the men thought that crocodiles should be protected, but controlled in the wild. Some thought all of the wild crocodiles should be placed in a reserve.

#### Conclusions

These interviews confirmed the general feelings Palauans have about crocodiles. Most of the men interviewed know about crocodiles because they hunted them at one time. Some of the men know them because they are fishermen or crabbers who are knowledgeable about the environments in which they work. Since they know these animals relatively well, their opinions about crocodiles are not necessarily representative of the rest of the people in Palau. However, many of the statements they made are typical of the sentiments generally heard about crocodiles: they are threats to humans, they catch the fish and crabs that people are trying to catch, there are too many of them in Palau, and they are getting closer to humans both in the water and on land.

There have been no attacks on people by crocodiles in recent times. However, Palauans fear that this will happen if crocodiles are allowed to continue to thrive. If future studies on the local knowledge of crocodiles are conducted, it would be useful to expand the respondents to include all types of people in Palau, not just fishermen and hunters. The perspectives of women who collect invertebrates from mangrove areas or who work in taro patches were lacking from this study. In order to design any meaningful conservation strategy for the Palauan saltwater crocodile population, it would be useful to confirm the range of perceptions regarding the threats posed by crocodiles, and

what peoples' beliefs are about the frequency of actual human-crocodile confrontations.

The saltwater crocodiles of Palau are a unique and rare species. They are dependent upon healthy coastal mangroves and a supply of fish and crabs. Populations of crocodiles can be maintained in protected areas where fishing is not allowed, such as areas around Lake Ngardok or Ngaremeduu Bay, with little or no threat to people.

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[This article is a shortened version of "PCS Report 2003-03, August 2003", a full version of which can be downloaded at: [www.wmi.com.au/articles/](http://www.wmi.com.au/articles/).]

## Europe

At the last Mipel leather goods exhibition in Milan (held twice a year), I saw a nice stand with alligator and crocodile skins hanging on the outside of the booth. Together with these skins were pictures of famous celebrities of the 1930s, 1940s, 1960s, 1970s and 1980s. Each celebrity shown (eg see Fig. 1) was carrying a briefcase or a bag, and near each picture was the original bag! I was really impressed with such a nice presentation, and at the same time a little mad at my sales team since no-one had ever mentioned this potential customer for alligator and crocodile skins.

I looked at all of the pictures and bags - they were positioned starting from the oldest to the most recent one - and then entered the stand, where I realised that all of the bags were made of .... printed cow leather.

I asked one salesman if they also sold genuine alligator or crocodile products, and he replied that the skins were just for display, to attract customers, since their production was really on medium- to low-priced items. I thanked the man,

took a brochure with a "nice" story about crocodile hunting and trade, and left.



Figure 1. Poster depicting celebrities (eg Walt Disney, at left) with “crocodile skin bags”, against the background of a crocodilian skin.

At the office the next day I read the whole brochure, only to find that at the end of their presentation they say that: "Today the modern culture of respect for environmental balance makes us consider the trade of exotic leather cruel and unreasonable" - the opposite of what it really is! The brochure depicted paintings and old photographs of crocodilians being hunted/ killed and in captivity (6 of 7 images are from “Crocodiles and Alligators”, 1989, edited by C.A. Ross; Facts on File: New York).

Lastly, I discovered that it was my company that sold the few real crocodilian skins they were displaying at the show.

Enrico Chiesa, *Italhide S.P.A., V.M. Macchi 35, 20124 Milan, Italy.*

## Just Friends!

Ruth Elsey submitted this photo taken by biologist Phillip “Scooter” Trosclair, showing a 2 m long alligator sitting on a much larger individual. “Jimmy”, the large alligator, is 52 years old, was 4.09 m (13’ 5”) long with 3” missing off his tail, and weighed 318 kg (700 lb) on 19 August 2002, when he was moved from an earthen pen to a concrete enclosure near the Rockefeller Refuge headquarters. Since being moved to the new pen he appears to have gained weight.

In spring/summer 2003, the 2 m long alligator was found wandering on the highway near Jimmy’s holding pen. Concerned that a vehicle might hit it, he was caught and moved into a smaller area adjacent to the large section housing Jimmy. The smaller alligator was usually quite

aggressive when fed.

Sometime in spring/summer 2004, the smaller, aggressive alligator was placed in with Jimmy so that its pen could be cleaned more easily (and safely) by a group of students. The two alligators did not show any aggression towards each other, so they were left together.



On 6 April 2005, Scooter visited the enclosure with his twin sons, and saw the smaller alligator resting on Jimmy’s back. Following a quick drive to the office to get his camera, Scooter was able to take this interesting photograph.

