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COVER PHOTOGRAPH: Morelet's crocodile (*Crocodylus moreletii*). Populations in Mexico and Belize were recently transferred to CITES Appendix II (see page 7). Photograph: Jerónimo Domínguez-Laso.

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

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Rachmat and Erik Wiradinata, Jakarta, Indonesia.

Editorial

On 14 February 2010 we learned of the tragic passing of one of our senior CSG members, Dr. John Thorbjarnarson, who died in the Delhi Hospital, India, during treatment for cerebral malaria (Obituary on page 4). A memorial was attended by a number of John's CSG colleagues, family and friends on 5 April (page 5), and a second memorial is planned by the Wildlife Conservation Society for 15 July in New York. John's professional career was largely about addressing conservation problems, in what were extremely challenging conservation contexts, where progress would be hard to achieve. His goals always seemed to me to be a little idealistic, but both practical and pragmatic - making things that little bit better by the time he left relative to when he arrived. John will be very sadly missed within the CSG.

In February 2010 the CSG assisted Madagascar with two of the CITES Standing Committee's recommendations developed at its 58th meeting (July 2009). Christine Lippai and Charlie Manolis assisted with audits of the crocodile ranches and delivered a training workshop to the local CITES Management Authority, CITES Scientific Authority, Customs, and law enforcement authorities. The lack of progress on the actions proposed by the Standing Committee in July 2009 were a matter of concern. At its 60th meeting (CoP15, March 2010) the Standing Committee provided Madagascar with 9 actions to be completed by 30 September 2010, but this time also recommended all international trade in *C. niloticus* from Madagascar be suspended (see page 9) until the actions are completed. We hope that this will encourage Madagascar to give priority to solving the problems they have with CITES compliance.

The CSG held its second regional meeting for West Africa at the "Ranch du Gibier de Nazinga", Burkina Faso, on 2-6 March 2010. Some 37 participants from 11 countries attended the workshop, and stronger ties with the CSG in this region resulted. The overarching objective of the meeting was to establish a framework for a regional crocodilian conservation strategy. A consolidated workshop report, incorporating all of the recommendations from the meeting, will be produced and made available on the CSG website as soon as it is available (see report, pages 5-7).

The CSG was well represented at CITES CoP15 (Doha, Qatar, 13-25 March 2010), with a number of members participating in various capacities (see summary report, pages 7-9). Major issues addressed at CoP15 were the approval of the *C. moreletii* and *C. niloticus* proposals for transfer from Appendix I to Appendix II, with zero quotas for commercial purposes. The definition for "Ranching" was also amended.

As mentioned in the last Newsletter, the CSG Action Plan species accounts are now complete and should be posted on the CSG website shortly.

The Proceedings of the 19th CSG Working Meeting (Santa Cruz, Bolivia, 2008) are now available, and have been posted to all participants. Anyone wishing to purchase a copy should contact Karina Sauma (ksauma@fan-bo.org).

Future CSG meetings of interest include: Sabah HCC Workshop (Kota Kinabalu, 23-25 June 2010); 20th CSG Working Meeting (Manaus, 12-17 Sept 2010); and, 21st CSG Working Meeting (Manila, 7-11 May 2012). In addition, planning has commenced for a meeting on *C. siamensis* at Mahidol University, Bangkok, Thailand, and a 2nd Tomistoma Workshop in East Kalimantan, Indonesia. Both meetings may possibly be held in early 2011.

Professor Grahame Webb, CSG Chairman.

Student Research Assistance Scheme Update

In the first quarter of 2010, 7 applications were received. and are currently under review. Projects approved in 2009 are summarized at: http://www.iucncsg.org/ph1/modules/Grants/srasprojects.html.

Obituary

John B. Thorbjarnarson (1957-2010)

Since his untimely and tragic death of malaria in February of this year, a great many articles, obituaries and memorials have celebrated the life of John Thorbjarnarson. Chuck Shaffer, John's cousin Andri Magnuson, and others have given us warm and loving accounts of his early life and worldwide influence. All refer to his extensive work in conservation, his global interests and his kindness. The death of this conservationist is a great blow, to his family, his friends and colleagues, to the many collaborators and co-workers who he inspired and motivated, and not the least to the animals he loved and dedicated his life to conserve.

The volume and diversity of his projects to conserve crocodiles and turtles is quite overwhelming. Working primarily from his position as Senior Conservation Ecologist for the Wildlife Conservation Society and member of the CSG, John was engaged in projects concerning: Chinese alligator, American crocodile, Cuban crocodile, Amazon caiman, Philippine crocodile, Nile crocodile, Dwarf crocodile and Slender-snouted crocodile, Siamese crocodile, Saltwater crocodiles, Black caiman, Gharial, Asian and Amazonian river turtles and anacondas.

His current projects involved field work and colleagues in the Philippines, Congo and Gabon, Cambodia and Lao PDR, China, Brazil, Mexico, Belize, Venezuela and most recently in Uganda and India. His prior work involved captive breeding and reintroduction of endangered Orinoco crocodiles and ecology, behavior and management of Common caiman in Venezuela. The scope and volume of his activity and the enormous energy he dedicated to it are without equal in this field and are reflected in the 166 publications of which he is an author. Beyond the volume of this work is its quality. John published several foundation works during his career including the first and definitive Crocodile Conservation Action Plan (1992), his extensive documentation of caiman ecology (1993-1995), a compendium and analysis of crocodilian reproductive ecology (1996), his critique of crocodilian use and trade (1999, 2002) and his numerous works on the American crocodile, of which he was among the pre-eminent experts, culminating with his conservation review of the species in 2006.

'John T', or 'Juan Caiman' as he was affectionately known all over the world, was in many ways the conscience of the crocodilian conservation community. He routinely addressed the problems that everyone else said were important - but too difficult - because of geographic, logistic or political constraints. He attacked these with vigor and determination, but always with a completely open mind and an ingenuous charm that opened doors and recruited colleagues and assistants wherever he worked. When we all agreed the interior of Vietnam and Laos were important, but difficult and dangerous - he surveyed them (with Steve Platt). When the dispersed distribution of American crocodiles and their researchers occluded our vision of that species' status - he brought the researchers together and revealed the species' status. When China was not easily entered, and the actual condition of Chinese alligators in the wild was not easily ascertained, he visited, rang the alarm bell about that species perilous decline, and recruited Chinese colleagues to help reverse it. When work in Cuba was beset by impediments, he overcame them. His recent work in west and central Africa supported colleagues there untangling crocodile systematics and conservation in that most dangerous of continents. He undertook this work with a quietly understated courage, a nonchalance about whizzing off to distant places, spending innumerable days and nights in uncomfortable lodgings and perilous field conditions - conditions that many crocodile workers experience, but not usually as a continual and extended portion of our working lives. Almost everyone else does crocodile work periodically - for John T it was full time.

His other great role for us all was the honest skeptic, the quiet but unremitting voice that insisted that proof be offered, data presented, alternative explanations explored. This was most evident in his insistence that claims about the conservation value of sustainable use of crocodiles be truly sustainable, and has demonstrated conservation effect. It was not good enough that we said so - John challenged us to prove it and the idea is strengthened as a result. Although he was a consummate naturalist, his interests were not just in nature, he was always interested in people and places as well. When he was working in a country, he would read about its history, geography, culture and politics. He was fascinated with maps and spent untold hours pouring over them before he ever set foot in a new place. His interest in, and sensitivity to, the people and cultures of the places he worked were a integral part of the conservation work he was able to achieve.

