CROCODILE SPECIALIST GROUP NEWSLETTER

VOLUME 25 No. 4 • OCTOBER 2006 - DECEMBER 2006

IUCN - World Conservation Union • Species Survival Commission

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

COVER PHOTO. Female Orinoco Crocodile (*Crocodylus intermedius*) defending her nest at El Frio Biological Station, Apure State, Venezuela. Photograph: Rafael Antelo.

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Contributors ($250 - $1000)

Dr. Michael Allen, Oxford, UK.
Brevard Zoo Animal Keepers, Brevard Zoo, Melbourne, FL, USA.
Broome Crocodile Park, Broome, Western Australia, Australia.
Cairns Crocodile Farm, Redbank, Queensland, Australia.
Darlow Smithson Productions Ltd., UK.
East Bay Zoological Society, CA, USA.
Edgardo Fernandez, Crocodilia Colombiana Farm, Barranquilla, Colombia.
Dino Ferrini, Curator of Amphibians and Reptiles, Audubon Zoo, New Orleans, LA, USA.
Johan Jordaan, Zongwe Farming Enterprises, Zambia.
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Yee Thai Leather Industries, Hong Kong.

Editorial

Following a considerable lobbying effort by Don Ashley (CSG Vice Chairman for Industry), Governor Schwarzenneger signed the California Bill (SB1485) allowing the sale of alligator and crocodile products within the State of California, effective 1 January 2007 (see page 15). Don Ashley is to be congratulated for the enormous amount of personal time and effort that he contributed to the passage of this Bill.

The Executive Officer has sent out the annual letters of request to our CSG donors who are once again supporting our efforts. We are most grateful to all those who continue to contribute and support the CSG's operations.

In November the CSG provided a third round of comments to the Brazilian CITES Management Authority on it's proposal to transfer *Melanosuchus niger* to Appendix II. I thank CSG members who provided input to the review.

The Executive Officer attended the 15th Annual Conference of the South East Asian Zoos Association (SEAZA) in Ho Chi Minh City, Vietnam, in September. He also took the opportunity to visit the Can Gio Mangrove Forest (possible future crocodile release site) and the Cat Tien National Park, site of successful re-introduction of Siamese crocodiles into the wild [CSGN 25(2)].

As the CSG Chair, I sent a letter to the CITES Secretariat and the Minister for Agriculture and Rural Development in Vietnam, concerning allegations of illegal trade in *Crocodylus siamensis* from Cambodia without CITES permits. The CITES Secretariat received a response from Vietnam denying the allegations, yet it seems common knowledge that crocodiles from Cambodia are traded with Vietnam. In Guangzhou, China, I visited the fish market in early December and saw numerous *C. siamensis* for sale, which were purportedly from Vietnam.

It was heartening to see that the CITES Secretariat undertook a review mission to Madagascar, with CSG Deputy Chairman Dietrich Jelden, because there had been repeated allegations of impropriety regarding wild crocodiles being exported as if farm produced.

A consultancy contract has been let to Akira Matsuda for "Renewal and Restructure of the CSG Website", incorporating a restructure of the current information, expansion of publications to include CSG Proceedings and other publications. The new site will also include the proposed online Crocodile Journal and a revised Crocodile Photograph Gallery.

The CSG provided comments on a French proposal on the draft amendments to Resolution Conf. 9.6 that are being prepared for consideration by the upcoming 14th Conference of the Parties to CITES. The document was circulated widely within the CSG and on the basis of comments received, the CSG was not able to support the approach being developed by France. Comments were also provided to CITES on a related issue - a paper arising from the Personal and Household Effects (PHE) Working Group. This CoP14 proposal is to amend Resolution Conf. 13.7 with an Annex that indicates the process for Parties in terms of proposing additional PHE.

Just prior to Christmas, I sent a letter to CSG members and crocodile farmers in Colombia, concerning a range of issues, from CSG membership, significant trade in wild *C. fuscus* and the CSG-recommended proposal for scute marking of hatchlings as a means of identifying wild skins from farmed skins.

Professor Grahame Webb, CSG Chairman.

Tomistoma Task Force

TICKETS ARE NOW AVAILABLE FOR " A NIGHT FOR THE CROCS". The gala benefit to support the CSG's Tomistoma Task Force and Tomistoma conservation will be held on 24 February 2006, at 6 pm at the Miami Metro Zoo.

This event includes a cocktail party and Caribbean style dinner followed by a special guest appearance and media presentation by National Geographic's resident Herpetologist Dr. Brady Barr. Also included is an auction with items such as the general curator's "Behind the scenes tour" of the Metro Zoo, a dinner and field trip with Brady Barr and a tour of the Everglades with Joe Wasilewski. Meet CSG-TTF representatives and other CSG members and hear first hand about the CSG's international conservation programs. Meet Pip, a young captive-born Tomistoma! Ticket price includes one day admission to the zoo.

For additional information and/or to order tickets, visit the CSG-TTF website (tomistoma.org) or contact the Zoological Society of Florida (305) 255-5551. To become an event sponsor or donate auction items, please contact Bruce Shwedick (shwedick@aol.com).

Saving the Tomistoma, the endangered False Gharial and its Asian peat swamp forest habitats has become a global effort by the scientists and conservationists of the CSG's Tomistoma Task Force. Founded in 2003, within the IUCN-SSC Crocodile Specialist Group, the Tomistoma Task Force (TTF) is dedicated to quantifying the status of this endangered crocodilian in the wild, identifying threats to its survival and promoting direct and sustainable conservation action.

Threats to its survival

Unfortunately the lack of commercial value in its hide has not been enough to prevent the Tomistoma from becoming endangered, even perhaps critically so. The main threat to its survival and the reason for its decline has been due to a loss of habitat. Deforestation from timber harvesting and for agricultural purposes has greatly reduced Asia's remaining peat swamp forest. The illegal demand for rainforest hardwoods such as the Ramin tree, *Gonystylus* spp., prized for producing warp-resistant rods for billiard cues, dowels, furniture and picture frames, has fueled a continued decline in available habitat for this species, especially habitat for breeding and nesting. In recent years peat swamp forests have been systematically drained in order to create monoculture plantations for palm oil production. It is believed that the island of Borneo has now lost more than 50% of its original swamp forest. This habitat loss has not only affected Tomistoma, but also many other forest-dependent species such as the endangered Orangutan. In addition to habitat loss, adult Tomistoma are sometimes killed when they are considered to be a threat to humans, they become accidentally entangled and drowned in gill nets and juveniles are sometimes caught in fish traps.

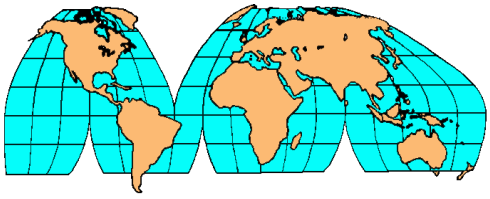
Conservation

Preliminary scientific investigations into the status and ecology of wild Tomistoma began in Sarawak in 1985, in Sumatra and Borneo in 1990 and in peninsula Malaysia in 1997. The first comprehensive assessment of its distribution and nesting biology did not begin until 1995. This took place in southern Sumatra with a series of spotlight surveys, nest searches and habitat quantification conducted along the Merang River and in the Berbak National Park. Repeat surveys during 2001 and 2002 began to reveal and confirm declines in population densities and a national workshop on Tomistoma was held in Indonesia. Though preliminary assessments have been conducted in Kalimantan (Indonesia Borneo) during the 1990s, the first comprehensive survey was not conducted there until 2004. The most recent survey was completed in Tanjung Puting National Park, central Kalimantan, in 2005. These surveys have been made possible by the financial contributions of organizations and individuals in Asia, Australia, Europe, and the United States. The highest priority regions for future comprehensive surveys are located in Kalimantan, in Sarawak and in Peninsular Malaysia, but surveys in the remaining swamp forests of Sumatra are also considered to be of high priority, especially in areas where no previous surveys have been conducted. Investigations into the genetic diversity of wild Tomistoma populations are also being initiated.

Excerpted from *"Tomistoma's Last Chance"* by Bruce Shwedick, REPTILES Magazine 15(2); February 2007**.** For article's references, visit www.reptilesmagazine.com.

Bruce Shwedick, *US Regional Coordinator, CSG Tomistoma Task Force, <shwedick@aol.com>.*

Regional Reports



Latin America & the Caribbean

Cuba

FIRST NATIONAL WORKSHOP ON THE STATUS OF THE CUBAN CROCODILE. From 13-15 June 2006 the 1st National Workshop on the Status of the Cuban Crocodile was held at the local headquarters of CITMA (Ministry of Science and the Environment) in the Zapata Swamp Biosphere Reserve. The objectives of the workshop were to:

- Review information on the current status of the species;
- Determine if the threats to the species that were identified at the Cuban crocodile PHVA in 2000 are still present and/or if new threats have emerged; and,
- Develop proposals to address these threats and prepare a strategic action plan for the conservation of this endemic species.

The workshop was organized by a number of Cuban institutions, including the office of the Zapata Swamp National Park, CITMA-Zapata Swamp and the National Center for Protected areas (CNAP) with funding from the GEF-UNDP program for Strengthening the National System of Protected Areas in Cuba. The workshop was conducted with the participation of 47 representatives from different government institutions involved in biodiversity conservation. Participants included specialists from institutions working in the Zapata Biosphere Reserve, such as the Zapata National Park office, CITMA, Forest Rangers, fisheries inspectors, the crocodile breeding center operated by the Ministry of Fishing Industries, the state veterinary office, the state forestry service (SEF), journalists, the local historians office and local residents. Other national institutions that participated include the Provincial Veterinary Laboratory (IMV), the Institute of Tropical Geography (IGT), the regional and national office forest rangers (CGB), the Havana Zoo, the Cuban Museum of Natural History, the Biology Department of the University of Havana, the Center for Inspection and Environmental Control (CICA) of CITMA, the National Flora and Fauna office (ENPFF) and journalists. Also present were the Minister of CITMA, the Vice-minister of the Ministry of Agriculture, the Director of the National Animal Pharmaceutical Laboratory (LABIOFAM), provincial delegates of CITMA, and local politicians.