## Science



NO LIVING CROCS LEFT IN WESTERN SAHARA: AN ARGUMENT ABOUT WHAT IT SHOULD SAY ON THEIR TOMBSTONES. [NOTE: *Crocodylus niloticus* is not destabilized by any of the changes proposed in this article; because, *niloticus* has been restricted to Egypt without a type specimen, and Egypt includes some wild Nile Crocodiles living south of the Aswan Dam today.]

The type of *suchus* Geoffroy, 1807, must always remain in the taxon *suchus*, but it somehow got hijacked. So, utilizing a current publication [“The Amphibians and Reptiles of the Western Sahara”, by Geniez *et al.* (2004)] as a straw man, I propose that the reproductive crocodiles surviving as remnants of *Crocodylus niloticus* that stay physically small and remain juvenile in their feeding habits in the Chad and Mauritania region, be called *Crocodylus niloticus vulgaris* Cuvier 1807, if they are to be anything more formal than pedomorphic. [We must avoid calling them “dwarf” (because that means *Osteolaemus*) Nile Crocodiles, *C. niloticus*, without any subspecies]. Although it might appear that I favor the use of subspecies in African crocodiles at this time, I do not. However, seven subspecies of *C. niloticus* exist in the literature now, and at least the northwestern one needs some revision. Thus my first choice for the crocodiles that formerly coexisted with big hippos

and elephants and giraffes in Western Sahara (Geniez *et al.* 2004) is *Crocodylus niloticus*.

Three of Africa's famous rivers, the Congo, the Niger and the Senegal, drain the western coast of the northern half of the continent. All three rivers and their surrounding territories are populated by a shared fauna, including the same three kinds of crocodylians, as documented in the CSGN for: Congo [13(3): 4-5; 8(3): 3], Congo & Gabon [22(3): 6-8], Gabon [23(1): 4-5], Nigeria [23(1): 4-5; 18(3): 5-7; 15(3): 4; 15(2): 15-16], Benin [22(1): 3-4; 15(3): 3], Togo [12(1): 17], Ghana [16(2): 11], Ivory Coast [21(2): 5-7; 9(4): 13; 9(1): 3-4], Ivory Coast & Liberia [21(4): 11]; Guinea-Bissau & Gambia [10(2): 7-8] and Senegal [23(1): 5-6; with the Senegal River on its northern border with Mauritania). The presence of three kinds of crocodylians in the region was first reported by Adanson a long time ago, who called them the Green Crocodile, the Black Crocodile and the Gavial, based on his travels to Senegal.

Assuming that the obvious is true, Adanson's African Gavial is today's *C. cataphractus* (named in 1825), Adanson's Black Crocodile is *Osteolaemus* (named in 1861), and the Green Crocodile is *C. niloticus* occurring in the northern part of westernmost Africa, such as the Niger River drainage and the Senegal River. Since Adanson's Senegal Gavial and Black Crocodile had not yet been collected, Cuvier (1807) had only one of Adanson's three, the Green Crocodile, which he made a syntype of *C. vulgaris* Cuvier, which is today a synonym of *C. niloticus* (though *vulgaris* is restricted to Egypt at the moment, see below). I believe that Cuvier's type description of *C. vulgaris* named only Egypt and Senegal as authenticated localities (see below).

After being introduced to the relict *Crocodylus* in Mauritania in the CSGN (Behra 1994; CSG editors 2000), and other places including on television, I was eager to learn more about these relatively small, tunnel digging, aestivation specialists that don't attack people or their livestock. So, when I saw Geniez *et al.* (2004) in the library, I read it carefully about crocodiles, finding most of their text informative; and, I was rewarded with a series of photographs of the Mauritanian animals. The history, ecology and herpetology of Western Sahara is fascinating.

In general, "The Amphibians and Reptiles of the Western Sahara" is an excellent and useful book, but these well-meaning people have used the wrong scientific and common names for their animal. Further, I think they went too far by elevating the Sahara region relicts to full species status. Personally I don't trust the evidence based on belly-scale counts (Fuchs, below), nor do I trust the "molecular evidence" that the *Crocodylus* of easternmost Sahara at the Nile River is different from that of the Senegal River or the Niger River drainage (below), since their sample did not include the relatively inoffensive and smallish

tunnel digger and aestivation specialist *C. palustris* which occurs in Iran and Iraq, both of which are remarkably close to Syria and Palestine which were inhabited by isolated *C. niloticus* in the known past (see below). For *C. palustris* on the border between Pakistan and Iran [see CSGN 12(4): 4-5]. For *C. palustris* being inoffensive when given space [CSGN 18 (2): 7-8] and, for ontogenetic variation in *C. palustris* diet [CSGN 14(4): 6-7; 12(2): 7]. Further, *C. moreletii* of the Americas was not in the "molecular evidence" sample [see CSGN 11(4): 7, about landowners tolerating *C. moreletii* in Belize].