It is impossible to create the foundation necessary to solve conservation problems without working with the people in the area and understanding the local dynamics there. This was just one more of John's many strengths.

It will not be possible to replace John T. We can aspire to continue down the path he charted, complete some of his unfinished works in his memory, support the conservation projects that he initiated and inspired. These perhaps will be his most lasting legacy. Everywhere he worked John's enthusiasm, dedication, great personal appeal and fundamental goodness attracted others to work with him, listen to him and amplify the work he began. The huge outpouring of grief, remembrance and compliments from all over the world reflects the very high esteem in which he is held. Since his death we have learned of another aspect of his character. Person after person has recounted to us how, in their times of need, grief and despair, John would turn up with a fistful of Cuban cigars and a bottle of rum, sit with them, listen to them and help them forward, apply his huge capacity for compassion to help others when they needed it. Oh John T, how much we all need your kind and humorous presence, cigars and rum right now.

Perran Ross and Kent Vliet (March 2010)

JOHN THORBJARNARSON MEMORIAL TRIBUTE. On 5 April 2010, about 85 people assembled in Cocoa Beach, Florida, to celebrate the life of John Thorbjarnarson. Friends, colleagues and admirers joined a large contingent of John's family to share their memories and deep grief, and find some comfort in reviewing the life of this remarkable man. Participants came from far afield including Panama, California, Texas, a contingent of WCS staff from New York, and of course many from Florida. Members of John's family from USA, Canada and Iceland, including his sisters, aunt and uncle, cousin and nephew shared stories of his early life and their memories of his mischievous tricks and early love of reptiles. Additional testimonials were offered by Kent Vliet, Luis Sigler, Miryam Anaya, Bob Godshalk, Rick Hudson, Joe Wasilewski, Gaby Blohm, John Robinson and Perran Ross. At the request of CSG Chairman Grahame Webb, Perran offered condolences and good wishes from Grahame personally, the CSG steering committee and all of the CSG. These memories and tributes were illustrated with a montage of images from John's early childhood to his most recent field work in Africa contributed by family and dozens of John's friends. Many tears were shed, but also many smiles and hugs as everyone remembered with joy and appreciation John T's many contributions to conservation, science and personal friendships.

Early that same morning the space shuttle launched from Cape Canaveral just a few miles away. As it always does, the immense roar of the booster rockets stimulated every alligator for miles around to roar and bellow back. We all thought that hundreds of alligators bellowing at the rising sun was a fitting tribute to John's memory. A second memorial celebration will be held at the Bronx Zoo on 15 July 2010. Those interested in this event should contact Kent Vliet (kvliet@ufl.edu).

Figure 1. CSG members at the John Thorbjarnarson Memorial, Cocoa Beach, Florida, 5 April 2010. L-R: Miryam Anaya, Val Lance, Kent Vliet, Frank Mazzotti, Allan Woodward, Wayne King, Joe Wasilewski, Bob Godshalk, Perran Ross, Mike Cherkiss, Luis Sigler, Thomas Rainwater, Steve Platt, John Bruegen (not shown): Photograph: Steve Platt/ Thomas Rainwater.

Perran Ross, *on behalf of, and with assistance from participating CSG members, <pross@ufl.edu>.*

2nd CSG West Africa Regional Meeting

The CSG held its second regional meeting for West Africa at the "Ranch du Gibier de Nazinga", Burkina Faso, on 2-6 March 2010. Situated 160 km southeast of Ouagadougou on the border with Ghana, Nazinga Ranch covers 940 km^2 and is managed by the Ministry of Environment and Cadre du Vie. Established in 1973 as a wildlife protection area, the ranch now has over 20,000 animals, including oribi, Anubis baboon, warthog, Buffon's kob and a significant population of African elephants and Nile crocodiles (*Crocodylus niloticus*).

The meeting was officially opened by the Secretary General of the Ministry of Environment and Cadre du Vie, Mme. Mama Christine Liehoun, who welcomed 37 participants from 11 countries [Benin (4), Burkina Faso (20), Chad (1), France (2), Gambia (1), Germany (1), Guinea (1), Madagascar (1), Niger (4), South Africa (1) and the United States (1)].

One of the objectives of the meeting was to bring together key players actively involved in crocodilian conservation and management in the region, in order to consolidate the CSG's newly established regional forum for West Africa. To this end, delegates made presentations and exchanged experiences on management strategies, current and planned projects, conservation needs and scientific research. The overarching objective of the meeting was to establish a framework for a regional crocodilian conservation strategy.

The first plenary session was devoted to national country reports. These indicated that: the Nile crocodile is the predominant and most widespread crocodilian species; surveys are needed to ascertain the population status of all crocodilian species; and, crocodilians have important cultural significance throughout the region. Delegates from Benin, the Gambia and Niger reported that crocodiles are being ranched

from the wild and reared in captivity for future reintroduction into the wild as well as for the production of meat and medicines. Throughout the region, it was noted that, although protected through legislation, illegal hunting and trade are taking place.

Following national reports, scientific and technical presentations were made on the following themes:

1. Revision of West African crocodilian systematics: imminent taxonomic changes to three species in the region (*C. niloticus*, *C. cataphractus*, *Osteolaemus tetraspis*), with associated conservation, management and legal implications.

2. Status of crocodiles and effect of water chemistry in Parc W, Benin: population surveys were carried out and the distribution of each species identified.

3. Human-Crocodile interactions around agropastoral dams, North Benin: crocodiles predate fish and livestock around agropastoral dams; their value through their various uses (ie bushmeat, medicines, tourism, cultural belief, etc.) mitigate these conflicts.

4. Management of *Osteolaemus tetraspis* and *Crocodylus cataphractus*, Gambia: working with the Gambian Park and Wildlife Management Authority, Croco's Ark Trust is establishing captive breeding for reintroduction activities into areas they have surveyed and where they have observed these species.

5. Practical aspects of crocodile breeding, Madagascar: a brief overview of crocodile rearing requirements for *C. niloticus*.

6. Community conservation initiatives in Sitatunga Valley, Benin: public awareness through an ecotourism venture, captive breeding of *O. tetraspis* and working with a fisherman's cooperative.

7. Crocodiliculture and Ecotourism in Parc W, Niger: proposed ecotourism venture to breed *C. niloticus*, establish an artisanal craft centre based on locally-tanned crocodile leather, and carry out surveys and reintroductions where necessary.

8. Reintroduction of *Osteolaemus tetraspis* in the community conservation area d'Ibolo-Koudouma in Congo: recognising the extensive habitat loss for *O. tetraspis*, as well as poaching for meat, the project aims to develop village-based captive breeding sites and reintroduction into four water bodies as alternatives to poaching activities.

9. Analysis of crocodile population of Nazinga, Burkina Faso: results from a survey carried out 8 years ago indicate that the Nazinga crocodile population is skewed towards young animals and warrants further research.

Several over-arching themes were identified and the meeting split into the following three working groups: Legislation and Policy (including international conventions and human-crocodile conflict); Science and Education (including capacity building); and, Sustainable Use and Management. Draft terms of reference were provided in an attempt to guide discussions towards the drafting of a regional strategy for crocodilian conservation and management.

The Policy and Legislation working group agreed that crocodile-specific texts and actions were needed to ensure sustainable management of crocodile populations across the region. They also identified issues of harmonization between national, regional and international policies that applied to crocodile conservation and management. The group recommended that surveys of wild crocodile populations in the region should be carried out before the next regional meeting.