The workshop produced an open exchange of opinions, information and experiences between Cuban specialists of diverse backgrounds. Building on the results of the Population and Habitat Viability Analysis (PHVA) for *Crocodylus rhombifer* conducted on the Isle of Youth in January 2000, two working groups were established to review the current situation concerning habitat and the wild crocodile populations. In addition to the discussions concerning the status of the wild populations, the groups also evaluated the captive breeding programs, particularly with respect to the genetic integrity of the species and the role of captive breeding in the overall conservation effort.

The Habitat work group reported that they could not analyze the two wild populations separately as was done in the 2000 PHVA, but focussed exclusively on the population in the Zapata Swamp, in Matanzas Province, the site of the only population that has been in existence continually since historical times. It was unfortunate that an analysis of the Lanier Swamp population could not be carried out because the group of crocodile specialists from the Isle of Youth was unable to attend because of stormy weather that resulted in the suspension of all boat traffic for several days. The Lanier Swamp population is considered to have been virtually extirpated in the first half of the 20th century as a result of excessive hunting but is now being restablished through a reintroduction program.

The Habitat group identified 28 threats to the continued survival of the Cuban crocodile, of which 7 were considered to be the highest priority. These were:

1. Loss and fragmentation of habitat.
2. Changes in food availability as a result of hunting and introduction of invasive species.
3. Lack of a detailed assessment of the crocodile's habitat.
4. Lack of information on traditional and current economic use of crocodiles.
5. Habitat alteration as a result of the introduction of invasive plants.
6. Inadequate management of the water resources in Zapata's hydrological basin.
7. Pollution from agrochemicals.

The Population group discussed the conservation issues for the species, noting that while the issues identified were present in both wild populations they are amplified in the Lanier Swamp as a result of its small size and relatively easy access from the surrounding communities. However, it was noted that the principal factor limiting the discussions was the lack of field studies to provide necessary information on the wild populations.

Sixteen threats were identified, along with the major strengths for addressing the problems. The 7 most significant threats, in order of importance, were:

1. Illegal hunting.
2. Hybridization with the American crocodile (*Crocodylus acutus*) in the wild.
3. Lack of material and human resources for research, management and protection.

4. Inadequate protection.
5. Lack of information on levels of genetic variability in the wild and captive populations.
6. Lack of opportunities to involve local communities in crocodile conservation actions.
7. Lack of information on the size of the wild population.

Following the identification of the main threats there was discussion concerning the development of proposals for a conservation action plan and designating the parties responsible for seeing that each action is completed. Two organizations, the Zapata Swamp National Park and the Zapata Swamp office of CITMA, were given the responsibility to make sure all parties followed up on their commitments.

Overall, most of the workshop's discussion centered on three issues; illegal hunting, the lack of adequate protection and hybridization occurring in the wild population. Illegal hunting was identified as the main threat to both of the wild crocodile populations. Hunting of crocodiles is no longer a sporadic, part-time problem but has now become a massive and systematic activity. In the Zapata region hunting is not centralized in any one community but is widely practiced throughout the region. Hunters are also known to come from the nearby communities of Jaguey Grande and even from parts of adjacent Havana Province. Hunting has reduced the size of the crocodile population in the Zapata Swamp as hunters enter the region both by land as well as by boat. As crocodiles and other fauna become scarce in one area the hunters extend their operations to new sites and have been eroding the already small range of this species and accentuating its endangered status. Although no socio-economic studies of crocodile hunters and hunting have been carried out, it is clear that the crocodiles are not being hunted for their skins, as these are usually left with the carcasses, or fed to domestic pigs or dogs. Hunting is being carried out almost entirely for the sale of the meat, which is now bringing high prices, or for the sale of small stuffed crocodiles. Hunters who are caught by the Forest Rangers or Fisheries Inspectors receive steep fines and have their supplies and equipment confiscated. However, resources available to these enforcement groups are scarce and the Zapata region is large, making enforcement very difficult.

Concerning genetic issues, there is a significant gap in the information on genetic variability of the wild and the captive populations. If hybridization is occurring, the threat to *C. rhombifer* will be the result of genetic introgression and the loss of genetic integrity of the species, leading to the potential loss of the Cuban crocodile as a distinctive species. The initiation of genetic studies of the species was given a high priority.

The participants of the workshop recognized the danger that these threats not only for the Cuban crocodile, but for the entire Zapata (and Lanier) wetlands ecosystems and the need for unified efforts by the institutions represented to preserve these unique ecosystems. Also considered important was a re-evaluation of the current IUCN Red List status of the Cuban crocodile. Other short-term actions identified were to create a Cuban crocodile specialist group through the Cuban Association of Zoological Parks and to organize a follow-up workshop in June 2007 to evaluate the progress on the priority actions that have been identified.

Figure 1. Cuban researcher Roberto ("Toby") Ramos with wife, Elia, and a Cuban crocodile (*Crocodylus rhombifer*) skin. Photograph: John Thorbjarnarson.

Roberto (Toby) Ramos Targarona, *Parque Nacional Ciénaga de Zapata, Playa Larga, Cuba, <pnacionalcz@enet.cu>*.

Mexico

PROJECT "SUMIDERO CROC": NESTING OF *CROCODYLUS ACUTUS* IN CAÑÓN DEL SUMIDERO, CHIAPAS. Project Sumidero Croc was initiated in 2004, based on a conservation project on *Crocodylus acutus* in Cañón de Sumidero National Park, which was developed by Luis Sigler in 1993-2003. The project is based on monitoring of the population (relative abundance), marking, capture and recapture, size structure and study of nesting, with a program of rescue of eggs for artificial incubation and later reintroduction to the wild.

The study area is within a protected nature area decreed in 1980 and is around 19 km. It can be characterised in relation to size structure or reproductive stages of the species present, and areas occupied by adults, subadults, hatchlings and nesting sites (Fig. 1).

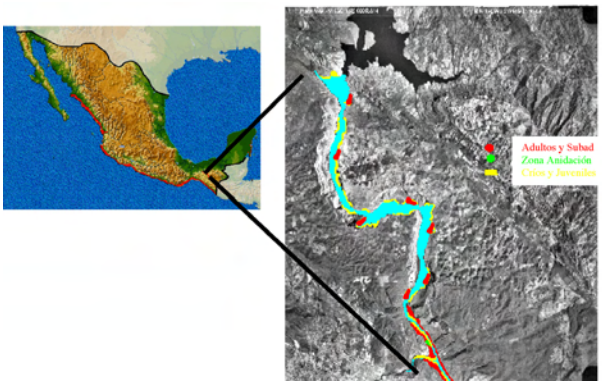


Figure 1. Location of study site in Chiapas, Mexico.

Thirteen years before the project started, I had detected a single nest, but with increasing search effort and progressive recovery of the crocodile population (Sigler 2001; Domínguez and Sigler 2006), in 2005 we recorded 9 nests. For some years we have taken the eggs of some nests for artificial incubation (due to risk of human or other impacts) and other nests have been left intact for observation of hatching, predation, etc.

From 2003 to 2005 we cancelled collection of eggs in order to measure matural hatching trends (not so natural due to direct, marked effects due to human presence, with farming activities, fishing with nets, poaching of eggs, illegal trade in hatchlings and introduction of feral dogs affecting nests, nesting areas and hatchlings). Natural factors and effects of natural predators also influence the population.

The 2006 nesting season was approached with concern, as there had been significant modification of the sandy nesting beaches by floods and hurricanes (Stan) in 2005; at least 50% of the known nesting areas were modified. At the same time, new potential nesting areas for the species had been created.

Survey (day and night) routes were maintained once per month, with the main aim of monitoring the size and the structure of the population. In the nesting (February-March) and hatching (May-June) seasons, we intensified the survey due to illegal activities within the zone. With support from the authorities and inspectors of the Commission of Protected Natural Areas (CONANP) and the Federal Office of the Judge Advocate General of Protection of Environment (PROFEPA), the day and night visits were intensified, to locate nests, count eggs, assess fertility, extract broken or infertile eggs that can generate smell that may attract predators such as ants, raccoons and dogs; to verify time of hatching when all hatchlings are out of their shells if the female does not help them in time; look to decrease the negative effects of fishing and the taking (hunting) of iguana and crocodile nests, the cutting of timber/wood, and the control of speeds of tourist boats that circulate daily around the site and that affect the banks of the river basin and hatchlings that are whipped mortally against rocks.

In February 2006 we begun to detect activity in the known nesting areas, through tracks and signs of females searching for nest sites, as well as by the sighting of some females that are not commonly visible in other seasons. Within this the first 15-20 days we noticed between 3 and 5 test holes by each female (Fig. 2), which were selecting the best location to nest based on hardness of the ground, temperature, shade, etc.

Figure 2. Tracks and test hole dug by female *C. acutus*. Photograph: Domínguez-Laso and Martínez-Aeyón.

Also, in this year I collected eggs from 6 nests that were in high risk of being squashed by cattle that access the nesting area. These eggs were taken to the facilities of the Crocodile Museum Crocodile in ZOOMAT, where they were placed in special incubators (Fig. 3). On hatching, hatchlings are fed an optimal diet before they are released back into the wild.

Figure 3. *C. acutus* eggs being artificially incubated. Photograph: Domínguez-Laso and Martínez-Aeyón.

This year (2006) was important, as 12 nests were located, 3 of which were produced by "new" crocodiles not recorded since the beginning of the project and which correspond to individuals released through this project 13 years ago. This exmplifies the importance of following through with efforts in spite of the few sandy areas and the modifications caused by the Hurricane Stan. There is a good possibility that the species has managed to stabilize.