In Ross (1998), I suggested the possibility that the sub-fossil *C. robustus* of Madagascar could be closely related to *C. rhombifer* of Cuba; and now, my added suggestion to test is that *C. moreletii* is closely related to *C. niloticus*, with the Morelet's Crocodile being a reproductive juvenile ecomorph, hiding in tunnels and feeding on small prey, [see CSGN 23(4): 9-10 about prey size]. The Morelet's Crocodile closely resembles a Sahara Desert skull in the MCZ at Harvard University, examined by F.D. and C.A. Ross while very familiar with *C. moreletii*. For *C. palustris* as a burrower in India, see CSGN 19(4): 16-17, and as a burrower in Iran, CSGN 18(2): 9-10. For *C. moreletii* as a burrower in Mexico, see Newsletter or perhaps a Proceedings, somewhere. For a hypothesis that *C. robustus* is closely related to *Osteolaemus*, see CSGN 13(3): 24.

The "molecular evidence" paper about Africa is Schmitz *et al.* (2003); and, it directly contradicts the opinions of Cuvier (1807) and Geoffroy (1807), by partitioning the greater Sahara into eastern and western sections of taxonomic value. I believe that I have seen *C. cataphractus* as a fossil in Egypt (Andrews 1906; as *C. articeps* Andrews). This confirms the general zoogeographic theory (Cuvier 1807; Geoffroy 1807) that, at a former time, if the Sahara Desert was not in the way, the crocodylian faunas of the Nile River, and also the Senegal River and/or the Niger River would all contain the same *Crocodylus* species. For Lake Chad, which borders the nations of Cameroon, Chad, Niger and Nigeria, see CSGN 20(1): 7-8.

In their Western Sahara book, Geniez *et al.* (2004) relied on what looked like established and accepted facts (some fairly prominent German publications), but, back when Mertens and Wermuth (1955) said that the type locality of *Crocodylus suchus* Geoffroy is Niger, they were wrong. At the time it was an unimportant mistake; because, *suchus* was a junior synonym of *niloticus* as a species without subspecies. Later, when Fuchs (1974) revived Geoffroy's *suchus* and used it as a subspecies with the common name "Nigerianisches Nilkrokodil" it should have been dealt with; but, at the time, and all through the 1980s, other Fuchs errors in South American crocodylian taxonomy were more pressing. Note that *suchus* at Niger was not a type locality restriction; but, rather it was a simple wrong locality based on an incomplete reading of the original French. At first glance, it looks like the talk about Thebes

is just more of the chatter about Aristotle and the ancients; but, the reason they were writing about Aristotle and the feeding of captive temple animals at Thebes, was partly Thebes itself (one cleaned skull, probably lacking mandibles).

What should have been noticed is that Geoffroy's *suchus* is really the Nile River crocodiles at the temple in Egypt at Thebes (Cuvier 1807; Geoffroy 1807). There is absolutely no truth to the Niger locality; and, worse still, it was *Crocodylus vulgaris* Cuvier (1807) that was claimed by its author to occur not only in the Nile, but also all the way across the Sahara to Senegal, based on an Adanson identified specimen, and a smaller second specimen (see below), both in the Paris Museum. The *suchus* hypothesis was restricted to two Thebes specimens, of which one reached Paris, and serves as the holotype (Geoffroy 1807). Note that any additional discussion and data about *C. suchus* in Geoffroy (1829) is not part of his 1807 type description.

Back to the German problem, in a December 15 magazine (probably later in the year than the Fuchs 1974 book), Fuchs and Mertens and Wermuth (1974) recognized the subspecies *C. n. suchus*, with its type locality as Niger; and, their distribution map showed *suchus* with a range that does not include the Nile River. Rather, Fuchs *et al.* (1974) said that the Nile River subspecies is *C. n. niloticus*. Though, in hindsight, it only led to the current problem, it was for a while quite possible to ignore the details of the distributions of the various Fuchs subspecies of *C. niloticus* by not recognizing any subspecies of the Nile Crocodile, for example, Groombridge (1982); and, King and Burke (1989); and, also Ross and Magnusson (1989), whose distribution of *C. niloticus* was beautifully crafted as "The widespread crocodylian of the African continent, it is found throughout tropical and southern Africa, and Madagascar. Its historical distribution included the Nile River delta and the Mediterranean coast from Tunisia to Syria. Isolated populations of the Nile Crocodile are known to have existed in lakes and waterholes in the Interior of Mauritania, Southern Algeria, and northeastern Chad in the Sahara Desert." For a review of the C.A. Ross edited book containing Ross and Magnusson (1989), see CSGN 8(4): 34-35. Note that northeastern Chad is not far from the Nile at the southern end of Lake Nasser, and also at Khartoum, Sudan.