The Science and Education working group noted the research being carried out in some countries in the region (eg Benin, Gabon, Gambia), but concluded that similar activities needed to be initiated in other countries to improve knowledge on all three species in the region and to facilitate better decision-making for management and conservation. The group also deliberated on the need for concerted environmental education campaigns targeting local communities living alongside crocodiles. They concluded that national focal points for crocodile-related activities should be considered in order to streamline the various disciplines surrounding crocodile management and conservation.

Finally, the working group on Sustainable Use and Management acknowledged that given the current national and international protection status of crocodiles in the region (eg CITES Appendix I), all commerce was effectively illegal. They noted that uses were varied and included traditional medicine, bushmeat, trophy hunting, skin trade and ecotourism, most of which demanded clarification and refinement of legislation. The group concluded by highlighting the need for wide stakeholder participation in developing appropriate management strategies for the use of crocodiles.

A consolidated workshop report, incorporating all recommendations of the meeting, will be produced and circulated to appropriate decision-makers in the region. This will also be available on the CSG website.

Figure 1. Participants of 2nd Regional West Africa meeting.

The meeting would not have been possible without the active participation and coordination of the Government of Burkina Faso, and particularly M. Urbain Belemsobgo, Director of Fauna and Hunting Division at the Ministry of Environment and Cadre du Vie, and his team. Financial support was provided by: the Government of Burkina Faso, La Ferme aux Crocodiles (France), which also provided the support services of Ms. Oriane Ansel from SOS Crocodiles, Reptilartenschutz e. V. (German Leather Industry) and the Crocodile Specialist Group.

[Note: An informal bulletin for the West Africa region is being developed to ensure that the enthusiasm and dynamism shown by participants at the workshop are not lost and that "crocodile" news from the various countries is shared. This bulletin will be circulated through e-mail in the first instance and all participants are encouraged to send material to Christine Lippai (crocnomade@gmail.com).]

Dietrich Jelden *(Dietrich.Jelden@BfN.de)*, Christine Lippai *(lippainomad@gmail.com)* and Samuel Martin *(s.martin@la fermeauxcrocodiles.com)*.

15th Meeting of the Conference of the Parties to CITES (CoP15)

The CSG was well-represented at CoP15 (Doha, Qatar, 13-25 March 2010), with members participating in various capacities, including inclusion in Party delegations (Asghar Mobaraki, Iran; Yoshio Kaneko, Japan) and as NGOs (Hank Jenkins). CSG Executive Officer Tom Dacey represented the CSG on the IUCN delegation, and Don Ashley, Yoichi Takehara and Hideki Sakamoto represented industry. Christine Lippai was contracted by the CITES Secretariat as a rapporteur, but was able to assist with a series of CSG issues (eg Madagascar). CSG Chairman Grahame Webb and Charlie Manolis participated at the CITES Standing Committee meetings (12 and 25 March 2010) and the CoP. James MacGregor was invited by the CITES Secretariat to participate in a side-event entitled: "Table on Businesses and Biodiversity Connecting Consumers to the Source".

Issues of relevance to the CSG at CoP15 included:

1. Proposal to transfer *Crocodylus moreletii* to Appendix II: The proposal to downlist *C. moreletii* to Appendix II (with a zero quota) was amended by the proponent (Mexico) in Committee I to restrict the zero quota to commercial trade in wild specimens. On the basis of concerns raised by Guatemala regarding the lack of information on the status of its population, the proposal was amended further to restrict it to the *C. moreletii* populations of Mexico and Belize only. The amended proposal was adopted - the Mexican and Belize populations of *C. moreletii* will be transferred to Appendix II, while the Guatemalan population will remain on Appendix I.

2. Proposal to transfer the Egyptian population of *C. niloticus* to Appendix II under Resolution Conf. 11.16 (ranching): The original proposal submitted for consideration at CoP15 focused on the development of a management regime based on ranching in Lake Nasser. Surveys carried out in 2008 and 2009 indicate the *C. niloticus* population in this man-made habitat has increased significantly, and human-crocodile conflicts are increasing. On the basis of comments received from the CSG and others, Egypt amended its proposal such that it would be assessed under Annex 4 of Resolution Conf. 9.24 (Rev. CoP14), but annotated it with a zero quota for the commercial export of wild specimens. The proposal did not receive a two-thirds majority in Committee I in order to be adopted, due largely to opposition from the European Union, whose position appeared to be based on the original proposal. However, in light of the strong support for the proposal in Committee I, and subsequent discussions between Egypt and the European Union, the latter reversed its position, and, and when debate on the issue was ro-opened in plenary, the proposal was supported unanimously.

3. Review of the Universal Tagging System and Trade in Small Crocodilian Leather Goods: The proposed amendments to Resolution Conf. 12.3 (tagging) were accepted in Committee II by consensus and adopted in Plenary. Specifically, these include:

   a) When trade in tagged crocodilian skins is authorized, the same information on the tags is to be given on the permit or certificate.

   b) In the case of crocodilian species subject to quotas approved by the CoP, no permit or certificate for skins should be issued before the skins are tagged in accordance with the requirements of the issuing Management Authority and their sizes are recorded.

   c) In the event of mis-matches of information within a permit or certificate for crocodilian skins, the Management Authority of the importing Party should immediately contact its counterpart in the exporting/ reexporting Party to establish whether this was a genuine error arising from the volume of information required by Resolution Conf. 12.3 and Resolution Conf. 11.12, and that, if this is the case, every effort be made to avoid penalizing those involved in the transaction.

   d) For small crocodilian leather products, Parties consider measures to alleviate the administrative burdens associated with this trade through simplified procedures to issue permits and certificates as provided in Part XII of this Resolution Conf. 12.3.

   e) For small crocodilian leather products, Parties that require import permits as a stricter domestic measure should review these requirements in order to determine whether they are effective in achieving the objectives of the Convention to ensure that trade in wild fauna and flora species is not detrimental to their survival.

The proposed amendments to Resolution Conf. 11.12 (universal tagging), were also adopted. Specifically, the amended clauses included, inter alia:

b) that crocodilian skins, flanks and chalecos be individually tagged before export;

c) that the non-reusable tags include, as a minimum: the ISO two-letter code for the country of origin; a unique serial identification number; a standard species code; and, where appropriate, the year of skin production or harvest, in accordance with the provisions of Resolution Conf. 11.16 (Rev. CoP14); and further, that such tags have as a minimum the following characteristics: a tamper-resistant, self-locking mechanism, heat resistance, inertia to chemical and mechanical processing, and alphanumeric information, which may include bar-coding, applied by permanent stamping;

d) the year of skin production or harvest and serial number be separated with a hyphen (-) where the information on tags appears in the sequence: country of origin, year of skin production or harvest, serial number, species code;

f) tails, throats, feet, backstrips, and other parts be exported in transparent, sealed containers clearly marked with a non-reusable tag or label together with a description of the content and total weight, and all the information required for tags for individual skins, flanks and chalecos, as outlined in paragraphs c), d) and e);

i) where the original tags have been lost, damaged, or removed from raw, tanned, and/or finished skins, and flanks and chalecos, the country of re-export should tag each such skins, or flanks or chalecos prior to re-export, with a 're-export tag' meeting all the requirements of paragraph c) above except that the country of origin and standard species codes and years of skin production and/or harvest will not be required; and further, that the same information as is on these tags should be given on the re-export certificate together with details of the original permit under which the skins, flanks and chalecos were imported;

4. Personal and Household Effects: The Standing Committee was directed to extend the operation of its Working Group on Personal and Household Effects until CoP16, and oversee the group's work in fulfilling the following terms of reference:

   a) clarify the relationship between 'tourist souvenirs', 'hunting trophies' and 'personal and household effects';

   b) clarify the interpretation of Article VII, paragraph 3 (b), of the Convention;

   c) assess whether there are specific species or types of personal or household effects which, in view of conservation concerns, would require different treatment under Resolution Conf. 13.7 (Rev. CoP14);

   d) collate information about how each Party has implemented Resolution Conf. 13.7 (Rev. CoP14), particularly with regard to requirements for export permits, and assess whether this indicates the need to amend the Resolution; and,

   e) report at each regular meeting of the Standing Committee until CoP16 and at CoP16.