Analysis of the 2006 information indicated a high fertility (75 to 90%/nest), and mean clutch size of 42 eggs, (measuring 7.6 to 7.9 cm in length, 4.8 to 5.1 cm in width and weighing an average of 120 g). Mean incubation time was 82 days.

Without artificial incubation, the hatching rate of 29-34 hatchlings per nest would have been greatly reduced due to predation, impact of cattle on nesting areas and by females not attending the nest due to disturbance by tourist boats.

Of the 250 eggs collected, 50 were infertile, 150 eggs were broken or damaged due to cattle (which are not allowed in the National Park) and 50 eggs were "normal". A total of 124 hatchlings (270-290 mm TL) were produced - a success rate of 62%. These would have been lost if the eggs had been left in the field. The hatchlings will be maintained in captivity for approximately one year before being released at their nest site.

On the other hand, with the quantification of the impact of cattle, I re-state a proposal that was made some years ago - to surround the most important nesting zones for *C. acutus* (eg Tomatal). Through the joint efforts of the personnel of the CONANP and the Cocodrilo-ZOOMAT-IHNE Museum, we have managed to stop the access by cattle with barbed wire, and this has also become a restricted area for all type of activities. Provisional signboards have been established to inform people about the program. The goal is conservation of not only crocodiles but also iguanas, birds, mammals and other native species of the Cañón del Sumidero National Park.

The stated impacts that decrease the growth of the wild population, and that the collection and artificial incubation of eggs with later liberation of juveniles is a valuable component that has been crucial for the establishment of this unique population of *C. acutus*.

Jeronimo Domínguez-Laso, <*jeroxdl@yahoo.com.mx*>.

RECORD OF MORELET'S CROCODILE IN COASTAL LAGOONS IN SOUTH QUINTANA ROO. The distribution of Morelet's crocodile and the American crocodile in the Caribbean is well well-known - *Crocodylus moreletii* is found mainly in freshwater marshes and *C. acutus* is restricted to coastal habtitats (Platt 1996). Although both species occur sympatrically on the coast of Mexico (Cedeño-Vázquez *et al*. 2006), *C. moreletii* is generally considered to be a freshwater species that can have populations in brackish environments (Leslie and Taplin 2000) - Platt (1996) and Thorbjarnarson (2000) found it in salinities of up to 22 ppt.

Both species occur in the State of Quintana Roo in Mexico. The study area is coastal lagoon habitat, where lagoons are connected to the sea and are interconnected by means of individual channels in flood-prone areas at times of rain. The area is surrounded by a dense barrier of mangroves (*Rhizophora mangle*). In times of drought, many areas become marshes and salinity in the lagoons can reach up to 40 ppt.

The habitat is characteristic of *C. acutus*, but as mentioned previously *C. moreletii* may also occupy these saline lagoons. The connection between these flooded zones often becomes difficult due to the dense vegetation, and previous studies indicate that *C. moreletii* inhabits inland freshwater marsh areas. Only *C. acutus* were captured in these lagoons. Nevertheless, in August 2006 a 100 cm long *C. moreletii* weighing 2 kg was captured, comprising the first record of the species in these lagoons on the south coast of Quintana Roo. It is strange to find to a *C. moreletii* of this size in a lagoon with salinity of 29 ppt. It would be more probable to find an adult or subadult with a greater ability to osmoregulate and walk several kilometres and to break through into this zone.

Cedeño-Vázquez (pers. comm., 2006) suggests that it is probably a hybrid individual in spite of its clear phenotypic characteristics as a *C. moreletii*, since genetic analyses have demonstrated that in the coastal strip of the State the two species tend to hybridize whilst maintaining morphological characteristics of the pure species. However, an alternate hypothesis is that it is a pure *C. moreletii*, and that like the adults the young individuals that travel overland in search of better habitats, as happens during times of drought when they move from small, deep pools to aestivate or to look for large lagoons.

A tracking study using telemetry would be very useful to quantify what these crocodiles do. Such information would assist in the conservation and management of the species and their habitats.

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Brazil

CONSERVATION STATUS OF THE DWARF CAIMAN, *PALEOSUCHUS PALPEBROSUS*, IN THE REGION SURROUNDING PANTANAL. The project "Monitoramento da área de ocorrência, estado de conservação e ecologia do jacaré-paguá no entorno do Pantanal" (= Monitoring of the area of occurrence, conservation status and ecology of the dwarf caiman in the region surrounding Pantanal) has been carried out since 2005 by Zilca Campos and Guilherme Mourão, crocodilian specialists of the Embrapa Pantanal. The research is supported by FUNDECT (Research Development and Support Foundation) and CNPq (Brazilian National Science Research Council) and has logistical support from the IBAMA (Brazilian Environmental Institute) of the states of Mato Grosso and Mato Grosso do Sul. The study's main goals are evaluate population stocks and quality of natural habitat in the areas surrounding Pantanal, contribute with information regarding the biology of the dwarf caiman, about which little is known, and propose conservation measures.

Embrapa Pantanal initiated research into the ecology of the dwarf caiman, *Paleosuchus palpebrosus*, in the 1990s (Campos *et al*. 1995) in the area surrounding western Pantanal, while reproductive aspects have been studied in the Central Amazon (Campos and Sanaiotti 2006). On a recent field trip covering 2581 km of highway to the heads of the five main rivers that drain into the Pantanal (Vermelho, Taquari, Negro, Aquidauna and Miranda), we found young and adult dwarf caiman in sites near waterfalls, running water and rocky substrate. However, the five rivers visited in the eastern and southern surroundings of Pantanal were found to be in alarming condition due to deforestation of riparian forests to create pasture along the riverbanks, siltation, industrial pollution, freezer wastes, urban sewage, human habitation along the riverbanks, intensive professional fishing activity, and fishing and hunting tourism, including hunting of caimans.

The landscapes of forest, savannas and marshes along these rivers and the sources of many creeks has been undergoing accelerated processes of change and total destruction of the vegetation by agriculture, mainly soybean, cotton, corn and sugar cane to supply ethanol plants, which leave toxic residues exposed to be carried off to the rivers and to the water table. The natural riverbeds of the rivers are suffering drastic changes in depth as well as width, as well as the opening of new drainage canals. This process became faster after the installation of hydroelectric plants (forming large lakes and flooding forested areas), and the formation of drainage canals and lakes for irrigation of rice crops. Small towns and cities are growing along these rivers, resulting in alarming destruction and carelessness regarding these environments. Even though the water supply for consumption by the inhabitants of these cities depends on the quality of the rivers, very little has been done.

The dwarf caimans apparently resist the pressure of habitat destruction as well as the enormous pressure of hunting in these rivers located near the cities in the region surrounding Pantanal. Several fishermen report that the dwarf caiman, known as "cascudo" or "thick-skinned", is hunted and makes a delicious soup. It may be killed or may have its tail cut off and be released "alive" in the environment. This fact is supported by their location in difficult-to-access places and difficulty in getting close to individuals due to their flight behavior as soon as the boat motor and/or lights are turned on. This same process has been occurring with the Pantanal caiman *Caiman crocodilus yacare* (Fig. 1), when tourists offer up to $US50/caiman to fishermen and river-dwellers in the region of Pantanal.

Figure 1. Pantanal caiman, *Caiman crocodilus yacare*, found dead in the Cuiabá River, August, 2006.

The dwarf caiman can be considered an indicator species of the quality and richness of the fauna of the rivers surrounding Pantanal, as a way of guaranteeing their survival and the conservation of its natural habitats, and indicating good places for conservation units in the river, creek, and marsh environments surrounding the

Pantanal.

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Peru

A LEUCISTIC SPECTACLED CAIMAN? *Caiman crocodilus* is a well distributed species in the Amazonian basin of Peru. A specimen of *Caiman crocodilus* (Fig. 1) was found in the Picha River, La Convención Province, Cuzco, at 11° 50' 01" S, 73° 10' 56" W and 365 m above sea level. This river is a tributary of the Urubamba River, and forest in the area was composed of bamboo species and *Heliconia* spp., high trees like *Cecropia* spp., *Ficus* spp. and *Cedrella* spp.

Figure 1. Wild "leucistic"? *Caiman crocodilus*. Photograph: G. Chávez.

The individual was sighted as it basked on a sandy beach at 0900 h on a cloudy day. Its body coloration was unusual (Fig. 1) but it was not possible to see its eye coloration - the photograph was taken from about 10 m from the animal. The size of the animal suggested that it was an adult, which is interesting, as leucistic individuals in the wild are considered to live only a few years due to predation.

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East and Southeast Asia

Laos

Little was known on the status and distribution of *C. siamensis* in Lao People's Democratic Republic until preliminary surveys were carried out in 2003 and 2005. These surveys confirmed the presence of small remnant *C. siamensis* populations, including within Champhone District, Savannakhet Province (central Lao PDR).

Champhone District is located in the centre of the Xe Champhone River system, a tributary of the Xe Bang Hieng River. The Xe Bang Hieng catchment includes one of the largest lowland wetlands in central and southern Lao PDR, where seasonally flooded forests provide important habitat for fish production and aquatic biodiversity. Recommendations of the 2005 surveys included follow-up activities in Champhone District to strengthen community awareness of crocodiles and initiate wetland management where crocodiles occur.

On 19-21 October 2006, a "Crocodile Conservation Workshop" and field trip were organised by WWF and the national Department of Livestock and Fisheries (DLF) in Champhone District. Funded by the WWF Lao "Community Fisheries Project" and the WWF Living Mekong Programme, the workshop aimed to promote awareness of the 2005 crocodile survey results, including the importance of the district for global conservation of *C. siamensis*, and to initiate planning for crocodile-related wetland management. Thirty-eight people from four districts in Savannakhet Province attended the workshop, including provincial and district government staff (fishery, agriculture, forestry departments) and the heads of eight villages. Three government staff from Attapeu Province (southern Laos, where crocodile breeding was also confirmed in 2005) also attended the workshop. A fact sheet about crocodiles in Champhone District was prepared and distributed to participants.