Utilizing the 1980s IUCN model, Schleich *et al.* (1996) and also Shine *et al.* (2001), had been able to write perfectly well about Mauritanian and central Saharan Desert relicts (as *C. niloticus*) being subject to severe conditions and evolved in behavior and size. For a similar case of Pleistocene huge Cuban Crocodiles becoming much smaller when their giant prey suddenly disappeared (see Ross 1998), where the species names of several fossils were made synonyms of the older *C. rhombifer* Cuvier, 1807, and their localities were marked on the distribution

map of the species as fossils. If they had wanted to, Geniez *et al.* (2004) could have marked the map of Western Sahara with dots labeled fossil art of *C. niloticus*.

Back to reality, the problems in Africa escalated when Schmitz *et al.* (2003) recognized *C. niloticus suchus* as a subspecies, and also contradicted themselves saying that they didn't have proof that *suchus* has any "taxonomically relevant genetic differences" from *C. n. niloticus*. Then, before the scientific community had time to discuss the "molecular evidence" or even the belly-skins scale counts, Geniez *et al.* (2004) chose to follow Schmitz *et al.* (2003), who in turn were following the Mertens and Wermuth (1955) error about Niger, either directly or from a repetition of the error in subsequent literature including a 1977 Das tierreich and the 1983 and 1995 CITES identification manuals for crocodylians (cited below).

The type locality of *C. suchus* is Egypt at the temple at Thebes; and, Cuvier believed that the well-behaved captives kept inside the temple were the same genetic stock as the dangerous wild crocodiles in the adjacent river. Geoffroy hoped that *suchus* was a diminutive second species, based on the mummies under the temple; but that is a different question. It may be noted though, that Nile Crocs are being worshiped by people in Africa today (see CSGN 22(3): 5), and it is fairly common knowledge that *C. palustris* is the temple crocodile of India [(other sources), including local worship, CSGN 18(1): 9; 14(1): 6], Pakistan [CSGN 23(3): 12-13], and Bangladesh [CSGN 14(1): 5-6]. In Central America and Mexico, if the Mayan priests kept a feeding pond as a tourist attraction, it would have been *C. moreletii* they worshiped as carrying the agricultural world on its back. In Africa today, it is thought in Mauritania that if the crocodiles disappear, the people will suffer thirst (various sources).

The word Niger does appear in Geoffroy (1807), but only in the context of unsupported speculation about Adanson's Black Crocodile and about climatic change in northern Africa through geologic time. Cuvier had included Adanson's Green Crocodile in *Crocodylus vulgaris*, based on two cf. Senegal specimens (see paraphrased translation, below); so, Geoffroy supposed that if there were two Nile crocodiles (a Green and a Black), then they both might have gone all the way to the Atlantic in former times. The reason that *suchus* is a Geoffroy (1807) name and not a Cuvier (1807) name, is that Cuvier thought that the temple crocodiles at Thebes (now the city of Luxor, Egypt, north of the Aswan Dam, and south of the Fayum) were *Crocodylus vulgaris* (today's *C. niloticus*); and, therefore Cuvier would not allow *suchus* to be recognized in his paper. Geoffroy was too eager to find Adanson's Black Crocodile, and as such he had to publish *suchus* under his own name. There is no possible way that the skull figured in 1807 as *C. suchus* was from the Niger River (Cuvier 1807; Geoffroy 1807). For the current status of the crocodiles in the Egyptian part of the Nile, see CSGN 15(1):

4 about a new Crocodile God Museum (Faiyum), and CSGN 16(3): 5-6 about natural repopulation above the Aswan Dam and perhaps also in the Luxor region where the temple at Thebes is. For the situation in Sudan in 1993, see CSGN 12(3): 7-8.

The Niger error which originated in Mertens and Wermuth (1955), and then later got perpetuated and magnified by Fuchs and the other two Germans, has now grown to a full species problem. The species *C. suchus* as used by Geniez *et al.* (2004) is a case of "the straw that broke the camel's back" because they didn't create the Niger error, they simply made it so big that it caught my attention. The peer reviewed literature process failed to prevent the type specimen of Geoffroy's *C. suchus* from being excluded from *C. niloticus suchus* for several decades; and, now from the species *C. suchus* Geoffroy also. According to the rules of zoological nomenclature, the above situation is impossible, and thus editors are advised to block all usage of *suchus* Geoffroy that does not include Egypt at Thebes (= Cairo to Aswan) in the distribution. In other words, any *suchus* Geoffroy associated with Niger or the Niger River in the type locality is illegal, and the use of an error in the endangered species list will surely invite further trouble. Although Geniez *et al.* (2004) did not present any evidence that the Mauritanian and Chad crocodiles are a genetic species, the assertion is now published. It deserves being tested properly, using skulls, and the new dorsal scale counting technique of Ross and Mayer (1983), which is another example of authors avoiding the task of correcting the errors of Fuchs in the 1980s, by consciously not recognizing any subspecies. For a 1987 explanation of the Ross and Mayer (1983) method for counting the dorsal scalation, see CSGN 6: 15.

