

CROCODILE SPECIALIST GROUP NEWSLETTER

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IUCN - World Conservation Union • Species Survival Commission

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IUCN - The World Conservation Union
Species Survival Commission

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COVER PHOTO. Siamese Crocodiles (*Crocodylus siamensis*) (and possibly *C. siamensis* x *C. rhombifer* hybrids) at a crocodile farm in Phnom Penh, which was visited as part of the CSG Review Mission to Cambodia (see page 4). Photo: Charlie Manolis.

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Editorial

The CSG has been steadily moving forward. The SSC is examining terms of reference for Specialist Groups, but we have developed a set of draft "operating principles" (see page 4) that we believe captures our priorities. Any comments on them are welcomed, and should be forwarded to Tom Dacey (csg@wmi.com.au).

The majority of regional and thematic Chairs and Vice Chairs are now allocated. Jiang Hongxing, from the State Forestry Administration of China, is the newest appointment, as joint Regional Chair for East and Southeast Asia with Jenny Daltry.

The CSG was finally able to get a high-level review team into Cambodia under the direction of CSG Deputy Chair, Dietrich Jelden (23 February to 3 March 2005). The comprehensive report (see page 4) argues that tightening internal controls on Cambodia's crocodile farming industry, which consists of some 900+ farms, many at village level, is an essential prerequisite for conserving the wild *Crocodylus siamensis* population. The report provides a roadmap of actions, and our ongoing assistance may be needed.

The report of the 2004 CSG-Tomistoma Task Force survey in Kalimantan (Indonesia) is now complete. It provides a comprehensive assessment of the social and biological context of this species' *in-situ* conservation. The species is still widespread but in low densities within the open water areas surveyed [CSG Newsletter 23(4)]. I flew to Indonesia recently (5-7 April 2005) to meet with Government and industry CSG members. Everyone agreed that it is important that Indonesian scientists and researchers become more involved with *C. siamensis* and *T. schlegelii* conservation efforts in Indonesia, and that the local crocodile industry helps partner those efforts.

The formation of a "CSG Commercial Live Exports Task Force", under the direction of Perran Ross, represents another significant CSG development. This issue has been a thorn in the side of the CSG for more than a decade, and some clear direction is needed. In a closely related CSG initiative, terms of reference have been agreed with the Reintroduction Specialist Group, for a joint review of Crocodylian Reintroductions. It should allow us to provide better guidance and assessment of risks.

A rather exciting new CSG development is being advanced by Frank Seebacher - the possibility of us developing a peer-reviewed electronic journal devoted to crocodylian biology and conservation. Another development is discussion about the identification of wild versus farm skins. Claims that farms are laundering wild skins in various countries have often been made, but the claims are difficult to verify. This is an issue where research and the experience of our industry members should be able to help resolve.

Within Latin America, the regional meeting to be held in May 2005 (Santa Fe, Argentina) will provide regional CSG members with an opportunity to reassess the regional role of the CSG, and to ensure regional experts are all within our membership ranks. The next major CSG review mission will be in Latin America, and take in four countries: Paraguay, Ecuador, Bolivia and Peru. When added to the

review mission in Colombia (2004), our understanding of local problems and priorities in Latin America is increasing. Tom Dacey was able to visit both Cuba and Mexico in March 2005, meeting key players and familiarising himself with the local situation.

One area where the CSG needs to take action is Africa. Although we have many CSG members in Africa, there are few resources available and the continent is so large and diverse that the problems are daunting. Over the next few months we'll start to work with Rich Ferguson and others on a way forward. A regional meeting is long overdue.

Draft CSG Operating Principles 2004-2008

MISSION:

To assist the IUCN and SSC to meet their missions with regard to the conservation, management and sustainable use of world crocodilians

GOALS:

1. To provide expert opinion and advice to the IUCN, SSC, Government authorities and other bodies on the conservation, management and sustainable use of crocodilians.
2. To ensure that CSG members are involved in:
 - Identifying problems associated with the conservation, management and sustainable use of crocodilians and their habitats;
 - Designing and implementing management solutions to identified problems; and,
 - Improving and refining the effectiveness of the solutions, over time, through adaptive management.
3. To integrate CSG activities with other appropriate initiatives within the IUCN and SSC.
4. To assist Regional Chairs and thematic Vice-Chairs to meet such contextual priorities as they may identify from time to time.

MECHANISMS:

The CSG will assist members and others to contribute to the CSG mission and goals, by:

- (a) Convening global and regional meetings to assess and discuss crocodilian conservation problems, and solutions
- (b) Facilitating information exchange between members

and the broader community through-

- i. Regional networking;
 - ii. Global networking;
 - iii. Maintaining an Executive Office;
 - iv. Publishing a CSG Newsletter; and,
 - v. Maintaining a CSG website.
- (c) Maintaining an Executive Committee to manage day-to-day CSG operations.
 - (d) Maintaining a Steering committee to ensure that the CSG is guided by the views and advice of its members.
 - (e) Creating specific CSG Task Forces, Thematic Sub-groups and Review Teams to address specific problems with the conservation, management and sustainable use of crocodilians.

IUCN Mission: "to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable."

IUCN Vision: "A just world that values and conserves nature."

SSC Vision: "A world that values and conserves present levels of biodiversity."

[Comments on the draft Operating Principles should be forwarded to Tom Dacey (csg@wmi.com.au)].

CSG Review Mission

At the 17th CSG working meeting (May 2004), representatives from a number of Government authorities and non-Government organisations within Cambodia strongly recommended an external review of crocodile conservation and management in Cambodia, with particular emphasis on the Siamese Crocodile, *Crocodylus siamensis*. The issue was again discussed informally amongst Government representatives from Cambodia and the CSG Chairman (Grahame Webb) in Bangkok, Thailand, during the 13th Conference of the Parties to CITES (October 2004).

In early January 2005, Nao Thouk, Director General of the Department of Fisheries (DoF), within the Cambodian Ministry of Agriculture, Forestry and Fisheries (MAFF), invited the CSG Chairman to undertake a CSG mission to Cambodia to review the status and current management of wild and captive crocodiles, and make recommendations to improve the management and conservation of crocodiles in Cambodia.

A CSG review team was formed, consisting of CSG Deputy

Chair Dietrich Jelden (Team Leader), Charlie Manolis, Choo Hoo Giam, Julie Thomson and Alvin Lopez. In consultation with Cambodian authorities and team members, draft Terms of Reference and an itinerary were developed. Although *C. siamensis* was the focus of the review, information on other species (eg *C. porosus*) was also sought during the review. The review was carried out between 23 February and 3 March 2005.

Major aims were to:

- Assess and evaluate monitoring and conservation of wild populations;
- Evaluate the production of crocodiles through captive breeding and its management;
- Assess the status of legal provisions aimed at regulating and controlling crocodile management; and,
- Make recommendations for improving the conservation, management and sustainable use of crocodiles within Cambodia.

On the basis of discussions with Cambodian Government authorities, NGOs and members of the farming sector, and visits to different types of crocodile farms (at Siem Reap, Tonle Sap Lake, Sihanoukville and Sre Ambel) and wild crocodile habitat (Sre Ambel River), a detailed report was prepared by the CSG Review Team.

The following general conclusions were made:

- a. The status of wild populations of *C. siamensis* in Cambodia remains a major concern for the CSG, and current conservation efforts in Cambodia need to be maintained and where possible strengthened. Improving the management of farming and trade, and improving compliance with CITES, are considered essential prerequisites to improved conservation action.
- b. Communication and information exchange between all stakeholders with an interest in the conservation, management and sustainable use of crocodiles, remains a serious impediment to progress and constrains public education.
- c. The historical and/or present status of *C. porosus* and perhaps *Tomistoma schlegelii* within Cambodia should ideally be investigated. Both, if present historically, may now be extinct!

Thirty-one specific recommendations were made, dealing with the broad issues of: CITES Compliance and National Legislation; Management of Trade and the Captive Population; the Wild Population; Illegal Trade; and, Regional Issues. The complete report can be downloaded from www.wmi.com.au/csgarticles.