The workshop enabled participants to discuss management of local wetlands for the benefit of communities and biodiversity conservation. Village heads presented information on the occurrence of crocodiles, community-managed wetlands and "sacred" wetlands in their respective lands. The head of Tansoum Village, close to a site where crocodile hatchlings were documented in 2005, reported that crocodiles had been seen again since then. Discussions resulted in a short-listing of key wetland sites in Champhone District, which could be used to plan and implement follow-up crocodile population surveys.

Two days were spent by participants visiting six wetlands in Champhone District, giving them the opportunity to discuss crocodile conservation in the field and observe threats to wetland and crocodile habitats. Crocodile dung collected at one previously unvisited site extended the

confirmed occurrence of adult *C. siamensis* in Lao PDR to a new locality. The workshop raised considerable local interest, and was reported in national newspapers. The Governor's Office of Champhone District attended the workshop, and requested support to develop a strategy for wetland management and crocodile conservation in Champhone District. The National Department of Livestock and Fisheries and WWF are now planning further activities in Champhone District, including baseline crocodile status surveys in sites not visited in 2005. The workshop highlighted the need to involve local communities in the conservation and management of the Siamese Crocodile.

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Myanmar

HISTORICAL PRESENCE OF SIAMESE CROCODILES IN BURMA. The Siamese crocodile was originally described by Schneider in 1801, based on a much earlier (1688) account by French Jesuit missionaries from the old Siamese capital of Ayutthaya (Ross *et al.* 1995). Over the ensuing centuries, Siamese crocodiles were also found in Cambodia, Laos and Vietnam. Historically, the species was also known from at least some of the Greater Sunda Islands, with known specimens from Java, and a small but surviving population in the Mahakam River in West Kalimantan (Cox 2004).

Siamese crocodiles have long been known from the lower Mekong River basin. Historically, the species was in the Mekong in Vietnam, and it still can be found in some parts of Cambodia, Thailand and Laos. The two other nations that share the Mekong basin are China and Myanmar (Burma). Crocodiles have never been reported from Yunnan Province in China. The eastern border of the Shan State of Myanmar forms the western margin of the Mekong between northernmost Thailand and China, and there has been speculation that Siamese crocodiles may at one time have been found there. Nevertheless, in a recent review of crocodiles in Myanmar (Thorbjarnarson *et al*. 2006) no historical records of Siamese crocodiles were found.

However, I was recently reading an account of the French Mekong Expedition of 1866-1868 that journeyed up the Mekong from Vietnam to China. This historical expedition formed much of the basis for the subsequent establishment of French Indochina, and the official account was written by Francis Garnier after the team's leader, Doudard de Lagrée, died in China. During their travels, the French expedition covered over 11,000 km by land and by boat. While they experienced many hardships, the group reached its nadir while traveling in the Burmese Shan country. Here, at the peak of the monsoon, bogged down by truculent authorities who owed their allegiance more to the Anglo-Burmese (and not the French), with waters rising, supplies running low and prospects uncertain, they arrived in July 1867 at the village of Paleo (Mong Pa-liao). This small village is nestled on the western (Burmese) bank of the Mekong, along a stretch which the expedition was traveling by foot because of extensive rapids in the river. In an effort to economize, the expedition members started eating local foods. Here, Garnier writes that "cayman" were plentiful and that July was their nesting season. As a result "cayman" eggs were abundant and cheap. While most of the expedition members did not partake, Garnier did and found them to be edible.

There can be little doubt that the "cayman" Garnier was referring to were Siamese crocodiles. The only other crocodilians in the Mekong are estuarine crocodiles, which have never been reported to move far up the Mekong and never from Laos. As such, this is the first, and to my knowledge, the only reference to Siamese crocodiles in Myanmar.

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Philippines

A 50-year-old business man from Paranaque City was arrested by Customs in November as he attempted to smuggle 3 live hatchling *C. siamensis* from Cambodia into the Philippines. The crocodiles were discovered inside carry-on baggage. The man had previously sought permission to import exotic animals but had been denied. The crocodiles were handed over to the Department of Environment and Natural Resources, and will be taken to the Parks and Wildlife Zoo in Quezon City.

Source: Anjo Perez and Ronniel C. de Guzman, *Metro Manila, 15 November 2006;* Rainier Allan Ronda, *The Philippine Star, 15 November 2006.*

DALUPIRI ISLAND SURVEY RESULTS. We carried out 3 night-time spotlight searches and 2 day-time track and nest searches along Caucauayan Creek on Dalupiri Island from 11-13 September 2006. We saw a pair of eyeshines on the 11th and on the 12th, which we believe were from the same individual.

The portion of the Manolong River where Ross *et al.* saw crocodiles in 1990 and which was dry in May and August 2005, was running, albeit the water was reddish brown and carrying a lot of silt.

Information and Education

Following the surveys, we visited the only elementary school on the island. We conducted a coloring contest where school children were given coloring sheets with illustrations of Philippine endemic wildlife. The best works in each grade won prizes, including an informative booklet on the Philippine crocodile, recently launched by the Mabuwaya Foundation, and a 2007 calendar featuring Babuyan wildlife produced by Isla. We also distributed copies of a poster produced by Mabuwaya Foundation promoting the protection of crocodile nests. Copies of the booklets, calendars and posters were provided to school teachers, barangay officials, our guides and the manager of the island-hacienda. The booklets were instantly used by teachers to impart information about the Philippine crocodile to their students.

Working with the Dalupiri Barangay Council

We attended the Barangay Council meeting on the 17th and shared with council members results of the current and past crocodile surveys on Dalupiri (the island of Dalupiri represents a single barangay). We also shared with them experiences of crocodile conservation efforts in San Mariano, Isabela.

Based on our work on Dalupiri for the past few years, we believe direct anthropogenic threats to the survival of the Philippine crocodile on Dalupiri are currently very low, unlike other areas of the Philippines where the species occurs. Nevertheless, we see the benefit of protecting the species against possible future threats, including harmful fishing practices which are not currently used, but which may come to Caucauayan Creek. This is likely if food resources from the sea around Dalupiri are depleted as a result of the current use of harmful fishing methods at sea.

Through dialogue with members of the Barangay Council, we have encouraged them to formulate a barangay ordinance to address possible threats to the Philippine crocodile and wetland resources on Dalupiri Island and this will be up for discussion among the council members. We offered assistance in drafting a possible ordinance and we will be in touch with them in October to monitor progress. We have also offered to extend the Rewards Program of Mabuwaya Foundation, currently running in San Mariano, to Dalupiri if an ordinance is passed. In this program, a reward of P500 will be donated to the barangay fund for every Philippine crocodile that hatches in the wild based on succeeding monitoring activities. The manager of the hacienda, representing the owners of the island, expressed support for the adoption of barangay legislation to protect crocodiles and wetland resources in the island.

Isla and Mabuwaya will be discussing future conservation strategies and measures in the coming months.

Acknowledgements

This work would not have been possible without financial support from Dr. Rafe Brown and Dr. Andrew Townsend Peterson of the University of Kansas and the Mabuwaya Foundation.

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FATAL CROCODILE ATTACK IN PALAWAN. A 9-year-old schoolgirl was killed in Palawan after a crocodile attacked her and her brother as they were crossing a shallow river on the evening of 4 November 2006. Reports said the girl and her 11-year-old brother were walking home after watching a movie at a house a few hundred metres away from their house, at around 2300 h. As they crossed the knee-deep Panalingaan River, the girl was dragged underwater by a crocodile.

Her brother sought help from the residents living nearby. After searching for almost 24 hours, only the victim's severed head was found a few hundred metres from the site. The size of the crocodile, which reportedly attacks farm animals in the area, is unknown. This was the first recorded crocodile attack on a human in this area. Palawan is known for its crocodile farm that attracts local and foreign tourists.

Source: Arnel Ozaeta*, Philippines Star News, 4 November 2006.*

Thailand

CROCODILE SEIZURE. On 11 October 2006, Thai authorities seized live Siamese crocodiles (*Crocodylus siamensis*) and skins being transported in a truck from the Thai/Cambodia border to a private crocodile farm. Acting on a tip-off, Custom officials had followed a truck

that crossed into Thailand at Aranyaprathet District, Sakeaw Province, at 0600 h. Officials detained the driver and seized over 200 live crocodiles and a freezer box of crocodile skins. The value of the seizure is estimated by customs officials to be 600,000 Thai Baht (approximately $USD16,000).

The truck driver, a Thai national, was charged under the Customs Act which carries maximum sentences of 10 years imprisonment or fine of 4 times the value of the imported goods. He was also charged under the Wildlife Law Act, which carries maximum sentence of 4 years imprisonment or 40,000 Baht fine.

International trade in *C. siamensis* requires the relevant CITES import and export permits. The Thai Fisheries Department confirmed that no permit had been issued for the import of these crocodiles. The confiscation and arrest was a result from the increased awareness in the role of Customs officials in stopping illegal trade in wildlife. Thailand has a lead role in the ASEAN-Wildlife Enforcement Network (ASEAN-WEN), a multi-lateral initiative designed to protect Asia's wildlife by facilitating cross-border inter-agency cooperation and exchange of information.

Source: *Wildlife Trade Working Group Wildtrade List.*

China

CHINESE ALLIGATORS. REINTRODUCTIONS AND INTERNATIONAL EXCHANGE OF ANIMALS. The Chinese alligator has been recognized by the CSG as the world's most endangered crocodilian, with wild populations totaling fewer than 150 individuals scattered in groups of no more than 10 individuals across a small area of southern Anhui Province. However, the Chinese government is taking significant steps to ensure that viable populations can survive in the future outside of breeding centers. In August 2003, the first trial release of captive reared alligators was carried out by the Anhui Forestry Bureau (AFB) in conjunction with East China Normal University (ECNU) and the Wildlife Conservation Society (WCS) (see CSG Newsletter 22(2): 4). This release was a success as all three animals adapted well to their new habitat, and the following year started nesting. The AFB conducted another release earlier this year at a different site, and together with the Anhui Normal University has been monitoring the animals [see CSG Newsletter 25(3): 23].