Writing in England, Boulenger (1889) gave the range of *niloticus* as "Africa, from the Nile and the Senegal to the Cape of Good Hope; Syria; Madagascar"; and, Boulenger considered *C. robustus*, from the interior of Madagascar, also as a full species. The authors Geniez *et al.* (2004) should have checked the 1807 French, before they revised Boulenger. The same goes for the editors who allowed Schmitz *et al.* (2003) to blindly follow the belly skin industry in such theoretically trustworthy publications as Wermuth and Mertens (1961, reprinted 1996), Wermuth and Mertens (1977 *Das Tierreich*), Wermuth and Fuchs (1978), Wermuth and Fuchs (1983 CITES) and CITES (1995). For an overly favorable review of the 1995 CITES Identification Guide, see CSGN 19(3): 20.

In the Cuban pedomorphism situation (Ross 1998), I was sure that today's *C. rhombifer* is the same species as the Pleistocene giants (which look different when full size); because, amongst the fossils there was a half-grown individual that was perfect *rhombifer* of today. Assuming that the Saharan relicts are pedomorphs of their larger and now southern conspecifics, they are all *C. niloticus*. However, Cuvier's *vulgaris* had approximately the same

range as Boulenger's *niloticus*, and later of Ross and Magnusson (above).

Writing in Paris, Cuvier (1807) didn't mention the interior of Mauritania; but, he did mention material from the Senegal region, and he said that Adanson called one of Cuvier's specimens the Green Crocodile (as compared with the Black Crocodile and the Gavial of Senegal). In the event that a Latin name is required for the Mauritania and Chad animals, figure out why Mertens and Wermuth (1955) restricted *vulgaris* to Egypt, before moving the type locality restriction to Senegal (see details below). Type locality restrictions have no binding force. We use them when they are useful. They can be changed. It might be very hard to find a better name than *vulgaris* for these relicts, which could then be called "Pedomorphic Nile Crocodiles" thus avoiding the names of any political nations such as "Western Sahara" which Geniez *et al.* (2004) say does not have any living native crocs in it today. We should also avoid the common name "Central African Nile crocodile" used in CITES (1995), because there is a Central African Republic nation. So, it can't be the Western Saharan or the Central African crocodile. And, as mentioned above, it can't be the Saharan Dwarf crocodile either. For information about a crocodile park in southern Tunisia which is exhibiting stock from a farm in Madagascar, see CSGN 22(2): 3-4.

For convincing evidence that Cuvier (1807) was correct about wild crocodiles becoming well mannered when correctly housed and fed in captivity, read Macaulay (1960) where he captured a bunch of Africa's biggest and was able to hand feed them when they were penned. Cuvier (1807) argued that Aristotle was making the point that, although you can make friends with a big crocodile (citing Egyptian temples visited by the Greeks), don't ever make the mistake of trusting a hippo. For details supporting the appropriateness of Geoffroy's three 1829 names from Faiyum being appropriate to replace *suchus* as "Egypt" if needed (below), search on the Web about Crocodilopolis and Kom Ombo, and the phrases "Sobek: he who causes fertility" or "Suchos is merciful" meaning that the Nile River makes agriculture possible. Suchos may well have been a single large individual, which was hand-fed by priests to impress and entertain visitors. Mummies are known from the Faiyum region, which is south of Cairo. In theory there should be no difference between the crocodiles of (going North to South) the city of Cairo, Fayim, Thebes, Aswan and Lake Nasser (Lake Nasser is a restricted military zone, so its crocs are perhaps the safest in Africa). In theory, along the Mediterranean Sea, the Tunisian coastal *C. niloticus* referred to by Ross and Magnusson (above) would be the same as those of the Nile Delta, but the "Syria" and "Palestine" localities deserve further attention.