5. Ranching and Trade in Ranched Specimens [Resolution Conf. 11.16 (Rev. CoP14)]: It was highlighted by the Secretariat that the requirements outlined in paragraph A.2 (d) of annex 4 to Resolution Conf. 9.24 (Rev. CoP14), regarding transfers from Appendix I to Appendix II under the ranching criteria, were more restrictive than that required for non-ranching transfer proposals. The matter was referred to a Working Group, and considered concurrently with the agenda item on Production Systems.

   The editorial changes to Resolution Conf. 11.16 (Rev. CoP14) proposed by the Secretariat were accepted. These changes clarified the clauses applicable to "proposals to transfer populations from Appendix I to Appendix II for ranching" and the clauses applicable to "changes to the ranching programme described in the proposal to transfer a species from Appendix I to Appendix II".

   In addition, CoP15 directed the Animals Committee to:

   a) evaluate the merit of reinstating the ability to transfer evaluate the merit of reinstating the ability to transfer suitably qualified populations that continue to meet the criteria in Resolution Conf. 9.24 (Rev. CoP14) from Appendix I to Appendix II pursuant to Resolution Conf. 11.16 (Rev. CoP14) or Resolution Conf. 9.20 (Rev.); and,

   b) if merit is found, draft a revision of the terms of paragraph A. 2 in Annex 4 of Resolution Conf. 9.24 (Rev. CoP14) to eliminate the requirement that downlisting proposals pursuant to Resolution Conf. 11.16 (Rev. CoP14) or Resolution Conf. 9.20 (Rev.) must also meet the criteria in Annex 1 of Resolution Conf. 9.24 (Rev. CoP14).

6. Production Systems for Specimens of CITES-listed species (Purpose Code "R"): CoP15 accepted the proposed definition of the term 'ranching' ("means the rearing in a controlled environment of animals taken as eggs or juveniles from the wild, where they would otherwise have had a very low probability of surviving to adulthood"), and its inclusion in Resolution Conf. 11.16 (Rev. CoP14) (ranching resolution).

   The Secretariat was directed to:

a) contingent on the availability of external funds, contract an appropriate expert to prepare a guide to advise the Parties on the appropriate use of source codes;

b) provide a draft of this guide to the Animals and Plants Committees for review and comment; and,

c) prepare and distribute the final product, incorporating the feedback of the Animals and Plants Committees, to inform the Parties on the appropriate use of source codes.

The Animals and Plants Committees were directed to review and provide feedback to the Secretariat on the draft guide to advise the Parties on the appropriate use of source codes.

7. Crocodile Management in Madagascar: At its 55th meeting (SC55; June 2007), the CITES Standing Committee provided Madagascar with a series of recommendations aimed at addressing concerns about the conservation and management of *C. niloticus* in Madagascar. In collaboration with the CSG, Madagascar developed a workplan to address these recommendations, and reported on progress at SC57 (July 2008). Progress with the workplan was further discussed at SC58 (July 2009) through a working group comprising Madagascar, France, Japan, USA, Germany, the Secretariat and the CSG. The working group agreed on a list of 15 priority actions to be undertaken by Madagascar and reported back to the Standing Committee by 31 December 2009. Two of these actions involved the CSG, specifically:

d. In September 2009 at the latest, and in cooperation with the IUCN-SSC Crocodile Specialist Group, organize a training workshop on techniques for distinguishing wild-taken from ranched or captive bred Nile crocodile skins and for regulating ranching operations (this workshop is aimed at the Management Authority, Scientific Authority and law enforcement authorities located inland and at the border).

e. Immediately after the training envisaged in paragraph d), carry out an initial audit of each ranching operation (Reptel's two units of production, CrocoRanch's two units of production and eventually a third operation, if this unit intends to produce skins in the short term). These audits shall contain information on the state of the stocks, an estimation of the annual production capacity, an evaluation of stock management (database used for monitoring) and implementation of a tagging scheme.

Due to the political situation in Madagascar throughout 2009, these two activities could not be undertaken by Charlie Manolis and Christine Lippai until February 2010. A detailed report on the CSG's activities was provided to the CITES Secretariat during CoP15.

At SC59 (12 March 2010), Madagascar sought a postponement of discussion on its progress report on the SC58 recommendations, and suggested that a proposal on a way forward would be presented at SC60 (25 March 2010). The working group formed at SC58 met intersessionally during CoP15, and recommended to SC60 that all international trade in *C. niloticus* from Madagascar be suspended, and a list of actions be completed within 6 months (by 30 September 2010). Failure to complete all of the actions will result in the trade suspension continuing until SC61 (2011). The CSG indicated its willingness to assist Madagascar to the extent possible to implement the recommended actions, which can be summarised as:

1. Review, update, adopt and implement the Strategy and Management Plan for Crocodiles in Madagascar (prepared in 2004).
2. Establish size limits on crocodiles harvested from the wild, in order to protect breeding stock.
3. Develop system of control for ranches.
4. Quantify numbers of artisinal and conventional retail outlets and tanneries, carry out inventories of current stocks, ensure registers are maintained, ensure registration/licencing with Government, and carry out random and regular inspections.
5. Further to inventories of stocks (4. above), ensure skins and products entering national and international trade are within established size limits, and all products not complying be seized and destroyed and offenders prosecuted.
6. Ensure only licenced and authorized egg collectors carry out collections.
7. Update all relevant databases relating to crocodile management, including human-crocodile conflicts.
8. Provide the CITES ecretariat with all relevant measures (eg laws, decrees, licence conditions) affecting harvesting, use and trade in *C. niloticus* in Madagascar, including minutes of meetings of the National Crocodile Committee.
9. On the basis of audits carried out in February 2010, establish 2010 export quotas for ranched specimens from each ranch.

The opportunity was taken to meet with various delegations and discuss crocodile-related issues. This included Burkina Faso, Cambodia, Colombia, Ethiopia, Indonesia, Sudan and Vanuatu. The Chair and Executive Officer met with SSC Chair Simon Stuart and discussed the proposed updating of all crocodilian species on the IUCN Red Listing and transferring Red List assessment data across to the online Species Information Service (SIS).

Tom Dacey, *CSG Executive Officer (csg@wmi.com.au).*

A Tale of Two Gharials and their Names

Tomistoma schlegelii is probably the only crocodilian whose common name indicates what it is not. A name such as "false gharial" is a conservation handicap; it implies that it

is a masquerader, an imposter; thereby, justifying the need for its conservation is a challenge. On the other hand, the existence of another "gharial" has necessitated the usage of a prefix to differentiate *Gavialis gangeticus*, such as Indian gharial, Nepali gharial, Ganges gharial. Such geographic underpinning alienates other nationalities. Traditionally, India has dominated the region geo-politically and naming a species as "Indian" causes rancour in neighbouring countries who have equal ownership of the species. The only other range country with a breeding population refers to the species as the Nepali gharial. This causes confusion - are the Indian gharial and Nepali gharial different species? Since the false gharial is also referred to as the Malayan gharial, the situation gets muddier.