Plans are also underway for a trial release of alligators in the Chongming Dongtan wetlands in Shanghai municipality in 2007. From 15-16 September 2006 a workshop on Chongming Island was organized by the Chinese State Forestry Administration, the Shanghai Agriculture and Forestry Bureau and WCS with the support of WWF-China and the Shanghai Industrial Development Corporation. The objective was to review current conservation programs for wild populations of Chinese alligator, discuss plans for reintroduction efforts, and develop a plan for May 2007 release of alligators into wetlands on Chongming Island. At the end of the workshop, participants visited the wetland area, which is still in the process of being restored. Phase 1 is finished (ca. 10 ha) and Phase 2 is being landscaped, and will cover 120 ha. Released alligators will be monitored by students from ECNU under the direction of Prof. Wang Xiaoming and WCS-China.

The alligators that will be used for this release program will come from the Changxing Breeding Center in Zhejiang Province, and will include a few Chinese alligators that were hatched and reared in the United States. In May of this year, a group of 12 Chinese alligators was shipped from

Figure 1. Crated Chinese alligator at the Bronx Zoo. Photograph: WCS.

Figure 2. Unpacking the Chinese alligators at the Changxing Breeding Center. Photograph: WCS.

Figure 3. Mr. Wang Zhiping, Director of the Changxing Breeding Center, inspects the newly arrived Chinese alligators. Photograph: John Thorbjarnarson.

the US (from the St. Augustine Alligator Farm, Disney's Animal Kingdom and WCS-Bronx Zoo). After spending several days in crates (Fig. 1) in the belly of an airplane and then being trucked from the Shanghai Pudong Airport to Changxing Breeding Center (Figs. 2 and 3), the alligators were released into a specially constructed quarantine pond where they have been adapting to their new home.

I visited these animals again in September and apart from some initial difficulties in adjusting to their new diet they seemed to be doing well and were in the process of digging burrows for the winter.

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West Asia

Iran

FIRST RECORD OF MUGGER CROCODILE HATCHLINGS IN I.R. IRAN. Southeastern Iran is the western most limit for the global distribution of the Mugger Crocodile (*Crocodylus palustris*). The small but very scattered population of crocodiles in the region is limited to the existing main water bodies in the area, like the Sarbaz, Bahukalat and Kaju Rivers and related natural ponds, as well as artificial ponds constructed in the region for local uses. The main distribution of the population is in the "Gandou" protected area (Mobaraki 2002).

The nesting season in Iran starts in late winter, and egg laying takes place in May. Eggs are laid in typical hole nests in sandy banks adjacent to water, usually under the shadow of trees and thick vegetation (Mobaraki 2002). Based on existing information on nesting season, the area was visited several times during the reproduction season in order to collect related data on hatchlings and the results of the reproduction. There is lack of information on time and extent of hatching.

Figure 1. Mugger hatchling. Photograph: A. Mobaraki.

During the survey in July 2005, hatchlings were observed in some of the important ponds in which the location of the nests also was identified. In the ponds and related nursery sites 5, 2 and 1 hatchlings were captured respectively, which seemed to be all of the survivors from the clutch. In another survey in July 2006 we observed 2, 1 and 1 hatchlings respectively in different ponds, of which only one was captured (Fig. 1). Mean size of hatchlings (2005 and 2006) from Hoot Gat Pond and after Pishin Dam was 30.23 cm total length and 87.35 g bodyweight.

Relative to the numbers of eggs, the number of surviving hatchlings indicates a high mortality of eggs and/or hatchlings which needs more investigation and possible conservation action. Mongoose (*Herpestes edwardsii*) are abundant in the area, and footprints were observed in the nesting area during the survey. Herons also are very common in the ponds. Moreover, the threat of drought exists in some parts (Mobaraki 2004). The nests are not exposed and are usually quite difficult to find them amongst the vegetation and trees. In some cases also trial nests close to the nest were evident (Fig. 2).

Figure 2. Trial Mugger crocodile nests at Hoot Gat Pond. Photograph: A. Mobaraki.

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Bangladesh

The country's first reptile farming enterprise has witnessed its first success as two crocodiles laid eggs this season (August). Reptiles Farm Ltd., a private entrepreneurship, started farming crocodiles commercially at Hatiber village in Mymensingh in 2004. Mesbahul Haque, Mushtaq Ahmed and Dr Sheikh Muhammad Abdur Rashid jointly launched the farm, together with financial support as a interest free loan from the Equity and Entrepeneur Fund (EEF) of the Government.

Initially, 75 Saltwater crocodiles (*Crocodylus porosus*) from Malaysia were imported on 23 December 2004. One crocodile died on its way to Bangladesh and 6 more died later after reaching the farm, leaving the current stocks of 54 females and 14 males. The imported reptiles were released into 12 specially designed curved ponds and in two lagoons in the project area, which covers 13.4 acres.

Two crocodiles laid 69 eggs during the wet season this year, which are being incubated in Dhaka. Mr. Mushtaq Ahmed, managing director and chief executive officer, stated that the farm hoped to produce 2500-3000 eggs next year if weather conditions were favourable. An Australian crocodile farming expert has been hired at the farm for a month to train the project staff on the latest technology of crocodile farming.

The farm has plans to rear other types of reptiles such as tortoise, snake and monitor lizards in the future.

Source: *Daily Star, Dhaka, Bangladesh, 17 November 2006.*

North America

USA

CALIFORNIA LAW NOW ALLOWS SALE OF ALLIGATOR AND CROCODILE PRODUCTS. On 29 September 2006, Governor Schwarzenegger signed SB1485 into law (effective 1 January 2007), which legalises the sale of alligator and crocodile products in California. California was the last of the 50 states to do so.

Part of the bill is a sunset amendment that requires the bill to be reconsidered by 1 January 2010 - this was the key to its successful passage. In the interim, products can still be landed in the USA, outside of California and trans-shipped. There should be no difficulty for holiday sales in California and confusion to exporters is ended.

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FOURTH YEAR OF SUCCESSFUL HATCHING OF THE ORINOCO CROCODILE (*CROCODYLUS INTERMEDIUS*) AT THE DALLAS WORLD AQUARIUM. The Dallas World Aquarium (DWA) is located in downtown Dallas, Texas, and opened to the public in October 1992. On 13 May 1998, the DWA imported a pair of adult Orinoco crocodiles from Venezuela (Hudson 1998) with the intention of contributing to *ex-situ* conservation of the species, and educating the visitors about this major South American predator through exhibition and informal education approaches. The crocodiles, nicknamed Miranda (female, 25 y) and Juancho (male, 18 y), were placed in the "Crocodile Cove", a 64,000 l fresh water exhibit located in the Rainforest (opened to public on 26 October 1997). This huge exhibit is dedicated to the fauna and flora of Brazil, Colombia, Peru and Venezuela, and Miranda and Juancho shared their pond with "Pacus" and "Piranhas" (Powell 1999).

On arrival, the crocodiles were introduced each other slowly, and after some time they showed reproductive behavior. Miranda laid her first clutch in December 1998 - those eggs were lost. The pair stopped breeding until 2002, when many changes were made to the exhibit, especially the nesting area.

The first hatchlings were produced in 2003 (53 eggs, 2 hatchlings, 1 survived), and again in 2004 (42 eggs, 6 hatchlings, 6 survived) and 2005 (47 eggs, 7 hatchlings, 3 survived) (Richardson 2006). Miranda laid her 5th clutch in December 2005, and a lot of attention was paid to it in order to improve incubation success.

A monitor and an infrared camera were installed over the nesting area and we observed activity over it daily. At 0700 h on 8 December, Miranda laid 39 eggs (38 good and one broken) in a normal hole in the sand and she covered it up. She spent 4 more hours over the nest and after that moved to the pond. At that moment we closed the gates so she could not come back, and we covered the closest door to the pond with a black curtain. The nest was located and dug up. Width and depth of the egg cavity were recorded. As the eggs were carefully collected they were numbered on the upper surface using a pencil. They were placed into two Styrofoam containers with sand from the nest and moved to the incubation area, where a Reptile Incubator (Lyon Electrical Company™) had been tested a month before to maintain temperature and more than 95% relative humidity.

In the incubation area, eggs were measured (length, width, weight) and checked for dents. The 38 "good" eggs were put inside two clear plastic containers (30 x 30 x 10 cm) with a non-hermetic tap with four additional small holes (3 mm width) and buried horizontally in a moistened mixture of coarse vermiculite with play sand (4:1). A digital Hydro-thermometer (Oregon Scientific™) was placed inside each box. As this year's goal was to obtain a high proportion

of females, our plan was to incubate at 30.5°C for the first 45 days and then increase the temperature to 32°C for the remainder of the incubation period (Thorbjarnarson, pers. com.). When relative humidity was lower than 92%, a mist bottle placed inside the incubator was used to mist the eggs and the vermiculite. A water-filled plastic container was placed at the bottom of the incubator to help maintain high humidity.

One egg was infertile. By day 1 the 37 fertile eggs had a 10 mm opaque band (spot). By day 18 it was 32 mm in width, and by day 40 all fertile eggs had an even band. Candling on day 40 indicated that 36 of the 37 eggs showed embryo development [one egg had suffered early embryonic death (see below)].

On day 85, two eggs were x-rayed - one (egg 7) had an air bubble and no embryo development, and the other (egg 11) showed a fully developed embryo. No croaking was heard, but on day 89 when a second x-ray was programmed for egg 11, croaking was heard for first time and a pip was noticed in the eggshell. Some other eggs showed signs of pipping and hatchlings trying to get out their eggs. Multiple hatching occurred in 20 eggs in less than 45 minutes. All hatchlings were identified to the egg from which they hatched, and scuteclipped in progressive order of hatching. At the end of day 89 26 had hatched, 5 more hatched the next day, and 5 more were helped to hatch on day 91 (by opening the egg) (Fig. 1).