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Photo 1: Members of CSG Review team and Department of Fisheries staff visiting a *C. siamensis* nesting site on an oxbow lake at the Sre Ambel River. This is one of seven sites in this area being considered as crocodile sanctuaries. Cambodia possesses large areas of suitable habitat for *C. siamensis*. From left: Choo Hoo Giam, Charlie Manolis, Heng Sovannara, Dietrich Jelden, Prum Sitha, Chap Seak Heng, Lim Nguon Krui, Ney Chea (boat driver) and Khut Vorn (nest guard/fisherman).



Photo 2: Adult *C. siamensis* at a crocodile farm in Phnom Penh. There are currently around 900 crocodile farms of different sizes in Cambodia.

Regional Reports



Latin America & Caribbean

Brazil

THE USE OF ULTRA-LIGHT AIRCRAFT IN STUDIES OF THE PANTANAL CAIMAN. Population estimate studies are fundamental to identifying the conservation

status of wild species and to evaluate the stocks that are subject to management. Traditional methods used to monitor the density of natural populations are often difficult to execute in the field and onerous over the long-term. Various species of vertebrates can be monitored with the aid of ultra-light aircraft, to count individuals as well as their nests. These species include: caiman, capybara, marsh deer, pampas deer, feral pig, coati and nest jabirus.

Throughout the world, population studies of crocodylians are done mainly using nocturnal data collection (night counts). This method has limitations in remote and densely vegetated areas. In addition, counts are affected by habitat conditions and environmental factors, such as temperature and water level. Crocodylians also learn to avoid the light beams used to identify them by shining them in their eyes. Studies conducted from the air have proven to be a good alternative to ease the methodological and financial problems of counting crocodylians at night.

The Brazilian Agricultural Research Company (Embrapa Pantanal) uses an ultra-light aircraft to monitor caiman's distribution and abundance, identify movement patterns, and study the behavior and thermoregulation of caimans on a small scale. The counting of caiman nests in floating vegetation has been done using an ultra-light since 1989. The method covers a known area of vegetated lakes using low altitude flights to locate nests and identify them in good, flooded conditions. The experience of the counter (spotter) is a key to the success of this research tool. A study of the effects of habitat and season on the population density of caimans was carried out in 1993 and 1994 in areas of intermittent lakes and rivers. The high concentration of caimans during the dry season contributes to the effectiveness of the method, together with the experience of the counter and the atmospheric conditions. The aircraft should be equipped with a GPS to guide the flights in pre-established paths, as well as a thermometer to measure air temperature.



Surveys using ultra-light aircraft should be carried out in the early morning (0700-0900 h) or late afternoon (1500-1700 h), when atmospheric conditions are favorable; eg less wind and more moderate temperatures. The speed should vary between 60 and 80 km/h, and the altitude should remain between 40 and 50 m, which can be checked with the aid of a hand-held altimeter. Defining permanent sampling quadrants makes it possible to monitor variations in

population density year after year.

The ultra-light has been used in radio-telemetry studies of caimans since 1990. The range of the radio signal transmitter doubles and facilitates the tracking of various caimans simultaneously at low cost. In this way, information regarding the re-location of many caimans is made available, mainly during the flooding season in the Pantanal. The ultra-light also aids in the identification of caimans with radio transmitters that have temperature sensors, and to monitor their thermoregulatory behavior. The tool makes it possible to relate the body temperature of the caimans to its position in the sun in the floating vegetation. The tracker should be equipped with a hand-held antenna, scanner receptor with the radio frequencies, and earphone. The ultra-light pilot should be knowledgeable about GPS and area that will be flown over. The coordinates of the starting point and the caiman's location should be recorded on the GPS. The tracking flights start out in the direction of the sites of the caimans monitored in the last sampling, and afterwards continue in circular flights with the idea of sweeping the entire area within range of the radio signal.



The experience of Embrapa Pantanal with the ultra-light aircraft in the study of caimans inspired Dr. Gordon Grgg of the University of Queensland to adopt this tool in long-term studies of kangaroos in Australia.

For more information, please consult the following articles:

1. Effect of habitat and seasonality on the densities of caiman in southern Pantanal, Brazil. *Journal Tropical Ecology* (1996) 12:741-747.
2. Relationships between rainfall, nesting habitat and fecundity of *Caiman crocodylus yacare* in the Pantanal, Brazil. *Journal Tropical Ecology* (1995) 11: 351-358.
3. Terrestrial activity of caiman in the Pantanal, Brazil. *Copeia* 2003(3): 628-634.

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Belize

AMERICAN CROCODILE CONSERVATION IN TURNEFFE ATOLL, BELIZE. The American crocodile (*Crocodylus acutus*) is considered threatened in Belize owing to a combination of past-over-exploitation, incidental drowning in fishing nets, and habitat destruction (McField *et al.* 1996; Platt and Thorbjarnarson 2000a). A country-wide survey of offshore and mainland habitats completed in November 1997 concluded that fewer than 1000 non-hatchling *C. acutus* inhabit Belize, with the largest population occurring in the Turneffe Atoll (Platt and Thorbjarnarson 1997, 2000a; Platt *et al.* 1999). Turneffe Atoll, located approximately 35 km from the mainland, is the largest atoll in Belize with an estimated surface area of 533 km² (Perkins 1983). The atoll is sparsely populated; four sport-fishing resorts, a research center, and scattered fishing camps are the only permanently inhabited dwellings. The *C. acutus* population in Turneffe Atoll is believed to consist of approximately 200 to 300 non-hatchling crocodiles, including 15-25 breeding females (Platt and Thorbjarnarson 2000a). Reproduction of *C. acutus* in the atoll is highly dependent on elevated beach ridges, which are rare due to a combination of natural and anthropogenic factors, and increasingly threatened by development (Platt and Thorbjarnarson 2000a; Platt *et al.* 2004). Platt and Thorbjarnarson (2000a) recommended a long-term monitoring program based on nest counts and spotlight surveys to determine population trends of *C. acutus* in the Turneffe Atoll. In accordance with these recommendations, further population monitoring was conducted in conjunction with the Oceanic Society during June-July 2002 (Platt 2003; Platt *et al.* 2004).

More recently, we conducted an additional survey of *C. acutus* nesting activity in the Turneffe Atoll during July 2004. We searched previously identified nesting areas (Platt and Thorbjarnarson 1996, 1997) as well as potentially suitable beaches where nesting has yet to be documented. During this survey 20 nests recently excavated by attending female crocodiles were found at four sites in the atoll (Table 1). Of these 20 nests, 11 (55.0%) occurred at a single beach on Northern Cay that Platt and Thorbjarnarson (1997, 2000a) considered the single most important *C. acutus* nesting site in coastal Belize. This beach is a high ridge composed of coarse sand, with an adjacent shallow brackish lagoon that provides excellent nursery habitat for hatchlings and undoubtedly enhances neonatal survival (Fig. 1; Platt and Thorbjarnarson 2000b; Platt *et al.* 2004). The size of this beach was substantially increased when tidal over-wash from Hurricane Keith in 2000 deposited a large amount of sand at the eastern end and created additional nesting habitat that was used by females in 2002 and 2004 (Platt, 2003; Platt *et al.* 2004).

Additional evidence of nesting was noted at one and two sites on Calabash and Blackbird Cays, respectively. Previous surveys (Platt and Thorbjarnarson 1996, 1997)

found no evidence of crocodile nesting on Calabash Cay, but we documented a single nest here in 2002 (Platt 2003) and found two nests at the same location during 2004. In addition to a nesting beach previously identified on Blackbird Cay (Platt and Thorbjarnarson 1997, 2000a, 2000b), we found four nests at another site near the northern terminus of the island. The latter nests were found on a densely vegetated beach ridge adjacent to an open marsh where several active crocodile wallows were noted.