'Gharial' is a Hindi word meaning "one with a ghara" (the 'ghara' is the growth on the nose tip of an adult male gharial). *Gavialis gangeticus* is the only species that fits that description (Fig. 1). Although a recent molecular study has shown that *T. schlegelii* is closely related to *G. gangeticus* and there is a suggestion to place it in the same family Gavialidae, (Willis *et al*. 2007) that is still no grounds to call it a gharial.

Figure 1. Gharial (*Gavialis gangeticus*). Photograph: Apoorva Joshi.

Figure 2. Tomistoma (*Tomistoma schlegelii*). Photograph: Grahame Webb.

The CSG's Tomistoma Task Force (TTF) suggests that henceforth the use of the common names "false gharial" and "Malayan gharial" are no longer appropriate and that the species should be commonly referred to as **Tomistoma** (Latin for "sharp mouth") (Fig. 2), a name which has been in use in published literature for many decades (Neill 1971). Since there is no other contender for the name, the TTF suggest that the "Indian" gharial be called **Gharial** with no geographic prefix. It is hoped this name change will help *T. schlegelii* gain a positive image, and may benefit regional conservation efforts for both it and its cousin, the Gharial.

The names "Gharial" and "Tomistoma" (for *Gavialis gangeticus* and *Tomistoma schlegelii* respectively) have been adopted in the revised CSG Crocodile Action Plan (2010).

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Willis, R.E., McAliley, L.R., Neeley, E.D. and Densmore III, L.D. (2007). Evidence for placing the False Gharial (*Tomistoma schlegelii*) into the family Gavialidae: Inferences from nuclear gene sequences. Mol. Phylogenet. Evol. 43: 787-794.

[Note: There is only one way to pronounce gharial: "ghari-yaal" ('ghari' rhymes with 'curry', 'yaal' with 'ball'). There are two acceptable pronounciations for Tomistoma: "toe-miss-toma" or "tom-is-toe-mah"].

Janaki Lenin, *Regional Chair South Asia and Iran, <janaki@gmail.com>* and Bruce Shwedick, *Chair CSG Tomistoma Task Force <bshwedick@aol.com>*.

Regional Reports

South Asia and Iran

Nepal

GHARIAL RELEASE INTO RAPTI RIVER. Ten (10) Gharial (*Gavialis gangeticus*) were released into the Rapti River as part of International Wetland Day (2 February 2010) activities (Fig. 1). The Rapti River is a tributary of of the Narayani River which passes through Chitwan National Park.

The Gharials, hatched in 2004, had been reared in captivity. At the time of release, mean dimensions were: 160.7 cm total length (range 148 to 171 cm); 86.7 cm snout-vent length (range 79 to 93 cm); and, 9.83 kg bodyweight (range 7.2 to 12.0 kg). All animals were scute-clipped prior to release. Sex was not recorded.

The Gharial were released by the Chief District Officer of Chitwan District, with the involvement of school children,

local community members, conservationists and members of non-government organisations. To reduce stress and allow gharial to acclimatize to new conditions, they were initially released into an enclosure constructed of *Naragna* spp. After a few days the animals break out of the enclosure and enter the river proper. The release site was in front of the Gharial Conservation and Breeding Centre, Kasara.

Figure 1. Juvenile Gharial being released into enclosure on the Rapti River. Photograph: Laxman Poudyal.

Bed Bahadur Khadka, *Assistant Conservation Officer, Gharial Conservation Breeding Centre, Kasara, Chitwan National Park, Nepal*.

CHITWAN SENDS GHARIAL TO KOSHI. In February Chitwan National Park (CNP) recently (February 2010) handed over 10 juvenile Gharials (*Gavialis gangeticus*) to Koshi Tappu Wild Life Reserve, in line with the policy of increasing numbers of Gharial in rivers such as the Koshi. Another 10 animals will be sent to Bardiya National Park, and 10 animals were recently released into the Rapti River (see previous article). CNP has been involved in Gharial conservation since it was established in 1973.

The 10 Gharial (6 females, 4 males) to be released into the Koshi River were from the breeding center at CNP. Despite the release by CNP of 708 crocodiles into different rivers across Nepal, the number Gharial has been decreasing in these rivers. Reduction in numbers of fish, the main prey for Gharial, together with decreasing water levels in large rivers, are considered to have contributed to decresaing numbers of Gharial. In addition, it is claimed that Gharial that enter Indian territory cannot return to Nepal due to the construction of dams. The last census conducted in 2008 placed the number of Gharials at 81, with 41 in the Narayani River, 24 in the Rapti River, 10 in Babai of Bardiya and 6 in the Karnali River.

Source: http://www.myrepublica.com/portal/index.php?action=news_details&news_id=14969.

India

SURVEY OF GHARIAL IN GHAGHRA RIVER. In a recent report, Basu and Singh (2009) present the results of a river fauna survey of a 90-km stretch of the Ghaghra River, undertaken with the support of Mr. Sanjay Kumar, District Magistrate of Sitapur District.

A total of 16 Gharial (*Gavialis gangeticus*), comprising 4 adult females (3+ m) and 12 "young of size >2 m", were sighted over the 4 days of daytime survey (8-11 December 2009). Sub-optimal survey conditions prevailed on two of the days (8 and 11 December). These data indicate a relative density of 0.18 individuals per km.
A 2001 survey that covered 550-600 km of the Ghaghra River reported only one sighting of a juvenile Gharial. Interviews with fishermen during the 2009 survey indicated sightings of Gharial had increased over a period of less than 3 months, suggesting that a "migration" of animals from the upstream Geruwa River in Katerniaghat Wildlife Sanctuary (KWS) into the Ghaghra River may have taken place as a result of unseasonal flooding which occurred in October 2009.

The Ghaghra River contains suitable Gharial habitat, and there has been the opportunity for migration from the Geruwa River in KWS. Fishing mortality and use of riverbanks for agricutural cultivation are considered factors responsible for the lack of recruitment observed in the river. The survey also documented sightings of dolphins, otters, turtles and birds.

Literature Cited

Basu, D. and Singh, S.P. (2009). Short Survey of River Fauna of Ghaghra River, in Districts Kherri Lakhimpur, Bahraich, Sitapur and Bara Banki Districts in the State of Uttar Pradesh, India 8-11 December, 2009. Unpublished draft report.

Dhruvajyoti Basu, *Gharial Conservation Coordinator, Gharial Conservation Alliance, (R)1/737 Vikas Nagar, Lucknow 226022, India (dhrubasu@rediffmail.com)* and Suresh Pal Singh *(Research Assistant, Endangered Species Project)*.

"WHITE" SALTWATER CROCODILE USED AS MASCOT FOR YOUTH FESTIVAL. A pale coloured female Saltwater crocodile (*Crocodylus porosus*) was hatched at the Saltwater Crocodile Research and Conservation Centre at Dangmal, in Bhitarkanika National Park, on 21 August 1975 (Fig. 1). Because of of her colouration, the crocodile was named "Gori", and is very popular among the people. She is the only partial "white" crocodile so far available at the Crocodile Research Centre.

Gori was chosen as the Mascot for the 15th National Youth Festival 2010 by the Honourable Chief Minister of Orissa and the Honourable Union Minister, Sports and Youth Affairs, Government of India. The National Youth Festival was held at

Bhubaneswar, the capital of Orissa State from 8- 12 January 2010. This exemplifies our Government's commitment to crocodile conservation in India.