My most serious criticism of Geniez *et al.* (2004) is their distribution map for "*Crocodylus suchus* Geoffroy Saint-

Hilaire, 1807" as a species, marked with two Christian crosses, presumably representing extinct populations. There is no indication that these marked localities are among the various Saharan region reports discussed on the same page, which all appear to be outside Western Sahara. I am assuming that the two crosses mark the rock paintings at Tifariti and Adrar Soutouf in Western Sahara, mentioned earlier in their book. The problem with including the two Western Sahara artworks in a discussion of pedomorphs which Geniez *et al.* (2004) consider a species (and taxonomically distinct from the Nile Crocodile which can kill wildebeests and zebras), is that the rock paintings also show hippo and giraffe and elephant. Again the evidence supports Cuvier (1807) when he said that the little suchus might grow up to be a big *vulgaris* if the conditions were right. Something like neoteny (the "Axolotl" neotenic tiger salamander keeps its gills throughout life and stays in its waterhole, because there is severe desert all around, and no terrestrial hunting is possible), I use the term "pedomorphic" to mean childlike in size, shape and diet. To me, the term "relict" implies that the crocodiles living between the feet of goats and camels could still gang-up and kill big game. The Sahara Desert pedomorphs live on something frog size; but, in rivers they are known to loose fear of man and take dogs.

In a perfect world, I would protect the central and western Saharan relicts as Pedomorphic Nile Crocodiles (*Crocodylus niloticus vulgaris*); and, I would protect the lower Nile and the Middle East with one of Geoffroy's three additional synonyms of 1829 (*C. marginatus*, *C. luconosus* and *C. complanatus*, take your pick); and, the rest of the Nile Crocodile is *C. n. niloticus*, the African Commercial Crocodile, which is the nominate subspecies of *C. niloticus*, the Nile Crocodile, with *madagascariensis* used when useful, such as the crocodiles in the northernmost Sahara today include captive cf. *C. n. madagascariensis* in Tunisia. It is unfortunate that the German mistake spoiled the availability of Geoffroy's suchus for the worshiped crocodiles of ancient Egypt and the Mediterranean. Now that it has been widely used for Nigeria and Mauritania and Chad, and repeatedly published as being distinct and distinguishable from the sacred crocodiles of Egypt and the eastern Mediterranean, the species-group name *C. suchus* Geoffroy has been destroyed.

If the world was ready to sort the crocodiles of Africa into piles without any skull characters or dorsal armor, using just belly scale counts and molecular evidence; then, perhaps the world is willing to sort the Nile Crocodile into piles using need of protection as a taxonomic character. To my mind, it is just as real. We must be able to put those creatures in Chad and Mauritania on an endangered list. And, we must be able to protect the repopulation of the lower Nile and the Middle East if it happens. And, we must have a commercial crocodile (or crocodiles, since there is a farm in Madagascar), as discussed at length in the

Newsletter. No studies have claimed to confirm or refute the scale counts that Fuchs used to carve *C. niloticus* into his seven subspecies. Based on an unpublished comparison of the Fuchs belly-scale data with the actual scales on the bellies of the MCZ collection at Harvard University, by Dr. Gregory C. Mayer, it can safely be asserted that Fuchs is fiction. I wouldn't be surprised if the same can be said of the molecular evidence paper.

Although Cuvier (1807) and Geoffroy (1807) discuss the suchus question at far too great a length to be quoted, I believe Cuvier's comments about *suchus* and *vulgaris* on pages 42-43 can be quickly summarized as "In the Paris Museum there are some fairly good size *C. vulgaris* specimens which are not significantly different from the skull reported by Geoffroy (1807) as *C. suchus*. In addition, there is a hatchling from Senegal (obtained from Dr. Roussillon) which must also be *C. vulgaris*. Thus, the species of the Nile (*C. vulgaris*) is found also in Senegal. ... The Paris Museum has two complete specimens of *C. vulgaris*, and also two heads of *vulgaris* in the same state of preparation as Geoffroy's *suchus* skull. One of the whole animals was collected by Adanson (1726-1806) and is labeled in his handwriting as Crocodile Vert du Niger." A search on the Web should divulge the itinerary of Michel Adanson's 1749-1753 African trip, published in 1757 as *Histoire Naturelle du Senegal*; and, in English in 1759 as *A Voyage to Senegal*. My theory about the "Niger" part of the name Green Crocodile of Niger, is that Adanson was told in Senegal that *C. niloticus* also occurs further east in the Niger River drainage in today's nation of Guinea, or more likely Mali.

The problem facing the IUCN today is what to call the pockets of crocodiles living north of the Senegal River and north and east of the Niger (ie Mauritania, southern Algeria, Niger and Chad, and even Mali at Timbuctou which is desert today), which survive now as pedomorphs (a reproductive but ecologically size and behavior "retarded" form). These crocodiles are different from *C. niloticus* (Adanson's Green) because they are not dangerous (I've seen it on television). They also look a bit strange for Nile Crocs, and should be compared with Sudan or Ethiopia *C. niloticus*, and also *C. palustris* and *C. moreletii* as an out-group, as opposed to *Paleosuchus* and *C. johnsoni* as they recently were by Schmitz *et al.* (2003), briefly noted in CSGN 23(1): 26.