The 20 crocodile nests we found in 2004 exceeds the previous maximum count of 15 nests in 1997 (Table 1). These data suggest that recruitment of breeding females is occurring in Turneffe Atoll, and possibly reflect an overall population increase since our earlier surveys were conducted. However, given the small number of breeding females in the atoll and the annual variability in nesting effort, these data should be interpreted with guarded optimism. Finally, our previous (Platt and Thorbjarnarson 1996, 1997, 2000a, 2000b; Platt 2003) and current (Platt *et al.* 2004) investigations further underscore the importance of the Northern Cay nesting beach to the Turneffe Atoll crocodile population.

Alarming, the Northern Cay nesting area is now in imminent danger of destruction due to the ill-conceived development of a tourist resort. During a day-long reconnaissance on 21 July 2004, we found numerous survey stakes and transect lines on the nesting beach, and noted that burning and extensive clearing of mangroves and littoral forest vegetation had recently occurred immediately adjacent to the nesting area. Additional clearance and construction on the nesting beach will undoubtedly follow. Otherwise, crocodile nesting beaches in Turneffe Atoll remain relatively undisturbed with little sign of human disturbance other than occasional visits by fishermen and coconut harvesters.

Table 1. Numbers of American crocodile (*Crocodylus acutus*) nests found at various beaches in the Turneffe Atoll (1994-2004). Data from Platt and Thorbjarnarson (1996, 1997), Platt (2003), and Platt *et al.* (2004). Note that data for 1995 are based on incomplete surveys. NA = Not available.

Location	1994	1995	1996	1997	2002	2004
Blackbird Cay (south)	0	NA	5	3	1	3
Blackbird Cay (north)	0	0	0	0	0	4
Blackbird Cay (west)	2	1	1	2	0	0
Calabash Cay	0	NA	0	0	1	2
Deadmans Cay	1	1	0	0	0	0
Northern Cay	8	NA	7	10	6	11
Totals	11	2	13	15	8	20

If this project is allowed to proceed an irrevocable loss of

critical nesting habitat will occur. Given that Northern Cay hosts the largest concentration of *C. acutus* nesting activity yet identified in Belize (Platt and Thorbjarnarson 2000a), this development constitutes a grave threat to the continued viability of the crocodile population in Turneffe Atoll. Even more importantly, because Turneffe Atoll appears to serve as a source population for *C. acutus* in other areas of the coastal zone (Platt and Thorbjarnarson 2000a), destruction of the Northern Cay nesting beach has potentially devastating consequences for this endangered species elsewhere in Belize. Therefore it is imperative that development be immediately halted. Additionally, some form of permanent legal protection is urgently needed for Northern Cay, as well as other nesting beaches in the atoll, to avoid future conflicts with development interests.



Figure 1. American crocodile nesting beach (above) with adjacent shallow mangrove lagoon (below) that provides nursery habitat for hatchling crocodiles. This site, located on Northern Cay in Turneffe Atoll, is regarded as the most significant nesting site for American crocodiles in Belize.

To this end one of us (Stefanie Egan), a graduate student at San Francisco State University working in conjunction with the Oceanic Society, is currently involved in efforts to designate Turneffe Atoll as a biosphere reserve.

Biosphere reserves are designated by UNESCO and function as integrated conservation areas, emphasizing both conservation and sustainable development (Hough 1988). A biosphere reserve is comprised of three distinct conservation zones: a core, buffer and transition zone. In contrast to the core zone where all forms of human activity are strictly prohibited, limited recreation, educational, and research activities are permitted in the buffer zone, and sustainable economic development is allowed in the transition zone. A biosphere reserve application is currently being prepared for Turneffe Atoll, a component of which is a zone map.

This zone map is being prepared using a Geographic Information System (GIS). By collaborating with scientists and local stakeholders, the location of significant natural resources, such as vegetation, crocodile nesting areas, and the habitat used by non-hatchling crocodiles, manatees, commercial and sport fish, and dolphins has been included in the map. GIS allows simultaneous spatial display of these resources making it possible to determine those areas in the atoll that are especially sensitive. Additionally, Marxan software®, developed to identify areas of particular conservation concern, is being used as another means to locate areas that should be included in each zone of the proposed reserve. The resulting map permits policy makers responsible for resource management in the atoll to identify those areas most in need of protection, and will greatly facilitate establishment of the three conservation zones required for biosphere reserve status.

To date, the three biosphere reserve zones have been delineated on a draft map which is currently being circulated among stakeholders for comment. It is hoped that biosphere reserve status will confer protection sufficient to ensure the continued viability of *C. acutus* populations in the atoll, while at the same time conserving other natural resources as well.

Finally, there is an urgent need to develop a long-term crocodile population monitoring program in the Turneffe Atoll. We believe this is best accomplished by determining the annual nesting effort based on counts of recently hatched nests. Nest counts have the advantage of being inexpensive and involve a minimal investment of time (two to three days). Moreover, annual nesting effort is thought to be a sensitive indicator of population trends (Platt and Thorbjarnarson 1997). Nest monitoring efforts should target previously identified nesting beaches, but also focus on other suitable sites in the atoll where nesting has yet to be documented.

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Colombia

ENGLISH ABSTRACT: EXPERIMENTAL PILOT PROJECT FOR THE CONSERVATION OF *CROCODYLUS ACUTUS* BY LOCAL COMMUNITIES IN THE MANGROVES OF CISPATA BAY, CÓRDOBA. Over the last two years, a group of 15 ex-hunters, known as “caimaneros”, at Cispata Bay, have become conservationists for the critically endangered *Crocodylus acutus*. This community group recently formed ASOCAIMAN (Asociación para la Conservación de los Caimanes de la Bahía de Cispata), with the main objective of the organisation being the conservation of this species. This non-profit organisation has released 129 tagged *C. acutus* (>1m total length), obtained from artificial incubation of wild eggs collected in February-March 2003 and raised in captivity, into natural habitats. Another 591 individuals will be released in 2005.

The conservation, training, conversion of hunters to conservationists and scientific research has been directed over the last 5 years by biologist Giovanni Andrés Ulloa Delgado, with support from Clara Sierra Díaz and Denis Cavanzo Ulloa. Technician José Luis Miranda is in charge of management and artificial incubation, and the community group of ex-hunters for monitoring, collection and transport of wild nests/eggs.

The article outlines the main stages carried out with this conservation program.

PROYECTO EXPERIMENTAL PILOTO PARA LA CONSERVACIÓN DEL *CROCODYLUS ACUTUS* POR COMUNIDADES LOCALES EN LOS MANGLARES DE LA BAHÍA DE CISPATA DEPARTAMENTO DE CÓRDOBA . PRIMERA JORNADA DE LIBERACION DICIEMBRE 15 DE 2004. Desde hace dos años un grupo de 15 antiguos cazadores conocidos como “caimaneros” de la Bahía de Cispata se han convertido en los conservacionistas de una de las especies de reptiles más amenazada y considerada en peligro de extinción en Colombia, el caimán del magdalena o caimán aguja, *Crocodylus acutus*. El grupo comunitario recientemente conformó la organización ASOCAIMAN cuyo objetivo principal es propender por la conservación de esta especie. Esta organización comunitaria sin ánimo de lucro, junto con la CVS cuentan con un total de 720 cocodrilos o

caimanes de aguja, y hoy se liberarán en su hábitat natural 129 ejemplares marcados, obtenidos en la incubación artificial de las nidadas recolectadas en febrero-marzo del 2003 y criados en cautiverio en las instalaciones de la “Estación experimental comunitaria para la investigación y manejo del *Crocodylus acutus* y otros elementos faunísticos de la región” en Amaya Bahía de Cispatá. Para el 2005 serán liberados los 591 restantes.

La conservación, la capacitación, la conversión de cazadores a conservacionistas y la investigación científica ha sido dirigida desde hace cinco años por el Biólogo Giovanni Andrés Ulloa Delgado, con el apoyo de los biólogos Clara Sierra Díaz y Denis Cavanzo Ulloa. El técnico José Luis Miranda es el encargado del manejo y la incubación artificial y el grupo comunitario de excazadores del monitoreo y la recolección y transporte de nidos naturales.