Figure 1. Gori, the pale coloured Saltwater crocodile used as mascot (inset) for the 15th National Youth Festival.

Dr. Sudhakar Kar, *Senior Wildlife Scientist, India*.

OBSERVATIONS OF GHARIAL AT JUGHDAH GHAT. In the first week of February 2010 I was in Madhya Pradesh, and visited the Son Wildlife Sanctuary (Sidhi District) as it is known to have a breeding population of Gharials (*Gavialis gangeticus*), at Jughdah Ghat. According to forestry officials there, part of the population has migrated about 65 km downstream from Jughdah Ghat. Last year there were 35 Gharials here, but the number has reportedly decreased to 17 this year. We counted 11 Gharials, and only one adult male was observed.

I am keen to obtain any information on this population, as I will be returning there in May. Any suggestions on other sites to visit, or specific aspects to looked into, would be greatly appreciated.

Figure 1. Female *Gavialis gngeticus*. Photograph: Apoorva Joshi.

Apoorva Joshi, *Department of Environmental Sciences, Fergusson College, Pune, Maharashtra, India*.

East and Southeast Asia

FFI CONSERVATION BIOLOGIST RECEIVES ROYAL AWARD. CSG member Dr. Jenny Daltry was recently honoured in Cambodia for her many achievements. The Royal Government of Cambodia awarded Dr. Daltry with the title of Officer of the Order of Sahametrei. The award is given to foreigners for their "distinguished services to the King and to the Nation."

During her 15 years at Flora and Fauna International (FFI), Dr. Daltry led a number of field expeditions in Cambodia that resulted in the increased protection of forested areas covering more than a million hectares in the Cardamom Mountains. In 2000, she re-discovered the Siamese crocodile (*Crocodylus siamensis*), which was previously considered to be possibly extinct in the wild), and subsequently spearheaded a pioneering community-based program to conserve this critically endangered crocodilian.

Dr. Daltry also led a ground-breaking initiative to establish a new generation of Cambodian scientists, through the creation of the first permanent Masters of Science program at the Royal University of Phnom Penh. To date, 147 Cambodians have enrolled on the course.

As the founder and chief editor of the country's first peer-reviewed scientific journal - the Cambodian Journal of Natural History - she has encouraged Cambodians to publish and share their knowledge of Cambodia's wildlife and natural resources.

Dr. Daltry's contribution to the conservation of the Siamese crocodile was also recognised by the CSG in 2004, when she was awarded the CSG's Castillo Award.

Source: *www.fauna-flora.org/news_daltry.php*.

Europe

At the urgent suggestion of Ralf Sommerlad, conservation breeding programs (European Studbook; ESB) for two critically endangered crocodilian species will be discussed at the EAZA Reptile TAG meeting in Barcelona, Spain, in April 2010. TAG Chair Ivan Rehak (Prague Zoo) and Fabian Schmidt (Leipzig Zoo), both CSG members, have been extremely supportive, in preparing formal proposals and presenting these important *ex situ* projects to TAG members. The ESB for *Crocodylus rhombifer* is awaiting agreement in Barcelona. Paington Zoo and its curator Mike Bungard have agreed to become ESB keepers. Another ESB or EEP for *C. siamensis* will be prepared and presented also. It is also planned to present an update on the situation of *C. siamensis* in East Kalimantan, Cambodia and Vietnam, with a call for support for existing conservation projects.

Ralf Sommerlad, CSG Regional Vice Chairman for Europe (crocodilians@web.de).

Latin America and the Caribbean

Mexico

CROCODILES IN IXTAPA-ZIHUATANEJO, GUERRERO, MEXICO. Although the State of Guerrero is within the distribution of the American crocodile (*Crocodylus acutus*), little information is available on its current status in the wild. In November 2009, we undertook a survey to document negative interactions with crocodiles in the State, and obtained important information on movement of large crocodiles between water bodies, which is of concern to the general public. We visited 10 areas of importance for tourism: the estuaries of Playa Linda, Estero del Negro, La Marina (in Ixtapa), La Marina Golf Course, Palma Real Golf Course, Pacífica, Playa de la Ropa, Las Salinas, Playa Larga and Paraíso Coacuyul Lagoon.

All sites are close to the sea, with the furthest being around 1.5 km away. Most sites comprise saline habitats, and are connected to the sea through rivers and creeks at some time during the year. Of the three freshwater sites, one is a natural lagoon (Paraíso Coacuyul), and the other two are artificial habitats in golf courses. All sites are situated between Ixtapa and Zihuatanejo, a 10-km stretch on the Pacific coast, which represents around 10% of the coastal habitat in the State.

We made diurnal and nocturnal visits to each site, and recorded 117 crocodile sightings, of which 64 (55%) crocodiles were longer than 2.5 m total length (Fig. 1). Some individuals were estimated to be 4.5 m long. The majority of sightings (N= 92; 79%) were at 4 sites (Playa Linda estuary, Pacífica, Palma Real Golf Course and Playa de la Ropa estuary) - these appear to the sites with the greatest movement of crocodiles to the sea (Playa Linda) and back. The total survey distance was 5-6 km. Sites varied in length, but were all less than 1 km long.

Figure 1. American crocodile coming out a lake at Palma Real Golf Course. Photograph: Jerónimo Domínguez-Laso.

Given the number of sightings and relative densities (eg Playa Linda, 49 sightings in 300 m; Palma Real Golf Course, 25 sightings in 300 m; Playa Linda, 12 sightings in 200 m), it was not surprising to learn that there have have been interaction between crocodiles and people - fortunately none have resulted in injury to date. It is not uncommon to find many people swimming at the various beaches.

A good friend, Eroberto Piza Ríos, better known as "Tamakun", has directly helped to control some of these problematic situations with crocodiles (eg through capture and relocation of problem crocodiles). Indirectly, through his show, where he feeds crocodiles with waste fish obtained from the local markets, he provides an "educational " experience for visitors and locals alike.

As spectators congregate at Playa Linda estuary, Tamakun will begins yelling "support" for a Mexican football team (Águilas del América), and finish with a Tarzan-like yell. At this signal, wild crocodiles of different sized begin to appear - on one occasion 29 crocodiles between 2.5 and 4.5 m came out of the water to be fed. During the show, Tamakun, leans on the backs of some crocodiles, caresses and even kisses them (Fig. 2). Monetary contributions from visitors allow him to keep the show going.

Figure 2. Tamakun feeding the crocodiles of Playa Linda estuary. Photograph: Jerónimo Domínguez-Laso.

Given the numbers and biomass of crocodiles present, the food provided by Tamakun once per week is unlikely to satisfy the nutritional requirements of these animals. Movement between freshwater areas and the sea is assumed to be to find food. During the last nesting season we located 7 hatched *C. acutus* nests and creches of hatchlings, indicating the importance of this area for nesting.

The current situation, considered problematic with regard to crocodiles in Ixtapa and Zihuatanejo, is largely in response to increasing human encroachment on crocodile habitat (eg hotels, restaurants). Of the 10 sites visited, at least 4 of them merit immediate attention, based on high densities recorded (Playa Linda estuary, Palma Real, Playa de la Ropa estuary, Pacífica), and 4 sites with lower densities may require attention in the medium-term (La Marina Golf Course, Las Salinas estuary, Playa Larga estuary, Laguna Coacuyul).