Looking at it as Nile River to northeastern Chad to Lake Chad and then overland to the Niger River and along it past Timbuctu to a short hop overland into the Senegal River, it is a hard trip today; but, there are endangered crocodiles, probably all the same species (and subspecies) all the way across Saharan Africa, including Algeria. They could be *C. niloticus* without subspecies. Note that Ross and Mayer (1983) included some relevant localities in arid westernmost Africa and also Lake Chad in their sample; but, they lacked data from Egypt, and substituted Ethiopia

as easternmost arid Africa. For a nation by nation account of *C. niloticus* without any subspecies, see the Red Data Book (Groombridge 1982), which includes details about, among others, Senegal, Mauritania, Niger, Chad, Algeria, Tunisia, Egypt and Palestine. The Mauritanian region locality records and ecological notes for "*Crocodylus niloticus*" in Schleich *et al.* (1996), and in Shine *et al.* (2001), are far more detailed than in the Geniez *et al.* (2004) field guide for *C. suchus*.

Think long and hard, and come up with some skull characters and dorsal armor counts before dividing *C. niloticus* into subspecies. Test Cuvier's hypothesis (see *C. vulgaris* above). Don't make *C. n. vulgaris* be the Pedomorphic Nile Crocodile (by restriction to Senegal) unless there is some way to identify them, and I haven't seen it published yet. There is nothing in Fuchs, nor in the "molecular evidence" that convinces me. Thus, the use of *C. suchus* in a field guide is one straw man too many. The 1995 World Conservation Monitoring Centre's "Checklist of Reptiles and Amphibians listed in the CITES Appendices" divides *C. niloticus* into three "protection" groups. There are Appendix-I populations, Appendix-II populations with an export quota, and Appendix-II populations without any quota. Geniez *et al.* (2004) assert that *Crocodylus suchus* Geoffroy is "included in Annex I of CITES" and is therefore protected. Indeed, Chad and Niger and Senegal have Appendix-I populations of *C. niloticus*. That must be what they meant.

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took their individual food one by one, without endangering the hand that was feeding them, since he found that he could go right in the pen with them (on land) and serve dinner. He was surprised at their intelligence in the wild and their impeccable table manners in captivity].

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\*Wermuth, H. and Mertens, R. (1961). Schildkroten, Krokodile, Bruchenechsen. Jena: Germany. xxvii + 402 pp. [Reprinted and expanded in 1996 to 506 pp. without noting and correcting the *suchus* error in the original synonymy].

\*Wermuth, H. and Mertens, R. (1977). Liste der rezenten

Amphibien und Reptilien: Testudines, Crocodylia, Rhynchocephalia. *Das Tierreich: eine Zusammenstellung und Kennzeichnung der rezenten Tierformen* 100: 1-174. [Lists the seven subspecies as boldly as ever and gives a formal synonymy of each one. They say the type locality of *suchus* is Niger, and give a 14 nation distribution].

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\*Wermuth, H. and Fuchs, K. (1983). CITES identification manual, Volume 3: Reptilia, Amphibia, Pisces. IUCN: Gland, Switzerland. [With complicated code pagination says "7 geographical subspecies can be identified on the basis of the belly skin" but nobody has tested it. Also, CITES identification manual, volume 5: parts and derivatives II, which includes a key to the belly skins of seven *C. niloticus* subspecies including *suchus*].

Franklin Ross, *Department of Vertebrates, naturalis Museum, P.O. Box 9517, Leiden 2399-RA, the Netherlands. The Nationaal Natuurhistorisch Museum, formerly the RMNH.*

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Frank Seebacher, Craig E. Franklin and Mark Read (2005). Diving behaviour of a reptile (*Crocodylus johnstoni*) in the wild: interactions with heart rate and body temperature. *Physiological and Biochemical Zoology* 78(1): 1-8.

Abstract: The differences in physical properties of air and water pose unique behavioural and physiological demands on semiaquatic animals. The aim of this study was to describe the diving behaviour of the freshwater crocodile *Crocodylus johnstoni* in the wild and to assess the relationships between diving, body temperature, and heart rate. Time-depth recorders, temperature-sensitive radio transmitters, and heart rate transmitters were deployed on each of six *C. johnstoni* (4.0-26.5 kg), and data were obtained from five animals. Crocodiles showed the greatest diving activity in the morning (0600-1200 hours) and were least active at night, remaining at the water surface. Surprisingly, activity pattern was asynchronous with thermoregulation, and activity was correlated to light rather than to body temperature. Nonetheless, crocodiles thermoregulated and showed a typical heart rate hysteresis pattern (heart rate during heating greater than heart rate during cooling) in response to heating and cooling. Additionally, dive length decreased with increasing body temperature. Maximum diving length was 119.6 min, but the greatest proportion of diving time was spent on relatively short (45 min) and shallow (0.4 m) dives. A bradycardia was observed during diving, although heart

rate during sub-mergence was only 12% lower than when animals were at the surface.