El Programa ha sido liderado por la Corporación Autónoma Regional de los Valles del Sinú y San Jorge, (CVS), en cabeza de su Director Jaime García Exbrayat, el Subdirector Ambiental Daniel Plata y el biólogo Rafael Espinosa, y por el Proyecto Manglares del Ministerio de Ambiente Vivienda y Desarrollo Territorial, apoyados por el Instituto Alexander Von Humboldt, Conservación Internacional Colombia (C.I.), Fundación Natura, Agrosoledad S.A., Zoben S.A. y Garbe S.A. Cada una de estas organizaciones han contribuido en logística, infraestructura y en algunos recursos económicos, que facilitaron el buen desarrollo de las diferentes actividades planteadas, las cuales podrían sintetizarse de la siguiente forma:

1. 2000-2002. Caracterización y diagnóstico del área de estudio, con miras a facilitar el manejo del hábitat natural y distribución, caracterización y diagnóstico de las poblaciones silvestres de *C. acutus* en la Bahía de Cispatá (Ulloa-Delgado y Sierra-Díaz 2002).
2. 2003. Actividades preliminares de manejo que consistieron en la recolección de nidos, la incubación artificial y el manejo de los neonatos, así como monitoreo de poblaciones silvestres. De esta actividad se obtuvieron 129 individuos, los cuales han sido objeto de liberaciones desde diciembre 15 de 2004. Se liberan individuos que posean una longitud total superior de 100 cm.
3. 2003-2004. La construcción de una infraestructura para el manejo *ex-situ* de crías de crocodílidos y una incubadora para el manejo de huevos de reptiles, con énfasis en caimanes y babillas y que preliminarmente lleva el nombre de “Estación experimental comunitaria para la investigación y manejo del *C. acutus* y otros elementos faunísticos de la región”. Estas construcciones están ubicada en la Bahía de Cispatá, en el sitio denominado Amaya, en donde la CVS cuenta con terrenos que comparte con otras instituciones de investigación y educación.

4. 2003-2004. Capacitación comunitaria para la conservación de las poblaciones silvestres de crocodílidos, dirigido principalmente hacia los usuarios ilegales de la especie en la Bahía de Cispatá, Departamento de Córdoba (Ulloa-Delgado y Sierra-Díaz 2004).
5. 2004. Actualmente la CVS, mediante un convenio con Fonade y dentro del marco legal de la implementación del Plan de manejo integral de los manglares de la Bahía de Cispatá, adelanta varias actividades de manejo de los caimanes con la participación comunitaria: a) Recolección, transporte técnico e incubación controlada de nidadas de *C. acutus* de 2004, con fines a obtener individuos para liberación en la Bahía de Cispatá; b) Implementar el manejo *ex situ*, de individuos nacidos bajo condiciones controladas (2003 y 2004), en tanquillas diseñadas y construidas para tal fin en la estación de Amaya de la CVS y evaluar los parámetros técnicos del desarrollo y crecimiento de los neonatos y juveniles; y, liberar los *C. acutus* obtenidos en la incubación artificial de las nidadas recolectadas en 2003, con miras a restablecer o reposicionar poblaciones silvestres.
6. 2004. Constitución de una organización comunitaria para la conservación del caimán de la Bahía de Cispatá. Esta ya se constituyó y se identifica como: Asociación para la Conservación de los Caimanes de la Bahía de Cispatá (ASOCAIMAN, con 14 miembros).
7. 2004. Adecuación de áreas de postura para la temporada de 2005 por los miembros de ASOCAIMAN.

Por los resultados parciales y las connotaciones sociales, este proyecto ha sido avalado internacionalmente por una comisión CITES de especialistas en el tema, como único en su género y considerado nacionalmente como el primer proyecto de conservación de una especie en peligro de extinción con participación de sus antiguos cazadores, situación que también lo ubica como único a nivel mundial para la conservación del *C. acutus* y modelo a seguir para la conservación de otras especies similares o para ser implementado en otros sitios diferentes a la Bahía de Cispatá.

El caimán del Magdalena “*Crocodylus acutus*” o “caimán aguja”, fue objeto de cacería masiva a lo largo de los valles del ríos Magdalena, Sinú y San Jorge. Para 1950 la especie fue diezmada, extinguiéndose de gran parte del territorio nacional, pues de manera tradicional era usada para alimento por pescadores y campesinos y su piel comercializada en los mercados internacionales.

La CVS y el Ministerio de Ambiente, Vivienda y Desarrollo Territorial han dispuesto como zona de Preservación de Manglares el área de Caño Salado en la Bahía de Cispatá, donde se localiza el mayor número de individuos de la especie, como estrategia de conservación del hábitat y

paralelamente acompañan a los antiguos cazadores en la puesta en marcha de la estrategia de manejo sostenible para la obtención de beneficios ecológicos, sociales y económicos como modelo de conservación, a través de las actividades de monitoreo de poblaciones silvestres y cría en cautiverio, fundamentado en principios científicos de investigación y seguimiento.

Adicionalmente, la Alcaldía de San Antero, los entes de control Político y Fiscalía participan en las actividades de educación ambiental y seguimiento para ayudar a la protección de los ejemplares que hoy se convierten en el futuro ecológico y social de la Bahía de Cispatá.

El compromiso entre las autoridades ambientales y la comunidad de conservacionistas caimaneros es la recuperación y estabilización de las poblaciones silvestres de caimanes de la Bahía de Cispatá. Una vez se logre este objetivo, que puede durar 3 o más años, las comunidades podrían acceder al aprovechamiento de animales o huevos para la obtención de pieles, las cuales podrían ser transformadas o comercializadas directamente en los mercados nacionales e internacionales, cobijados por los principios conservacionistas del Uso Sostenible y apoyados por el monitoreo y la investigación científica.



Figura 1. Sector de Caño Salado Manglares de la Bahía de Cispatá.



Figura 2. Liberación de *C. acutus*.

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East and Southeast Asia

Lao PDR

SIAMESE CROCODILES AT BAN KUEN ZOO, LAO PDR. In Lao PDR, a cooperative conservation project for Siamese crocodiles (*Crocodylus siamensis*) is being undertaken by the Living Aquatic Resources Research Centre (LARReC, Ministry of Agriculture and Forestry) and Wildlife Conservation Society Lao Program (WCS), with funding from the IUCN Mekong Wetlands Biodiversity Program. The Ban Kuen public zoo (Thoulakhom District, 70 km north of Vientiane) is one of the few local institutions with a relatively large population of captive Siamese Crocodiles, and during a brief, unofficial visit to the zoo on 6th March 2005, the following observations were made.

The zoo currently holds at least 300 crocodiles (*Crocodylus* spp.), most of which are from farms in Thailand (zoo staff pers. comm.). A few may be wild specimens from southern Lao (Stuart and Platt 2000). They appear to be principally *C. siamensis*, but the possibility of hybridisation with *C. porosus*, which is common in Thailand (Thorbjarnarson 2003), cannot be rejected. Like Thorbjarnarson (2003), we found no obvious *C. porosus* (Saltwater Crocodile) among them. Testing would be required to confirm the genetic makeup of the zoo's crocodiles.

Approximately 200 mostly adult animals, 2-3.5 m total length, are housed in two public pens: a large one with a raised walkway for visitors (approximately 190 individuals); and, a smaller pen with eight individuals. In the larger pen, 22 nesting stalls are along one wall. An off-display section of the zoo holds another 80-100 crocodiles, all reported to be captive bred on site (2002-2004). They are up to 1-2 m TL, and are grouped according to size in eight concrete pens. There are 30+ hatchlings (0.30-0.4 m TL) Nesting occurs in the large public viewing pen, and eggs are incubated in small foam boxes lined with nesting material. Hatchlings are fed small fish, frogs and shrimps.

In 1999, crocodile eggs and stuffed hatchlings were on public display and sale at the zoo (Nooren and Claridge 2001), but none were observed during the current visit. The zoo apparently does not sell eggs, hatchlings, crocodiles or crocodile products, nor purchases crocodiles from local people. It is unclear how the increasing captive crocodile population will be managed, but the intention is apparently to "keep them".