The development and implementation of an integrated management program for the region, and establishment of Wildlife Management and Conservation Units (UMAs) in a strategic way, could serve to preserve biodiversity (including crocodiles) and habitats. Toursitic activities, such as that undertaken by Tamakun, could be used to increase public awareness of crocodiles and their habitats, and provide positive economic incentives for their long-term conservation of *C. acutus* in the region.

Acknowledgments

We thank Ing. Alejandro Bravo Abarca (Municipal Constitutional President of Zihuatanejo de Azueta), C. Elba González Negrete (Town Councillor of Urban Development and Ecology), Ing. Raúl Villegas Barrientos (Director of Ecology), Lizette Tapia Castro (Projects Leader of Ecology Direction), Laurel Patrick, Biol. Pablo Mendizabal Reyes and DVM Jorge E. Guzmán (Refugio de Potosí), the hotel sector of Ixtapa and Zihuatanejo, particularly The Tides and "Dorado Pacifico Barcelo Hotels, José Luís Lujano Tapia (Town Hall of Zihuatanejo), Palma Real Golf Course and Marina Ixtapa, civil protection and firemen of Zihuatanejo, the Cooperative Society of Ecoturistic Rural Services estuary "Playa Larga", and to all who in some way intervened to give this first step to guarantee harmony between man and crocodile in Ixtapa-Zihuatanejo. A special mention is extended to our friend and colleague Eroberto Piza Ríos (Tamakun) for his labor and for sharing his experiences with us during this visit.

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LA ESPERANZA SANCTUARY - A PARADISE FOR CROCODILES. La Esperanza Ranch was founded in 1953, when the original owner Mr. Braulio Brindis Marcelli begun agriculture and livestock activities at the 120 ha site. In 1970 a few 60-80 cm long crocodiles, from the Usumacinta River (Catazaja Municipality, Chiapas), were introduced into three artificial lagoons built in 1964 for fish [Nile tilapia (*Oreocromys nilotica*), Mozambique tilapia (*O. mossambicus*), common carp (*Cyprinus* sp.), trout (*Oncorhynchus* sp.), small fish (Family Poeciliidae)] and Pond Slider turtles (*Trachemys scripta*).

The location (16°18'18.83"N, 93°21'56.23"W) is outside the natural range of crocodilian species in Chiapas (see later), has an average altitude of 610 m above sea level, the weather is warm and sub-humid, with annual rainfall of 120 mm (summer rain). The hydrography of the ranch is formed by two river basins (El Tablón and Santo Domingo Rivers), which converge with the basin of the Grijalva River (Jiménez 1999).

In the living room of the ranch homestead is a 4.2 m long tanned skin of what is considered to be one of the original crocodiles introduced in 1970 (Fig. 1). Most (84%; (13 hatchlings, 4 juveniles, 1 sub-adult, 3 adults) crocodiles captured in the lagoons had the characteristics of *C. moreletii*, but some (14%; 2 hatchlings, 1 juvenile, 1 sub-adult) were not typical of *C. moreletii* (eg lack of scale inclusions, slightly longer snout or slight prefontal "bump"). At this stage it is not possible to establish whether these atypical animals are hybrids, but genetic analysis is expected to be undertaken soon to clarify the situation. The ranch is 150 km from the nearest *C. moreletii* population, and 80 km from the nearest *C. acutus* population.

Figure 1. Pedrero family, the new owners of La Esperanza Sanctuary, with 4.2 m long tanned skin of mature male *C. acutus*. Photograph: Jerónimo Domínguez-Laso.

The new owner of the ranch, DVM Sergio Pedrero, has an interest in conservation and management of the crocodile population, and is developing a management program for the relevant government authorities, in order to register the ranch as a Wildlife Management and Conservation Unit (UMA) with the purpose of research, ecotourism and sustainable development. It is anticipated that the ranch will be established as an ecotourism centre, through which the crocodile population and other species can be managed.

During 2009, a study was undertaken to determine the abundance of crocodiles through seasonal surveys. The population is estimated at 35 (± 5) individuals, of which 56% are 50-100 cm, 19% are 101-150 cm, and 25% are 151+ cm total length. The recorded sex ratio was 0.40 (expressed as a proportion of females). Two nests were located, constructed of clay (80%) and organic material (20%), and containing 27 and 40 eggs respectively.

The ranch has conventional fencing, and so crocodiles are able to move out of the area - a number of animals have been recovered from neigbouring ranches. It is hoped that this issue will be addressed to the extent possible within the management plan to be developed.

In addition, the management plan will include the capture and

relocation of some crocodiles that represent potential danger to people and livestock [eg "La Pancha" (female, >3.5 m), "El Sabritas" (male, has eaten several dogs, >3 m), "El Tuerto" (male 2.9 m), "La Esperanza" (female, 2.6 m), "El Carnicero" (male, 2.9 m) and "El Jorobado" (male, 2.90 m)], to new, secure enclosures, where reproduction can be monitored and allow hatchlings to develop without the potential problem of cannibalism.

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Acknowledgments

DVM Sergio Pedrero, Alfredo Pedrero and their families, DVM Ángel David Alvarado Díaz (country support) and Liliana Berenice García-Reyes (country support and translation).

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Science

Recent Publications

Charruaua, P., Thorbjarnarson, J.B. and Hénauta, Y. (2010). Tropical cyclones and reproductive ecology of *Crocodylus acutus* Cuvier, 1807 (Reptilia: Crocodilia: Crocodylidae) on a Caribbean atoll in Mexico. Journal of Natural History 44(11-12): 741-761.

Abstract: *Crocodylus acutus*, a coastal species nesting in sand beaches, could be affected by increasing tropical cyclone frequency. We studied key characteristics of *C. acutus* reproductive ecology on Banco Chinchorro atoll from 2006 to 2009, including the impact of two tropical cyclones. Hurricanes increased canopy openness causing earlier nesting the following year. Crocodiles nested at the beginning of the wet season with hatching in mid-wet season; this could represent a compromise between risking nest flooding and increasing freshwater availability for hatchlings. Tropical cyclones dramatically reduced nesting success by cooling and flooding clutches. Nursery sites were usually hypersaline, but heavy rainfall from tropical cyclones can likely benefit hatchling survival by decreasing salinity. While tropical cyclones have negative short-term impacts on crocodile nesting, they likely have an overall beneficial effect by creating and maintaining open sandy nesting areas used by *C. acutus* and they may explain its widespread distribution in Caribbean coastal areas.

Llobet, A., Ten, S., Pena, R., Avila, P., Saavedra, H., Gutierrez, E., Severiche, J., Zambrana, M. and Merubia, M. (2009). Population status of spectacled caiman (*Caiman yacare*) in areas under management plans for sustainable use of the species in Beni and Santa Cruz, Bolivia. Rev. Bol. Ecol. y Cons. Amb. 25: 11-24.

Ross, J.P., Honeyfield, D.C., Brown, S.B., Brown, L.R., Waddle, A.R., Welker, M.E. and Schoeb, T.R. (2009). Gizzard shad thiaminase activity and its effect on the thiamine status of captive American alligators *Alligator mississippiensis*. Journal of Aquatic Animal Health 21: 239-248.