All the hatchlings were weighed and measured (total length, umbilical scar length and width), and spent their first night inside clear plastic containers with a paper towel misted with fresh water in groups of three, inside the incubator. Of the 36 hatchlings, 23 were in good condition, 11 were called “big bellies” because of the size of their abdomen and two had external yolk sac, which was surgically removed. Only one of the “good” hatchlings was found dead the day after hatching, possibly due a hemorrhage from the umbilical cord.

Figure 1. Orinoco crocodile hatchlings hatched at Dallas World Aquarium.

The day after hatching all the crocodiles were placed in an acrylic aqua terrarium divided in four compartments with a 50% water-land ratio, with 4 infrared lights on from 1800 h to 1900 h, and under a central UV light on between 0700 h and 1800 h. The aqua terrarium works with Reverse Osmosis Water and is run by a pump and sand filter.

Five days after hatching, all the hatchlings started eating half-growth crickets dusted with a multi-mineral supplement (Miner-all™). They were fed once per day until they were 30 days old, when they were fed twice per day.

The umbilical scar had closed completely by 21 days of age. At 28 days of age three hatchlings from each group (good shape, big bellies and yolk sac surgically removed) were x-rayed on 6 May to see the development of their abdomens. We found small stones in the stomachs of the “good shape” and “big belly” individuals.

Right now, the DWA has 47 Orinoco crocodiles: 2 adults, 1 female (hatched 2003), 9 males (6 hatched 2004, 3 hatched 2005) and 35 unidentified (females?, hatched 2006). As part of the agreement between the Venezuelan Government and the DWA, hatchlings are to be sent back to Venezuela for release into the wild. Also the DWA is co-sponsoring a workshop with the Wildlife Conservation Society and The Nature Conservancy on the status of the Orinoco crocodile in Colombia and Venezuela, with emphasis on an analysis of the hatchling/juvenile release activities into the wild. The DWA is possibly the only place outside Colombia or Venezuela where the species is breeding.

Acknowledgements

I thank Fabian Aguirre and Rudy Jara for all the information and help for this document.

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Luis Sigler, *Manager of the Reptile Collection, The Dallas World Aquarium, <cocodriloblanco@yahoo.com>.*

RECORD RE-TRAP ALLIGATOR HARVESTED. Glenn Capdepon, an alligator trapper from Youngsville,

Louisiana, harvested a record "farm-retrap" alligator on 10 September 2006. Hunting in Tensas Parish, Mr. Glenn Capdepon harvested a 3.81 m (12' 6") male alligator (Fig. 1). As he loaded the carcass, he noticed a notch in the tail scutes, indicating that this alligator had been previously marked by Louisiana Department of Wildlife and Fisheries personnel. Closer inspection revealed a small web tag between the alligator's toes on one of the hind feet (Fig. 2). Although tags are usually lost over time, this tag had been retained, providing valuable data for LDWF biologists.

Figure 1. Glenn Capdepon (right) and Brandon Jackson (left) with two large alligators taken in the 2006 harvest. The 3.81 m (12' 6") alligator on the left is the largest re-trap recorded to date. Photograph: Jeff Thomas (courtesy of Glenn Capdepon).

The alligator had been initially marked at a farm on 28 August 1993, when it was 1.12 m (44") long. In the 13 years between release and capture it had grown 2.69 m, an average of 20.7 cm (8.1") per year. It had been released about 13 km north of where it was later harvested.

Louisiana alligator trappers have caught dozens of re-traps in the 3 m (10') size class, and several in the 3.4 m (11') size class, but this is the first to attain 3.7 m (12'). An added bonus was that the alligator still had the tag in it's foot, which provided precise data on time and date of release.

Louisiana's sustainable use harvest program with alligators benefits many citizens who elect to participate, including private landowners, alligator trappers, alligator farmers and their employees, alligator buyers and dealers and others. In 2005, the value of raw alligator skins and meat alone was approximately $US40 million. Despite the devastating hurricanes of 2005 [see CSG Newsletter 25(1): 4-5 and 25(3): 19-21], the resilient alligator remains a valuable resource for the state and after careful review of survey data conservative harvest quotas were set for the 2006 season.

Figure 2. Feet of two re-trap alligators, showing web tags (indicated by arrows). Photograph: Ruth Elsey.

An important component of the alligator program is the mandatory release of alligators from farms to the wild. This is to compensate for the egg harvest, to replace the portion of juvenile alligators that is estimated to have survived on their own had the eggs not been collected. Extensive research suggests this is about 14% of the eggs that hatch. In most years, the LDWF marks some 40,000 to 50,000 juvenile alligators at farms, to be released to wetlands to ensure population recruitment for future generations. The recovery of web tags by alligator trappers help LDWF biologists monitor alligator growth, survival, and dispersal. Even if the web tag has fallen out with growth of the alligator, information on the tail notches on the alligators which indicate the year of release is still valuable.

Source: *Text taken from a draft press release by LDWF, provided by Ruth Elsey, <relsey@wlf.louisiana.gov>.*

Europe

Denmark

FIRST PRIVATE BREEDING OF THE DWARF CROCODILE IN THE NETHERLANDS. A 10-year-old female *Osteolaemus tetraspis* laid eggs on 25 May 2006. Seven eggs were removed and incubated at approximately 32°C. Some eggs were left in the nest, but it was not possible to get an accurate count as the female was extremely aggressive. The temperature of the room in which the nest

is located fluctuates between 28 and 34°C.

On 17 August, after 85 days of incubation, five eggs hatched. One egg was infertile (it was double the size of the "normal" eggs), and one egg was rotten (it had a broken shell from the beginning).

On 29 August, 12 days after the eggs in the incubator had hatched, the female was observed to dig in the nest, take an egg in her mouth, and open it with her jaws. Then she took the hatchling to the pond - an amazing thing to see in my own house! There were two hatchlings from the eggs left in the nest, and there four more eggs (two broken, two infertile) in the nest. I was able to dig these out as the female had lost her aggressiveness. Total clutch size thus comprised 13 eggs.

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Australia and Oceania

East Timor

There is little information on the distribution and status of crocodiles in East Timor (Democratic Republic of Timor-Leste). Medical and other personnel working in remote areas of the country over the last few years have reported that crocodile attacks on humans occur regularly (1-2 fatal attacks per year, mainly in estuarine areas), but specific details on these attacks are not available.

In addition, there appear to be "local" reports of two types of crocodile - whether this reflects *C. porosus* from saline and freshwater habitats, or confusion with *C. novaeguineae* from parts of neighbouring Indonesia (eg Papua Province) is unknown.Three *C. porosus* are held in captivity in the capital of Dili.

Figure 1. Saltwater crocodile (*Crocodylus porosus*) found behind the Hotel Roberto Carlos, in the town of Los Palos. Photograph: Colin Trainor.

Colin Trainor (Charles Darwin University, Darwin, NT) sent some images of what are clearly *C. porosus* in the Los Palos (Figs. 1 and 2) area, in the eastern part of the country. Information from local informants suggest that a good population of crocodiles exists in Lake Iralalaro (Fig. 2), which is being assessed for the country's first national park and also for a hydroelectric scheme.

Figure 2. Saltwater crocodile (*Crocodylus porosus*) basking at Lake Iralalaro. In background are houses and agricultural/grazing land. Photograph: Colin Trainor.

Charlie Manolis, *CSG Regional Chairman for Australia and Oceania, <cmanolis@wmi.com.au>*.

Africa

The following abstract was extracted from the MSc thesis of Georgina Thomas [Thomas, G.D. (2006). Human-crocodile conflict in the Okavango Delta, Botswana. MSc Thesis, University of Stellenbosch].

Human-Crocodile Conflict (HCC) is becoming an increasingly social, and conservation problem in most African countries, as many predator species are under threat due to conflict situations where predation of livestock and humans is occurring. However, very little is known about this multidimensional issue, that affects social, political, economic, cultural and biological aspects of life in regions throughout the world.

The extent and severity of HCC in the Okavango Delta, Botswana, was investigated through completing questionnaires with the aid of translators in 35 villages surrounding this unique inland delta in the Ngamiland District of Botswana (N= 482). Perceptions towards crocodiles, the degree of utilization of river resources and traditional beliefs of the local people were also investigated. A high incidence of attacks was expected to occur where human and livestock populations were high, with an increasing number of attacks over time. Half of the people interviewed fear crocodiles and remarked that the

brain is poisonous when consumed. Most human attacks occurred when people were fishing, swimming or collecting water. Total human population was positively correlated with total attacks on humans and total livestock attacks. The rate of attack on humans and livestock is increasing linearly with time, which is very concerning as people are dependant on farming (livestock and crops) for about 50% of their income. A comparison of recorded attacks with the DWNP (Deptartment of Wildlife and National Parks) records, revealed that the number of livestock attacks by crocodiles is minor compared to attacks by lion and leopard in the Ngamiland District. However, combined with external influences, such as HIV/AIDS, the impact of HCC will potentially greatly undermine people's livelihoods in the future.

Mitigation measures combining both prevention and reactive techniques are provided for policy amendments and for communities for the long term resolution of HCC. The gradual phasing-out of monetary compensation (which is currently practiced in Botswana), together with regulations restricting use of open access water of the Okavango Delta is recommended. Policy instruments and various incentives (for communities) will aid in policy implementation and thus facilitate the future coexistence of man and crocodile in the Okavango Delta, Botswana.

Science

Recent Publications

Benoit de Thoisy, Tomas Hrbek, Izeni Pires Farias, William Rangel Vasconcelos and Anne Lavergne (2006). Genetic structure, population dynamics, and conservation of Black caiman (*Melanosuchus niger*). Biological Conservation 133: 474-482.