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Chanthone Phothitay (LARReC), Bounthavy Phommachanh and Mark R. Bezuijen, *Wildlife Conservation Society Lao PDR Program, P.O. Box 6712, Vientiane, Lao PDR.*

Vietnam

TOMISTOMA IN VIETNAM. Adam Britton (WMI) recently received the following letter from Mr. Joseph Mucelli, regarding the possible historical occurrence of *Tomistoma schlegelii* in Vietnam.

“Re the distribution of Tomistoma, I have seen one, about four feet long, in the vicinity of Dai Quay bridge in Lam Dong Province, Vietnam in 1967. In fact, it was killed by Vietnamese soldiers who were fishing with hand grenades. It was stunned and surfaced at which time they shot it and dragged it ashore. In my opinion it is the least appetizing source of protein I have ever encountered. I have observed basking individuals from an observation aircraft, and also what I would guess to be Siamese crocodiles in the more remote sections of the river. The tomistoma killed near the bridge site was probably a stray, or was carried there by the swift currents from more remote locations. Possibly estuarine crocodiles also could be found in these inland river as well. I had one NVA soldier turn himself in after being attacked while swimming a poncho raft of ammunition across a river. He related that another soldier had lost a foot in a similar encounter. I spent 45 months in Lam Dong province, from 1965 to 1968, with ARVN Ranger and Infantry units and it was a wild, rugged area of low population and development.”

Joseph B. Mucelli, *P.O. Box 210032, San Francisco, CA 94121, USA.*

Philippines

Under the auspices of The National Museum of the Philippines, Silliman University, and the Smithsonian Institution, a biological reconnaissance of the Batan and

Babuyan Island groups in the South China Sea north of Luzon was undertaken between 1985 and 1990. During fieldwork conducted on Dalupiri Island (19 05'N, 121 15'E) between 14 and 20 March 1990 by Ronald I. Crombie and myself, crocodiles were sighted several times by day and eyeshine at night in a small stream, the Manulong River, on the northeast side of the island. The crocodiles could not be identified to species as no artifacts or individuals were collected.

Dalupiri Island is privately owned, difficult to reach, and most habitation is in the central part of the island. This, as well as the inhospitable nature of the stream, with extremely steep sides, and large boulders at its mouth where it empties into the ocean, have probably helped these animals survive. However, correspondence from the island's owner (C. Fernandez, Fernandez Hermanos, Inc., 1 December 1990) states “there has always existed a group of crocodile which the inhabitants of the island happen to catch from time to time and sell the skin and the meat at very profitable prices”. As the Manulong River is marginal crocodile habitat best, culling of individuals may put this small population in jeopardy.

The occurrence of crocodiles on Dalupiri Island is of interest as it is one of the northernmost localities, and, possibly the northernmost extant population of crocodiles in southeast Asia. I had hoped to take advantage of the invitation of Mr. Ferrandez to revisit his island and make a positive identification of these animals, but after 15 years, realise this is now unlikely.

Charles A. Ross, *9551 Owen Lane, Dunkirk, MD 20754, USA, <ross@chesapeake.net>.*

Australia and Oceania

Australia

Jason Lewis' bid to become the first man to sail around the world using human power almost came to a grisly end, when he was chased by a 5 m Saltwater Crocodile as he paddled his kayak (canoe) just north of Cooktown, Queensland.

The crocodile “snapped its jaws behind him for 100 m”, and was about 3 m away when Mr. Lewis was able to leap out onto land - leaving his cell phone in the kayak. Unable to reach the phone, Mr. Lewis spent a sleepless night without food and water on the beach. Finally, in desperation he hit the crocodile on the head with his paddle, and the crocodile left the scene. A quick telephone call later, and Mr. Lewis was rescued by seaplane and taken to Cairns.

The use of canoes or kayaks in waters inhabited by Saltwater Crocodiles is not recommended. Unlike even

small, conventional boats, canoes have been known to be attacked by 'salties' in northern Australia.

Tom Dacey, *CSG Executive Officer*. Source: *Cairns Post*, 30 March 2005.

North America

United States of America

The status of the American Crocodile has so improved that the US Fish and Wildlife Service is proposing to reclassify it from "endangered" to "threatened" in its Florida range. Annual monitoring of the crocodile's distinct population segment (DPS) and its nesting activity in Florida show the criteria for reclassification from endangered to threatened have been achieved.

The USFWS also proposes to initiate a five-year review of the species, to ensure that it has the appropriate level of protection under the Endangered Species Act. A five-year review considers all information that has become available since the original listing of the American Crocodile and will evaluate population data, factors affecting the species, and ongoing conservation measures.

Extensive monitoring of the American Crocodile population in Florida has been conducted for many years, and the population in Florida has grown from less than 300 individuals to a conservative estimate of 800 to 1000 non-hatchlings. The nesting range has also expanded on both the east and west coasts of the state since the American Crocodile was listed. Reclassification of the species to threatened will only apply within its current range in Florida, including coastal areas of Miami, Dade, Broward, Monroe and Collier counties.

Since 1975, when the crocodile was protected under the Endangered Species Act, numbers have climbed from 10 to 20 nesting females concentrated in a small area in northeastern Florida Bay. Crocodiles are now seen frequently throughout most of their historical range in Florida, including Key Largo, Biscayne Bay, Florida Bay and even occasional nests on the southwest coast and Marco Island. During 2003, 61 crocodile nests were recorded in south Florida, and nesting has increased for several years. The actual number of nesting females may be higher than the 61 nests recorded.

Approximately 95% of the remaining crocodile habitat in south Florida is under public ownership (eg Everglades National Park, Crocodile Lake National Wildlife Refuge) or otherwise protected from development (eg Turkey Point cooling canal system). As a result, no significant further erosion of critical crocodile habitat is anticipated. According to Paul Moler (Florida Fish and Wildlife

Conservation Commission), one of the greatest concerns now is dealing with the increasing number of "nuisance" animals as population pressures push crocodiles into areas of human activity.

If this proposal is finalized, the American Crocodile in Florida will continue to be federally protected as a threatened species. Federal agencies would still need to ensure that activities they authorise, fund or carry out are not likely to jeopardise its continued existence.

The USFWS invites public comments on its proposal to reclassify the American Crocodile in Florida from endangered to threatened status, and to aid in the five-year review process for the species. Comments may be directed to the Field Supervisor, South Florida Ecological Services Field Office, U.S. Fish and Wildlife Service, 1339 20th Street, Vero Beach, Florida 32960, and will be accepted through May 23, 2005.

Source: News release from the Center for North American Herpetology (25 March 2005) and Paul Moler, Florida Fish and Wildlife Conservation Commission.

ALLIGATOR ATTACK IN FLORIDA. A 56-year old truck driver from Bartow, Florida, became the most recent victim of an American alligator attack. Missing since 9 March, the man's remains were found at Six Pond Pond on 12 March by a group of fishermen. An autopsy on the victim indicated that an alligator of around 9 feet was responsible. An 8 foot 9 inch (2.7 m) alligator was captured, and an autopsy revealed the man's forearm in its stomach.

The fatality rate for American alligator attacks is low (around 6-7% for unprovoked attacks) relative to Saltwater Crocodiles (27% in Australia) and Nile Crocodiles (>50% in southern Africa), perhaps reflecting the less aggressive nature of alligators. It seems that local residents had been feeding the alligator, which is illegal. However, whether this had affected the alligator's behaviour, thereby contributing to the fatal attack, is unknown.

Source of information on attack: The Associated Press, 15 March 2005. Additional information from Charlie Manolis.

Croc Capture - 1500s style!

Val Lance came across an old book on the web [Job Hortop (1591) "The Travailes of an English Man"], which contains an interesting description of a capture of a large crocodilian. As the author was somewhere in the Caribbean, it is assumed that it may have been *Crocodylus acutus*, or possibly *C. intermedius*.