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Mark Auliya (2004). Crocodiles of Indonesia - Current State of Research. Tier und Museum 8(4): 101-115.

**Summary:** Indonesia, the worlds largest archipelago, presumably harbours at least four native crocodylian species, of which two are endangered (*Crocodylus siamensis* and *Tomistoma schlegelii*), while another two, *Crocodylus porosus* and *C. novaeguineae*, are highly sought after for the commercial leather trade. To date, the taxonomy and distribution status of the Indo-Pacific freshwater crocodiles remains unresolved. Some phylogenetic relationships have only recently been detected. A fifth questionable species, *Crocodylus raninus*, which is still extensively discussed in terms of taxonomic validity, possibly resembles *C. novaeguineae*. However, only with taxonomic certainty will it be possible to identify, monitor and manage isolated relictual Crocodylia populations in the Indo-Pacific realm for the purpose of conserving biodiversity-rich wetland habitats and to sustainably use the afore mentioned species in the long-term. To reach this goal, it is of major concern to discover isolated wild populations and therein identify population size. In order to advance molecular studies, collection of tissue samples from specimens examined in the wild and identification of historic distribution patterns will be essential.

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## **Books**

“Temperature-Dependent Sex Determination in Vertebrates”, edited by Nicole Valenzuela and Valentine Lance, attempts to compile and integrate existing information on temperature-dependent sex determination (TSD) through “a series of reviews of what is known about the ecological, physiological, molecular, and evolutionary aspects of TSD”. In my view the book succeeds very well in achieving its goal.

The book is organised into four thematic sections. Part 1 (“Prevalence of TSD in Vertebrates”) deals with TSD in fish, turtles, crocodylians, lizards and the tuatara, and thermal sex reversal in amphibians. Denis C. Deeming’s review on crocodylians presents the results of studies of TSD on 12 species and the effects of incubation temperature on post-hatching growth, survival and phenotypic characteristics of crocodylians. The importance of TSD in relation to other archosaurs is also discussed. This chapter is a good summary of what is known about TSD in crocodylians.

Part 2 (“Thermal Effects, Ecology, and Interactions”) includes a chapter by Turk Rhen and Jeff Lang, who

describe the temperature has on phenotypic traits other than sex, in both TSD and genetic sex determination (GSD). Allen Place and Val Lance review what is known about molecular networks associated with sex determination, contrasting GSD and TSD systems.

Part 3 (“Evolutionary Considerations”) covers the phylogenetics of sex determination (F. Janzen and James Krenz), the evolution and maintenance of TSD (Nicole Valenzuela), and the implications of TSD for population dynamics (Marc Giron dot *et al.*).

Part 4 (“Missing Links and Future Directions”) consists of short summaries of each review by Nicole Valenzuela, who also offers thoughts on future directions that research may take in order to provide further insights into TSD.

[Nicole Valenzuela and Valentine Lance (eds.) (2004). Temperature-Dependent Sex Determination in Vertebrates (2004). Smithsonian Institution: Washington. ISBN 1-58834-203-4.]

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## **Meeting Announcements**

### **18th CSG Working Meeting**

The 18th Working Meeting of the Crocodile Specialist Group will be hosted by “La Ferme aux Crocodiles at Pierrelatte”, and will be held in Montélimar, France, 19-23 June 2006.

The CSG Steering Committee meeting will be held on 19 June, the Working Meeting from 20-23 June, and a field trip is anticipated for 24 June.

Early registration is encouraged, to facilitate visa applications and to assist organisers with preparations. Please consult your nearest French Embassy or Consulate Office for visa requirements. Online registration and submission of papers can be done through the website ([www.lafermeauxcrocodiles.com/meeting.htm](http://www.lafermeauxcrocodiles.com/meeting.htm)). Additional information can be obtained from Samuel Martin ([info@lafermeauxcrocodiles.com](mailto:info@lafermeauxcrocodiles.com); Tel: 33 4 75 960931; Facs: 33 4 75 963907).

EDITORIAL POLICY - All news on crocodylian conservation, research, management, captive propagation, trade, laws and regulations is welcome. Photographs and other graphic materials are particularly welcome. Information is usually published, as submitted, over the author's name and mailing address. The editors also extract material from correspondence or other sources and these items are attributed to the source. If inaccuracies do appear, please call them to the attention of the editors so that corrections can be published in later issues. The opinions expressed herein are those of the individuals identified and are not the opinions of CSG, the SSC, or the IUCN-World Conservation Union unless so indicated.
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