Abstract: Microsatellite DNA polymorphisms were screened in seven populations of the largest Neotropical predator, the Black caiman *Melanosuchus niger* (n = 169), originating from Brazil, French Guiana and Ecuador. Eight loci were used, for a total of 62 alleles. The Ecuadorian population had the lowest number of alleles, heterozygosity and gene diversity; populations of the Guianas region exhibited intermediate diversities; highest values were recorded in the two populations of the Amazon and Rio Negro. During the last century *Melanosuchus* populations have been reduced to 1-10% of their initial levels because of hunting pressure, but no strong loss of genetic diversity was observed. Both the inter-locus g-test and the Pk distribution suggested no recent important recovery and/or expansion of current populations. On a global scale, the inter-population variation of alleles indicated strong differentiation (FST = 0.137). Populations were significantly isolated from each other, with rather limited gene flow; however, these gene flow levels are sufficiently high for recolonization processes to effectively act at regional scales. In French Guiana, genetic structuring is observed between populations of two geographically close but ecologically distinct habitats, an estuary and a swamp. Similar divergence is observed in Brazil between geographically proximate "black water" and "white water" populations. As a consequence, the conservation strategy of the Black caiman should include adequate ecosystem management, with strong attention to preservation of habitat integrity. Distribution of genetic diversity suggests that current populations originated from the central Amazonian region. Dispersal of the species may thus have been deeply influenced by major climatic changes during the Holocene/Pleistocene period, when the Amazonian hydrographic networks were altered. Major ecological changes such as glaciations, marine transgressions and a hypothesized presence of an Amazonian Lake could have resulted in extension of Black caiman habitats followed by isolation.

Claudio Borteiro, Carlos Prigioni, José Eduardo García, Marcelo Tedros, Fransisco Gutiérrez and Fransisco Kolenc. (2006). Geographic distribution and conservation status of *Caiman latirostris* (Crocodylia, Alligatoridae) in Uruguay. Phyllomedusa 5(2): 97-108.

Abstract: Populations of *Caiman latirostris* are known to occur in Uruguay but their geographic distribution remains uncertain. This work presents an update of the species distribution and conservation status in Uruguay. Surveys conducted by the authors confirmed the presence of the species in the previously known distribution range of northwestern Uruguay, where it seems to be widespread and relatively abundant in contrast to earlier reports. We report new localities for *C. latirostris*, most relevant being those of the Cebollatí and Tacuarí Rivers, and the Pelotas, India Muerta and San Miguel stream basins, which significantly expand its distribution through important wetlands in the eastern part of the country. The overall distribution is coincident with different landscape types, where lagoons, artificial impoundments, livestock waterholes, rivers, streams, creeks and marshes are inhabited by caiman. Illegal non-commercial hunting was detected all over the country.

John Thorbjarnarson, Steven G. Platt, Win Ko Ko, Khin Myo Myo, Lay Lay Khaing, Kalyar and Bill Holmstrom. (2006). Crocodiles in Myanmar: species diversity, historic accounts, and current population status and distribution. Herpetological Natural History 10(1): 67-79.

Abstract: Myanmar is the largest country in mainland Southeast Asia, but its fauna is poorly known owing to a lack of biological surveys over the past 50 years. The situation concerning crocodilians is particularly

confusing. Five species (*Crocodylus porosus, C. palustris, C. siamensis, Tomistoma schlegelii, Gavialis gangeticus*) have been reported from Myanmar, but the basis of many reports is unclear. We reviewed historic accounts and found that verified records for *C. siamensis* and *T. schlegelii* are lacking, and the occurrence of *C. palustris* is based on a single questionable record from the late 1800s. *Gavialis gangeticus* apparently occurred in tributary streams of the Ayeyarwady, but was extirpated in the early 1900s. *Crocodylus porosus* is the only extant species occurring in Myanmar. Although once widespread in coastal regions, the species is now confined to the lower Ayeyarwady River, and coastal Rakhine and Tanintharyi States. The only viable *C. porosus* population remaining in Myanmar occurs in Meinmahla Kyun Wildlife Sanctuary and adjacent Reserved Forests of the Ayeyarwady Delta. Crocodiles are completely protected in the sanctuary, and a head-start program was initiated in 1998 to return juvenile crocodiles to the wild. Our surveys in 1999 and 2003 found large numbers of juvenile and subadult crocodiles, suggesting population recruitment is occurring. We also documented crocodile nesting in the sanctuary and surrounding Reserved Forests. Conservation efforts are complicated by occasional fatal attacks on humans. A crocodile farm established in Yangon during 1978 and stocked with wild-caught animals has made no significant contribution to crocodile conservation.

Mike Letnic and Greg Connors (2006). Changes in the disribution and abundance of saltwater crocodiles (*Crocodylus porosus*) in the upstream, freshwater reaches of rivers in the Northern Territory, Australia. Wildlife Research 33: 529-538.

Abstract: Since they were declared a protected species in 1971, populations of saltwater crocodiles (*Crocodylus porosus*) have increased in the tidal rivers, freshwater swamps and marine waters of the Northern Territory. The recovery of the *C. porosus* population has been accompanied by an increase in the incidence of 'problem crocodiles' that represent a threat to people in freshwater and marine habitats. Despite the implications for human safety, little is known about *C. porosus* populations in the freshwater reaches of rivers, well upstream of tidal influence. In this study we examined the density and body-size structure of *C. porosus* populations in three freshwater rivers using a combination of data from spotlight and helicopter surveys conducted between the 1980s and 2005, and the inland extent of *C. porosus* using distribution records in the Northern Territory. Since the 1980s, the density of *C. porosus* in upstream, freshwater reaches of the Daly and Roper rivers has increased, as has the inland extent of *C. porosus* on the Daly River. Although *C. porosus* was not detected in spotlight surveys of the Victoria River, helicopter survey and anecdotal records indicate that *C. porosus* were present after 1989. In all, 52.1% of the crocodiles sighted in spotlight surveys were between 2.1-3.4 m total length. Distribution records show that C. porosus occur up to 235 km inland and at elevations of up to 126 m above sea level. The potential distribution of *C. porosus* is likely to be similar to that of barramundi (*Lates calcarifer*), a readily identifiable diadromous fish that must spawn in estuarine waters and, occurs at elevations of up to 178 m above sea level. Because the density and inland extent of *C. porosus* in freshwater rivers is likely to increase, it is recommended that: (1) programs communicating crocodile awareness use the linkage between the presence of barramundi and the potential presence of *C. porosus*; (2) that crocodile warning signs be erected in upstream areas within the potential range of *C. porosus*; (3) that research be conducted on developing techniques to detect and exclude *C. porosus* from swimming areas; and (4) that widespread systematic surveys be undertaken to document the inland extent of *C. porosus*.

James Aparicio E. and Jehan N. Ríos (2006). Experiencias de manejo en el proceso de aprovechamiento sostenible del lagarto (*Caiman yacare*) en Bolivia (1995-2004). Rev. Electrónica Manejo de Fauna Silvestre en Latinoamérica 1(7): 1-11. [Experiences in management of the sustainable harvest process of the caiman (*Caiman yacare*) in Bolivia (1995-2004)].

This paper summarises the history of the *Caiman latirostris* management program in Bolivia, from 1995 to 2004. It summarises information from available sources such as technical reports and legal instruments in chronological order, and provides an overview of the evolution of the program over time. The results of an analysis of advantages and disadvantages of models implemented until now and new alternative proposals are presented.

Letnic, M. and Ward, S. (2005). Observations of freshwater crocodiles (*Crocodylus johnstoni*) preying upon cane toads (*Bufo marinus*) in the Northern Territory. Herpetofauna 35: 98-100.

Summary: The cane toad (*Bufo marinus*) is one of the world's most successful invasive species. Since they were introduced to Queensland in 1935 they have invaded much of northern Australia and their range is still expanding. Cane toads contain high concentrations of the toxin, bufotoxin, which is poisonous to most Australian vertebrates. We report upon observations of predatory interactions between cane toads and *Crocodylus johnstoni* during night-time crocodile population surveys on the Roper and Daly Rivers, Northern Territory during 2005. Cane toads have been present in the Roper River since 1997 and in the upper Daly River since 2003-2004. During the surveys, numerous observations were made of cane toads swimming in the water or sitting on the banks of the river in areas where they were likely to be encountered by crocodiles. A total of 624

C. johnstoni were sighted in eight nights of surveys over 100 km of river. On four occasions freshwater crocodiles were observed to have ingested or caught cane toads, or attempting to catch cane toads. On 3 occasions we were able to photograph these interactions.

Figure 1. A dead *Crocodylus johnstoni* found with a cane toad in its stomach on the Daly River, Northern Territory. The crocodile had no obvious external injuries.

Figure 2. An approximately 1.20 m TL *Crocodylus johnstoni* with a cane toad in its jaws. The crocodile and the cane toad were 2 m from the water's edge and dry, suggesting that the crocodile may have captured the cane toad on land rather than in the water.

These observations confirm previous reports which indicate that cane toads are a prey item for and may be ingested by freshwater crocodiles in the Northern Territory. Without a more detailed post-mortem an observation of a dead crocodile with a cane toad in its stomach cannot be used to conclude that the ingestion of the cane toad was the cause of death. Nonetheless it provides strong evidence that predation on cane toads may result in the death of wild freshwater crocodiles.

Sharma, R.K. (2006). Status of Mugger (*Crocodylus palustris*) in protected areas of Madya Pradesh. Herpinstance 4(1): 2-9.

Awasthi, K. (2006). Croc can't go on. Down to Earth 15(13): 42-49.

Zilca Campos, Marcos Coutinho, Guilherme Mourão, Peter Bayliss and William E. Magnusson (2006). Long distance movements by *Caiman crocodilus yacare*: implications for management of the species in the Brazilian Pantanal. Herpetological Journal 16: 123-132.