"In this river we killed a monstrous Alagarta in this port at

Sunne set: seven of us went in the pinnice up into the River, carrying with us a dogge, unto whom with rope yarne wee bound a great hooke of steele, with a chaine that had a swivel, which wee put under the dogs belly, the point of the hooke cōming over his back fast bound, as foresaid, we put him over bord, & vered out our rope by little & little, rowing away with our boate, the Alagarta came and presently swallowed up the dogge, then did we rowe hard, till we had choked him, hee plunged and made a wonderful sturre in the water, we leapt on shore, and haled him on lande: he was 23 foote by the rule, headed like a hogge, in bodie like a serpent, full of scales as broad as a sawcer, his taile long and full of knots, as bigge as a fawcon shotte, he hath foure legges, his feete have long nailes like unto a dragon, we opened him, tooke out his guttes, flead him, dried his skinne, & stuffed it with straw, meaning to have brought it home, had not the shippe been cast away. This monster wil carrie away and devoure both man and horse."

CSG Meeting Proceedings

The Proceedings of the 17th CSG Working Meeting (Darwin, Australia; May 2004) have been distributed to all participants. A limited number of copies are still available and can be purchased from the CSG Executive Office (csg@wmi.com.au). An online version of the Proceedings has been prepared by Adam Britton and is available for downloading at <http://wmi.com.au/csg17/proceedings>.

Science

Frank Seebacher, J. Smith and Craig E. Franklin. Cardiovascular responses to alfaxalone anaesthesia in the crocodile, *Crocodylus porosus*. [A full version of this unpublished manuscript can be downloaded at www.wmi.com.au/csgarticles].

Summary: Anaesthesia in reptiles is becoming increasingly relevant because of the popularity of reptiles as pets, their use as model systems for scientific research and, for crocodylians in particular, wildlife management and farming may require effective anaesthesia. Pharmacological techniques that are standard for mammals, however, may not be applicable to reptiles at least partly because metabolic rates in ectotherms are 5-8 times slower than in endotherms. Additionally, anaesthesia may compromise respiratory and cardiovascular function and cause potentially harmful side-effects, for example cardiac arrhythmias and excessive brady- or tachycardias. The aim of this research was twofold, firstly to explore a new anaesthetic agent for use with crocodiles (Alfaxan-CD RTU, Jurox, New Zealand) and, secondly, to assess the effect of anaesthesia on cardiac function.

Crocodiles stopped ventilating and lost their righting and corneal reflexes within 1-2 min of Alfaxan injection (Fig. 1, upper panel). Immediately after being anaesthetised, heart rate decreased significantly (one way analysis of variance, $F_{2,27} = 25.92$, $p < 0.0001$), by 28.6% (± 0.031 [s.e.]) on average between onset and midpoint of anaesthesia (Fig. 1, lower panel). After reaching minimum values at approximately the midpoint of anaesthesia, heart rate increased and animals self-ventilated and regained reflexes when heart rate reached starting values; this pattern was consistent across all animals and allowed accurate prediction of when animals were recovering from anaesthesia. Duration of anaesthesia, that is from the initial loss until regaining of reflexes, increased exponentially with dose rate according to: $Y = 12.56e^{0.42doserate}$ ($r^2 = 0.72$; Fig. 2).

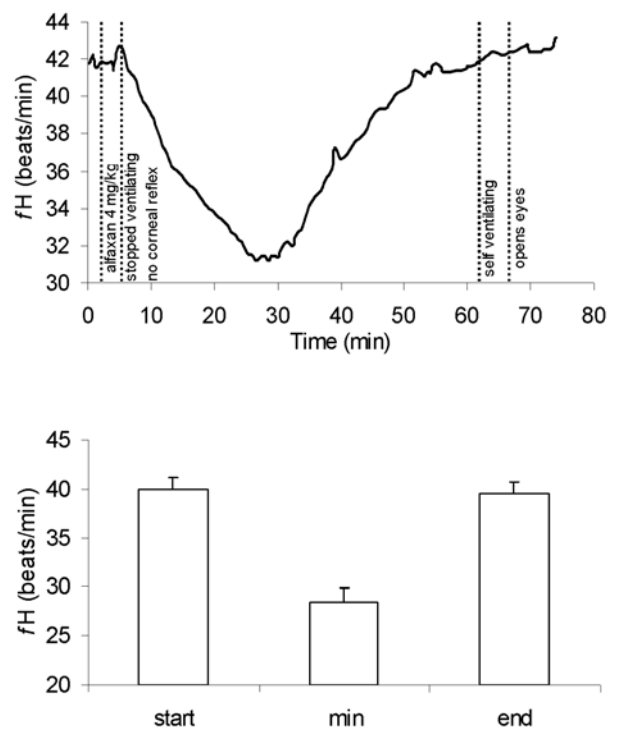


Figure 1. Representative record of heart rate during anaesthesia. The animals stopped ventilating and lost reflexes 2-3 min after injection with Alfaxan CD-RTU (dotted vertical lines indicate the time of different events; upper panel). Heart rate (means \pm s.e.) decreased significantly at the midpoint of anaesthesia (lower panel).

The rapid onset of anaesthesia after intravenous Alfaxan CD-RTU administration and the rapid and uneventful recovery make Alfaxan a suitable drug for minor surgical procedures, potentially even under field conditions. The duration of anaesthesia was predictably dose dependent, although there was variation between individuals which suggests that animal condition affects the efficacy of the drug. Additionally, effective dose rates for larger animals

should be experimentally determined, because mass specific physiological rate functions, and particularly metabolic rates, decrease allometrically with body mass so that relatively lower doses may be needed in larger animals.

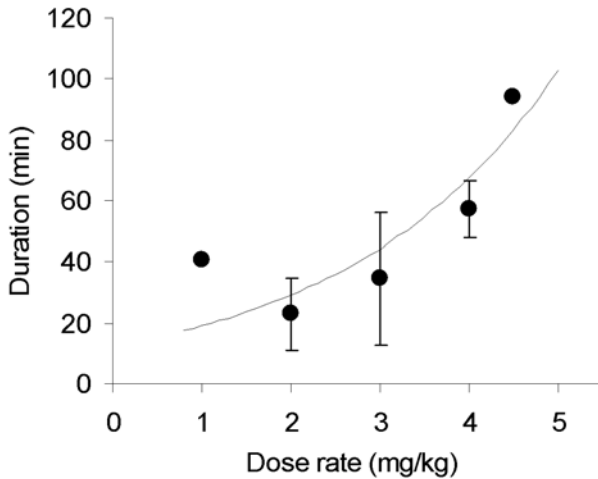


Figure 2. Duration of anaesthesia (means \pm s.e.) increased exponentially with increasing dose rate. The line shows the exponential relationship. Note that data points at 1 and 4.5 mg/kg are single observations.

Ross A. Jeffree, Scott J. Markich and Anton D. Tucker (2005). Patterns of metal accumulation in osteoderms of the Australian freshwater crocodile, *Crocodylus johnstoni*. *Science of the Total Environment* 336: 71-80.

Abstract: The concentrations of 15 metals were measured in the osteoderms (dermal bones) of 30 freshwater crocodiles (*Crocodylus johnstoni*) from a single population in the Lynd River, northeastern Australia (17° 50' S, 144° 20' E), that were well characterised with respect to site fidelity, reproductive status and age. Multiple linear regression analyses were used to determine the effects of crocodile size (snout-vent length, 25-128 cm), age (0.7-62.7 years), gender (male or female) and reproductive status (sexually mature or immature) on osteoderm metal concentrations. Gender and reproductive status were not significant ($P > 0.05$) co-predictors of the osteoderm concentration of any metal. In contrast, size, age and osteoderm calcium concentration were highly significant ($P < 0.001$) systematic predictors of the osteoderm concentrations of all metals, except Na and K. Osteoderm metal concentrations were inversely related ($P < 0.001$) to both size ($r^2 = 0.52-0.92$) and age ($r^2 = 0.52-0.84$), but positively related ($P < 0.001$) to osteoderm calcium concentration ($r^2 = 0.67-0.92$). Relative to calcium concentration, the rates of metal accumulation in the osteoderms of *C. johnstoni* were inversely related to the solubility constant (log K_{sp}) of the metal as a phosphate; however this relationship was not linear. This finding is

consistent with that previously established for the flesh of freshwater bivalves, which like the crocodilian osteoderm, have a calcium phosphate repository in the form of extracellular granules. The constancy of this relationship between rate of metal accumulation and relative solubility for calcium phosphate deposits, despite contrasting Ca accumulation regimes and taxonomic dissimilarity, points to a potential underlying principle that warrants investigation in a greater range of biota. The implications for using the osteoderms of *C. johnstoni* as an indicator of metal levels in freshwater ecosystems are also discussed.

Frantisek Moravec, Winston R. Kay and Russell P. Hobbs (2004). *Micropleura australiensis* n. sp. (Nematoda: Micropleuridae) from the body cavity of *Crocodylus johnstoni* in Western Australia. *J. Parasitol.* 90(2): 322-326.

Abstract: A new nematode species, *Micropleura australiensis* n. sp., is described on the basis of specimens found in the peritoneal cavity of the Australian freshwater crocodile, *Crocodylus johnstoni* Krefft, from the Ord River area, Western Australia. The new species is mainly characterized by the length of spicules (0.360-0.366 mm) and gubernaculum (0.096-0.105 mm), the number and arrangement of male caudal papillae (4 preanal and 6 postanal pairs), and the postequatorial vulva. To date, it is the first species of *Micropleura* reported from Australia. *Micropleura trionyx* Agrawal, 1966, and *M. lissemysia* Chattervati, 1985, are considered junior synonyms of *M. indica* Khera, 1951.

Henderson, Donald M. (2003). Effects of stomach stones on the buoyancy and equilibrium of a floating crocodilian: a computational analysis. *Canadian Journal of Zoology* 81(8): 1346-1357.

Abstract: A three-dimensional mathematical/computational model of the crocodilian *Alligator mississippiensis* has been developed to investigate the influence of gastroliths on crocodilian buoyancy. The model is self-correcting, recovers from large perturbations, and can replicate the body orientations and degrees of immersion seen in living crocodilians that have attained equilibrium with respect to the competing forces of buoyancy and weight. For a range of lung deflations where the model was still positively buoyant, adding gastroliths of mass equal to 1% of the body mass has the effect of lowering the body, on average, by 2.6% of the maximum trunk depth while simultaneously increasing the inclination of the body with its sagittal plane. With the lungs fully inflated, the model would become negatively buoyant only when loaded with stones weighing more than 6% of the total body mass. Without gastroliths the body would sink when the lungs were deflated by 40%-50%. In all situations the model was resistant to capsizing. The relatively small amounts of gastroliths (<2% body mass) found in aquatic tetrapods are considered to be

inconsequential for buoyancy and stability, and the lungs are the principle agent for hydrostatic buoyancy control.

Winston R. Kay (2004). Movement and home ranges of radio-tracked *Crocodylus porosus* in the Cambridge Gulf region of Western Australia. *Wildlife Research* 31: 495-508.

Abstract: VHF radio-tags were attached to 16 estuarine crocodiles that were tracked between October 2001 and May 2003. Male (n = 12) and female (n = 4) crocodiles exhibited distinctly different patterns of movement. Females occupied a small core linear range (1.3 ± 0.9 km) on the main river channel during the dry season and moved up to 62 km to nesting habitat during the wet season, returning to the same core area the following dry season. They occasionally made excursions away from their core areas during the dry season. Males moved considerable distances along the Ord River throughout the year. The largest range recorded was 87 km for a 2.5 m juvenile male. However, ranges of males did not appear to be related to body size, with the largest two ranges being recorded for the smallest (2.5 m) and largest (4.3 m) males tagged. Rates of movement of males did not significantly between three size classes of males but there were seasonal differences, with the highest mean rates of movement occurring during the summer wet season (4.0 ± 5.4 km/d). However, males were quite mobile during the dry season and the highest rate of movement detected was 23.3 km/d for 1 4.3 m male at the end of July. The highest rate of sustained movement was 9.8 km/d for a translocated 2.6 m juvenile male, which travelled 118 km in 12 days to return to the area of its capture. Neither males nor females showed exclusive habitat preferences for any of the four broad riverine habitats identified on the Ord River. However, the three largest males had activity centres that they returned to frequently despite numerous excursions throughout the year, both up- and downriver. Males had substantial range overlaps with no obvious spatial partitioning, suggesting that territoriality is not an important behavioural characteristic of free-ranging male crocodiles along the Ord River.

Mark A. Read, Jeffrey D. Miller, Ian P. Bell and Adam Felton (2004). The distribution and abundance of the estuarine crocodile, *Crocodylus porosus*, in Queensland. *Wildlife Research* 31: 527-534.

Abstract: A total of 6444 *Crocodylus porosus* (4303 non-hatchlings and 2141 hatchlings) were recorded during 196 vessel-based surveys of 103 waterways to determine the distribution and abundance of *Crocodylus porosus* in Queensland. The surveys, conducted from January 1994 to December 2000, covered 4174.3 km of waterway. Population structure was biased towards immature crocodiles, with 91% of all animals sighted being less than the minimum breeding size for individuals in the Northern

Territory. The mean relative density of non-hatchling *C. porosus* was highest in waterways along the populated east coast of Queensland. The highest numbers of hatchlings were recorded from waterways of north-western Cape York Peninsula, where nearly 74% of all hatchlings were recorded during the seven-year period survey period. The *C. porosus* population in northern Queensland appears to be undergoing a limited recovery, with marginal increases in the mean relative density of non-hatchlings in seven of the eight crocodile biogeographic regions. On the basis of the distribution and abundance of hatchling and non-hatchling crocodiles, the north-western Cape York Peninsula region contains the best habitat for *C. porosus* in Queensland, particularly in the Wenlock River and Tentpole Creek area.

Winston R. Kay (2004). A new method for attaching electronic devices to crocodylians. *Herpetological Review* 35(4): 354-357.

This paper describes a new method for attaching VHF radio tags to *Crocodylus porosus*, that could easily be modified to attach other electronic devices such as satellite tags, GPS data loggers or time-depth recorders.

Marc Stoltz (2003). Hermès and crocodile leather: towards dialogue between industrialists and scientists. *Bull. Sci. zool. Fr.* 129(1-2): 247-253.

Abstract: The use of skins from species under CITES regulations represents about ten percent of the Hermès-Sellier leather business. Some twelve thousand crocodile skins from *Alligator mississippiensis*, *Crocodylus niloticus* and *Crocodylus porosus* are used each year by the Leather Department of Hermès-Sellier to make various high-quality leather goods. More than 90% of these skins originate from specialised farms or ranches, a production process that Hermès has been supporting for thirty years, and that reconciles the conservation of crocodile populations and the supplying of leather industries. Tanning crocodylian skins is a highly sophisticated activity, involving complex processing and bringing substantial incomes for both the countries that produce rough skins and those that transform them into fancy leather goods. For the future, Hermès calls for a closer dialogue with the scientists involved in species management and conservation.

James O. Farlow and Ruth M. Elsey (2004). Femoral dimensions and mid-thigh circumference in *Alligator mississippiensis*. *Lethaia* 37: 401-405.

Abstract: The mid-thigh circumference of the intact hindlimb in *Alligator mississippiensis* is tightly correlated with transverse dimensions of the proximal and distal articular surfaces of the femur, and with minimum midshaft femoral circumference. Maximum diameter of the

proximal articular end, width across the distal articular end, and midshaft circumference are the best femoral predictors of circumference of the intact thigh. Regression equations of mid-thigh circumference against these femoral dimensions can be used to estimate the transverse dimensions of the intact hindlimb in extinct crocodylian-like archosaurs.

Requests

CROCODYLIAN REPRODUCTIVE BEHAVIOUR QUERY. My name is Tim Isles and I have an BSc (Hons) in the life sciences (biology), with interests in comparative animal behaviour and evolutionary biology. I am currently in the initial stages of a M.Phil. research project investigating reproduction in extinct taxa, and have been trying to contact any zoos, private individuals or breeders who may have in their personal archives any unreleased photographs or videofilm of crocodylian matingbehaviour. As you can appreciate, such records would be a valuable resource for behavioural comparisons.