Movement patterns of caimans were studied over a 16-year period in two areas of the Brazilian Pantanal, one dominated by intermittent rivers and another, adjacent region of many isolated lakes. We marked caimans in 100 lakes (1986-2001) and two rivers (1987-1999). We recaptured 163 adult males, 132 adult females and 237 juveniles. In a two-year interval, hatchlings moved only within the lake area or within the river area and the maximum distance moved was 6.0 km (mean= 0.5 km, SD= 1.0) in the lake area, and 1.25 km (mean= 0.6 km, SD= 0.3) in the river area. In a period of one year, females and males larger than 40 cm snout-vent length moved similar distances in both areas (max.= 9.8 km). We monitored 47 adult caimans by radio-telemetry in the river area for about a year. The size of the area used by telemetered individuals over periods of 30 to 436 days varied from two to 1649 ha. The areas used by five males in sites subjected to experimental hunting were similar to those used by five other males in areas not subjected to hunting. In periods of 1-5 years, females and males larger than 40 cm SVL moved maximum distances of 16 and 18 km, respectively. Five individuals marked as hatchlings in the lake area were recaptured as adults after intervals of 5-15 years. The extensive long-term and short-term movements by caimans mean that individual ranches should not be considered independent management units for sustained use of caimans in the Pantanal.

Submited Publications

WORLDS LARGEST CROCODILE SKULL? Recent CSG Newsletters [Kar 2006a, 2006b; Manolis 2006] contain brief notes on skulls from large (6+m TL) Saltwater crocodiles (*Crocodylus porosus*), the largest of which was confirmed at 72.8 cm long (Manolis 2006).

The pictured skull (Fig. 1) is currently held in the Kanika Palace of Sri S.N. Bhanja Deo, Raja of Kanika. The crocodile, 24' 9" (7.5 m) long, was shot in 1926 in the Dhamara River of Bhitarkanika Sanctuary. The head length of this skull was reported by Daniel and Hussein (1973) as 100 cm long (cited in Webb and Messel 1978), but this measurement is the length of the skull to the posterior margin of the mandibles (we measured this as 99 cm).

Comparison of published data with recent up-to-date measurements of this skull (Table 1) indicate that it is one of the largest, if not the largest, *C. porosus* skull recorded in India and possibly the world.

Figure 1. Skull of 7.5 m long *C. porosus*.

We are trying our best to recover the skull from the Kanika Palace and put it into the Museum at Dangmal/Bhitarkanika Crocodile Research Centre, where *C. porosus* skulls of various sizes are kept.

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Kar, S. (2006b). Record of a large Saltwater crocodile from Orissa, India. Crocodile Specialist Group Newsletter 25(3): 27.

Manolis, C. (2006). Record of a large Saltwater crocodile from the Northern Territory, Australia. Crocodile Specialist Group Newsletter 25(3): 27-28.

Montague, J.J. (1983). Influence of water level, harvest pressure and habitat type on crocodile abundance in the Fly River drainage, Papua New Guinea. Biological Conservation 26: 309-329.

Webb, G.J.W. and Messel, H. (1978). Morphometric analysis of *Crocodylus porosus* from the north coast of Arnhem Land, northern Australia. Aust. J. Zool. 26: 1-27.

Dr. Sudhakar Kar, *Senior Research Officer, Wildlife Organisation Headquarters (Forest Department), Prakruti Bhawan, Bhubaneswar-751012, Orissa, India, <Kar_sudhakar2005@yahoo.com>.*

NILE CROCODILE THESES. Five of Dr. Alison Leslie's students at the University of Stellenbosch have submitted their Masters theses, which will soon be available on the Okavango project website (www.sun.ac.za/consecol/okavango). These are:

1. Wallace, K.M. (2006). Feeding ecology of yearling, juvenile and subadult Nile crocodiles, *Crocodylus niloticus*, in the Okavango Delta, Botswana. MSc Thesis, University of Stellenbosch.
2. Shacks, V. (2006). Habitat vulnerability for the Nile crocodile, *Crocodylus niloticus*, in the Okavango Delta, Botswana. MA Thesis, University of Stellenbosch.
3. Detoeuf-Boulade, A.S. (2006). Reproductive cycles and sexual size dimorphism in the Nile crocodile, *Crocodylus niloticus*, in the Okavango Delta, Botswana. MSc Thesis, University of Stellenbosch.
4. Thomas, G.D. (2006). Human-crocodile conflict in the Okavango Delta, Botswana. MSc Thesis, University of Stellenbosch.
5. Maciejewski. K. (2006). Temperature-dependent sex determination in the Nile crocodile, *Crocodylus*

Table 1. Attributes of 11 large *C. porosus* skulls (HTL= total head length; HIO= interocular width; HSE= snout-eye length; HPP= cranial platform width; HMP= cranial platform midpoint width; HMW= maximum head width; TL= total length). Sources: 1= Webb and Messel (1978); 2= Manolis (2006); 3= Kar (2006); 4= Montague 1983. ZI= Zoological Institute (Russia); BMNH= British Museum of Natural History (UK); MCZ= Museum of Comparative Zoology (USA).

Locality	?	India (Dhamara R.)	ZI	Australia (Mary R.)	BMNH	Sarawak?	PNG	Australia (Mary R.)	India (Dhamara R.)	MCZ	Australia (Mary R.)
Source	(1)	(Fig. 1)	(1)	(2)	(1)	(1)	(4)	(1)	(3)	(1)	(1)
HTL (cm)	75	74.5	74.0	72.8	71.5	71	70	68.7	68	67.4	66.6
HIO (cm)	-	8.6	8.2	7.1	8.2	-	-	7.8	8	7.1	7.5
HPP (cm)	-	23.0	20.4	23.0	20.5	-	-	19.5	18	20.1	23.5
HMP (cm)	-	19.5	-	19.4	17.7	-	-	17.2	15	17.5	18.9
MHW (cm)	47	48.0	-	45.8	47.8	-	-	48.5	40	44.8	48.0
HSE (cm)	-	54.0	51.6	50.0	50.0	-	-	48.0	45	48.8	44.3
TL (m)	?	7.5	?	6.7	?	?	6.2	5.64	6.04	?	6.15
TL (ft in)	?	24' 9"	?	22'	?	?	20' 4"	18' 6"	19' 8"	?	20' 2"

niloticus, in the Okavango River, Botswana, and the effect of global climate change. MSc Thesis, University of Stellenbosch.

Dr. Alison J. Leslie, Ecologist/Crocodile Specialist, *Dept. of Conservation Ecology and Entomology, Faculty of AgriSciences, University of Stellenbosch, P/Bag X1, Matieland, 7600, South Africa, <aleslie@sun.ac.za>.*

CROCODILE COINS LAUNCHED IN MALAYSIA. On 23 December 2006 the Royal Mint Malaysia launched a series of commerative coins aimed at instilling public awareness on endangered animals and their habitats. The latest series has the theme of Endangered Marine Animals and Reptiles, and features the Siamese crocodile (*Crocodylus siamensis*), Saltwater crocodile (*C. porosus*) and False Gharial (*Tomistoma schlegelii*).

Source: *english.peopledaily.com.cn/200605/09/eng20060509_263970.html; www.bernama.com.my/bernama/v3/news.php?id=238103.*

INAUGURAL ISSUE OF HERPETOLOGICAL CONSERVATION AND BIOLOGY

The editorial staff of Herpetological Conservation and Biology announced the release of the inaugural issue on 27 September 2006. The first issue is 70 pages long and contains 12 articles. You are invited to peruse the articles posted on the journal website (www.herpconbio.org) and any feedback that might help improve the journal is welcome. Herpetological Conservation and Biology is an international open-use electronic journal published in partnership with PARC and the World Congress of Herpetology.

All material except Editorials and Announcements receive anonymous peer review. The current acceptance rate for submitted articles is ca. 50%. There are no page charges or download fees for HCB users. Print versions of HCB are planned for release at the end of each year. The journal is indexed by BioAbstracts and Zoological Record. The current editorial staff is around 60 members and there are plans to expand the international presence this fall.

If you have any questions or comments regarding the journal or its operations please contact any member of the editorial staff.

R. Bruce Bury, *Editor-in-Chief (buryb@herpconbio.org)*; Malcolm L. McCallum, *Managing Editor (Malcolm.mccallum@herpconbio.org)*; Raymond A. Saumure, *Technical and Copy Editor (insculpta@hotmail.com)*; Stanley E. Trauth, *Special Sections Editor (strauth@herpconbio.org).*

CSG PROCEEDINGS

Printing of the Proceedings of the 18th CSG Working Meeting (France, June 2006) will be complete by mid-January 2007, and will be posted to all meeting participants shortly thereafter.

Samuel Martin, *CSG Regional Co-Chairman for Europe, <s.martin@lafermeauxcrocodiles.com>.*

WATER SNAKE HARVEST IN CAMBODIA

A recent article in "Geographical" deals with the water snake harvest that takes place in Tonle Sap Lake, Cambodia. With an estimated harvest of over 4 million snakes from 8 species each year, the author states that the demand by crocodile farms is the main driving force behind the harvest.

Although the ready availability of snakes has seen them become popular as a food item for people, the meat is mainly used as a source of food for captive crocodiles (*Crocodylus siamensis*). The CSG review of crocodile conservation and farming in Cambodia in 2005 reported that snakes were commonly used by crocodile farms of different sizes, but fish (fresh and marine) were also a commonly used food sources, particularly during the dry season.

The article cites PhD student Sharon Brooks and the Wildlife Conservation Society (WCS) who have seen signs of decline in the crocodile industry, but farmers are still holding onto their stocks, in the hope that there will be a reversal in the market. Thus, the demand for snakes remains high, and there are concerns on the sustainability of the harvest. The harvest is a significant economic activity in the area, and a total ban on the harvest is not considered to be viable. Rather, some form of regulation is considered the best option for making the harvest sustainable.

Source: Virginia Fitzherbert (2007). Tipping the scales. Geographical 79(1): 43-47.

Steering Committee of the Crocodile Specialist Group

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