In terms of the type of data I am searching, a brief example is at: <http://www3.ocn.ne.jp/~kmitoh/zaturoku/megane/megane.html> though the bottom underwater picture of caimans mating has been censored. By the way, should anyone know the source of the above photograph (I assume it's from an institute in Japan), I would be most appreciative if you could pass on that information.

In that respect, would anyone have in their archives similar photographic material, videofilm or even screen captures describing copulatory behaviour in crocodylians? I am currently aware of relevant footage taken by Dr. Rick Hudson of Philippine Crocodiles (*C. mindorensis*) at the Fort Worth Zoo, though am wondering if such similar data exist elsewhere.

Mr. Terry Cullen, Director of The Cullen Vivarium Wildlife Conservancy, recently wrote: "The only other reasonably good footage that I'm aware of is of *C. intermedius*, but I haven't a clue as to who currently holds that film. I saw it in Venezuela about 2 years ago at a private facility. The folks there have since lost track of it". If anyone knows of the footage to which Mr. Cullen is referring, perhaps they could provide me with appropriate contacts?

Any information provided would be for comparative and research purposes only and would not be distributed or duplicated in any form whatsoever.

Any assistance (or appropriate redirection) that can be offered would be greatly appreciated as I am sure you can imagine how extremely difficult it is to find such visual records. I thank you all very much in advance for your time and look forward to your reply.

Tim Isles <ethology101@yahoo.com or ethologist@gmail.com.

LOOKING FOR EGGSHELLS: We are seeking eggshell material from crocodylians, turtles, geckos and birds, to be used as part of a PhD project at the University of Bolton, England. The project is testing the utility of eggshells as indicators of palaeodiversity.

Morphometrics and biological studies on either modern or fossil eggshells are scarce. For example, it is still unexplored if each organism lays an exclusive eggshell.

Basically, the project will test the intra- and inter- specific morphometrical variation within same eggs (poles and equator), nest, and all together from different species of extant land turtle, crocodile, gecko, mammal and bird.

The outcomes will define the morphometrical boundaries between and amid eggs, normal and abnormal eggs and their utility as indicators of palaeodiversity. Therefore, they will be applicable to environmental and conservation issues, and other adjacent areas such as the poultry industry.

It is anticipated that results will be published in recognised scientific journals, and due acknowledgement will be made to individuals and organisations who provide material.

Dr. R. Howell (Supervisor), *The University of Bolton, Department of Psychology and Life Sciences Deane Road, Bolton, BL3 5AB, UK*, <xp1pls@bolton.ac.uk>; and, Xavier Panades I Blas (PhD student), <cogombra@hotmail.com>.

HUNG-UP ON HIS OR HER HIPS. To the best of my knowledge, we can not assign sex to a crocodylian axial skeleton by means of head shape or pelvic structure. Female crocodylians lay eggs, so their hips don't have to be different to males. Presumably both sexes engage in head-bashing contests, but if males do it more, they don't seem to have special sex-related modifications to the basic skull pattern. Adding an extra thickness of bone to the sides of the head would be easy to do, if it were selected for by nature. There must be a reason that there are limits to how wide a crocodile's head will be.

Has any crocodile farm or zoo experimented to see if a healthy and not so obese crocodylian ever gets its belly or pelvis stuck and can not squeeze or wiggle itself all the way through a hole to the other side? Has natural selection awarded the crocs with a measuring tool, the maximum width of the head, which warns the animal when it is unwise to proceed further into a crevice or hole that is too small for the body and tail to pass through safely?

Please test the hypothesis that crocodylian skulls don't get

Meeting Announcements

CSG Regional Meeting

A CSG regional meeting, Latin America and Caribbean region, will be held at Santa Fe, Argentina, 17-20 May 2005. The meeting will be organized with sessions on: Crocodylian Natural History; Biology, Physiology, Pathology and Genetics; Husbandry; Management Programs; and, Conservation Programs.

Three workshops are planned, on:

1. Indicators of sustainability in crocodylian management programs.
2. Management of *Caiman yacare* within its area of distribution.
3. Review of the Downlisting Process in ESA and CITES.

Santa Fe City is situated 480 km north of Buenos Aires. Both cities are connected by air (one hour trip) and road (in comfortable buses, 6 hour trip).

Registration fee is \$US100, which covers meeting materials, Proceedings of the Meeting (on CD, in PDF format), T-shirt, welcome dinner and farewell dinner. Hotel accommodation in the city varies from \$US60 (Holiday Inn, 5 star), \$US18-35 (3-4 star hotels) to \$US6-10 (hotels, hostels). There may possibly be cheaper accommodation available for students (\$US2 a day per person).

Please confirm your interest in participating in the Regional Meeting, and whether you plan to present a paper (yacare@arnet.com.ar, cidcarlos@infoaire.com.ar).

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.

A registration form is included with this Newsletter, and online registration will soon be available. Additional information can be obtained from Samuel Martin (info@lafermeauxcrocodiles.com; Tel: 33 4 75 960931; Facs: 33 4 75 963907).

significantly wider than the hips, because squeezing through the smallest hole possible is selected for by evolution. Note that the axial skeleton (the head, the vertebrae and ribs, and both girdles) is distinguished from the dorsal armor exoskeleton where alleged sexual variation was shown to me in a sample of Morelet's Crocs in Chiapas, Mexico, by Miguel Alvarez-del-Toro, decades ago. The breeding bulls had more dorsal neck scutes.

Franklin D. Ross, *Department of Vertebrates, Naturalis Museum, P.O. Box 9517, Leiden 2300-RA, the Netherlands.*

WANTED: DEAD OR ALIVE? A hundred years ago, trophy hunters measured the total length of freshly killed and relaxed crocodylians which they had stretched straight on a flat sandy beach, if available, or had dragged to a roadway or other level surface. In contrast, I often watch Brady Barr on television measuring large living crocodylians which he and his team have manhandled out of the water but not very far, often onto a highly uneven substrate on the steeply sloped bank of the water, amidst vegetation. Today, as Brady and also Steve Irwin explain in each episode, the conservation biologist takes great care to prevent lactic acid problems, and not stress the animal too much.

At crocodile farms, animals can be measured while alive and presumably squirming and angry; and, then later when freshly dead and presumably relaxed. Does anyone have total length data from such a sample? Do freshly killed crocodylians stretch to be longer than they were when alive? If it is true that relaxed carcasses measure longer, then people reporting the sizes of crocodylians should say which technique they utilised.

With a trophy carcass on a flat sandy beach, one still has the choice of measuring the length of the creature above it, the way Brady Barr so often does; or, below the belly by putting a very long tape measure on the ground and then placing the animal atop it. An alternative method of straight-line measure of large individuals is marking the smooth level sand with lines scratched with sticks at both ends, and then measuring the distance with a yardstick or whatever units are available. On a paved surface, chalk marks will show where the tip of the nose and the tail were.

Does anyone have comparative measurements taken above and then also below the same animals? What happens when Brady's monster is bent in a fairly strong curve over the edge of a riverbank with the muddy and vegetated substrate arching its back, and then measured over the top? How different is the data from the same animal laid out fresh-dead on a roadway and then measured both ways (ie above in a gentle curve over the head and the body; or, below the belly in a perfectly straight line)?

Franklin D. Ross, *Department of Vertebrates, Naturalis Museum, PO Box 9517, Leiden 2300-RA, the Netherlands.*

Steering Committee of the Crocodile Specialist Group

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For further information on the CSG and its programs, on crocodile conservation, biology, management, farming, ranching, or trade, contact the Executive Office or Regional Vice Chairmen

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Note: Only Regional Chairs, Thematic Vice Chairs and Honorary Steering Committee members are shown here. Regional Vice Chairs, Thematic Deputy Vice Chairs and Task Force Chairs are not listed at this time.

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