Abstract: Adult mortality and low egg hatch rate were observed among American alligators *Alligator mississippiensis* in Lake Griffin, Florida, between 1998 and 2003. Previous studies show that the alligator mortality is due to neurological impairment associated with thiamine (vitamin B1) deficiency. This study determined the rate of thiaminase activity in gizzard shad *Dorosoma cepedianum*, a fish often eaten by alligators, and examined the thiamine status of captive adult alligators fed only gizzard shad. We found that the thiaminase activity of gizzard shad in Lake Griffin is 16,409 ± 2,121 pmol/g/min (mean ± 2SEs). This high rate of thiaminase activity was present in most months and across a wide range of shad sizes. Seven alligators were captured in the wild from Lake Griffin and Lake Woodruff, held in captivity, and fed gizzard shad. We monitored blood and muscle thiamine levels throughout the experiment and liver thiamine at the end. Over a period of 6-12 months, all of the alligators maintained weight but blood and muscle thiamine levels decreased to 25-50% of the original (healthy) values. Three animals with the greatest reduction in thiamine died, demonstrating mobility impairment and neural histopathology similar to those seen in wild alligators in Lake Griffin. Two alligators were fed shad for 10 months but then treated with thiamine. These animals showed a reduction in thiamine while eating shad, but treatment restored their thiamine levels to the initial values, which were comparable to those of normal wild Lake Griffin alligators. We demonstrated that thiamine deficiency can be induced by a diet of gizzard shad and cause neurological signs and death in alligators in captivity. We conclude that the thiaminase activity in gizzard shad is high enough to cause thiamine deficiency in wild alligators when shad are a major part of their diet.

Rao, L., Turlapati, R., Patel, M., Panda, B., Tosh, D., Mangalipalli, S., Tiwari, A., Orunganti, V.P., Rose, D., Anand, A., Kulashekaran, M.K., Priya, S.R., Mishra, R.K., Majumdar, K., Aggarwal, R.K. and Singh, L. (2009). Cytogenetic characterization and fluorescence *in situ* hybridization of (GATA)(10) repeats on established primary cell cultures

from Indian water snake (*Natrix piscator*) and Indian mugger (*Crocodylus palustris*) embryos. Cytogenet. Genome Res. 127(2-4): 287-296.

Abstract: Sex determination among reptiles has continued to draw the attention of geneticists and the mechanisms involved have been extensively studied and documented in the past 3 decades. The setting up of primary cell lines of reptilian tissues is an important tool in the present study which is a unique aspect not applied in earlier studies. Establishing the cell lines from various species of reptiles would help in our understanding of the mechanisms of evolution and differentiation of sex chromosomes. Therefore, in the present study, we have established for the first time primary cell cultures from Indian water snake (*Natrix piscator*) and Indian mugger (*Crocodylus palustris*) embryos. In the preliminary growth stage, 2 types of cells, fibroblast- and epithelial-like, were found to be attached and proliferating *in vitro*. These fibroblast-like cell cultures were later overtaken by epithelial cells. The cell lines were grown in minimal essential medium supplemented with fetal bovine serum and subcultured for a period of 8-10 months. The morphology of cell types was kept under constant observation microscopically. Interestingly, at a subsequent passage of the cells sporadically scattered neuronal-like and beating cells were observed. The suitable temperature for growth of these cell cultures was 28-30°C. Chromosome analysis was performed from the actively proliferating cells, which revealed 5 pairs of macrochromosomes and 15 pairs of microchromosomes in *N. piscator*, and 15 pairs of only macrochromosomes in *C. palustris*. (GATA)(n) repeats are well known to be associated with sex chromosomes. Fluorescence *in situ* hybridization performed with (GATA)(10) repeats delineated the W chromosome in the cells of *N. piscator* which has so far not been reported. This cell culture method has presently only been applied to water snakes and crocodile embryos in the current study, but it will be employed in other reptilian species and could go a long way to being a sustainable source of primary cells. This would eventually serve as an important tool for molecular studies in reptiles and other species in the future.

Cramp, R.L., De Vries, I., Gary Anderson, W. and Franklin, C.E. (2010). Hormone-dependent dissociation of blood flow and secretion rate in the lingual salt glands of the estuarine crocodile, *Crocodylus porosus*. J. Comp. Physiol. B.

Abstract: Salt and water balance in the estuarine crocodile, *Crocodylus porosus*, involves the coordinated action of both renal and extra-renal tissues. The highly vascularised, lingual salt glands of *C. porosus* excrete a concentrated sodium chloride solution. In the present study, we examined the *in vivo* actions of vasoactive intestinal peptide (VIP), B-type natriuretic peptide (BNP) and angiotensin II (ANG II) on the secretion rate and blood perfusion of the lingual salt glands. These peptides were selected for their vasoactive properties in addition to their reported actions on salt gland activity in birds and turtles and rectal gland activity in elasmobranchs. The femoral artery was cannulated in seven juvenile crocodiles for delivery of peptides and measurement of mean blood pressure and heart rate. In addition, secretion rate of, and blood flow to, the salt glands were recorded simultaneously using laser Doppler flowmetry. VIP stimulated salt secretion was coupled to an increase in blood flow and vascular conductance of the lingual salt glands. BNP was a potent stimulant of salt gland secretion, resulting in a maximal secretion rate of more than 15-fold higher than baseline; however, this was not coupled to an increase in perfusion rate, which remained unchanged. ANG II failed to stimulate salt gland secretion and there was a transient decrease in salt gland blood flow and vascular conductance. It is evident from this study that blood flow to, and secretion rate from, the lingual salt glands of *C. porosus* are regulated independently; indeed, it is apparent that maximal secretion from the salt glands may not require maximal blood flow.

Katsu, Y., Braun, E.L., Guillette, L.J. Jr. and Iguchi, T. (2010). From reptilian phylogenomics to reptilian genomes: analyses of c-Jun and DJ-1 proto-oncogenes. Cytogenet. Genome Res.

Abstract: Genome projects have revolutionized our understanding of both molecular biology and evolution, but there has been a limited collection of genomic data from reptiles. This is surprising given the pivotal position of reptiles in vertebrate phylogeny and the potential utility of information from reptiles for understanding a number of biological phenomena, such as sex determination. Although there are many potential uses for genomic data, one important and useful approach is phylogenomics. Here we report cDNA sequences for the c-Jun(JUN) and DJ-1(PARK7) proto-oncogenes from 3 reptiles (the American alligator, Nile crocodile, and Florida red-belly turtle), show that both genes are expressed in the alligator, and integrate them into analyses of their homologs from other organisms. With these taxa it was possible to conduct analyses that include all major vertebrate lineages. Analyses of c-Jun revealed an unexpected but well-supported frog-turtle clade while analyses of DJ-1 revealed a topology largely congruent with expectation based upon other data. The conflict between the c-Jun topology and expectation appears to reflect the overlap between c-Jun and a CpG island in most taxa, including crocodilians. This CpG island is absent in the frog and turtle, and convergence in base composition appears to be at least partially responsible for the signal uniting these taxa. Noise reduction approaches can eliminate the unexpected frog-turtle clade, demonstrating that multiple signals are present in the c-Jun alignment. We used phylogenetic methods to visualize these signals; we suggest that examining both historical and non-historical signals will prove important for phylogenomic analyses.

Merchant, M., Mead, S., McAdon, C., McFatter, J. and Wasilewski, J. (2010). Identification and characterization of dipeptidyl peptidase IV enzyme activity in the American crocodile (*Crocodylus acutus*). Vet. Immunol. Immunopathol.

Abstract: Serum from the American crocodile was assayed for dipeptidyl peptidase IV (DPP4) activity. We measured the DPP4-mediated hydrolysis of Ala-Pro-AFC. The generation of AFC was dependent on the titer of serum, with significant DPP4 activity (0.20+/-0.03 nmol product formed) measured using only 2 muL of crocodile serum, with maximum activity measured using 500 muL of serum. The hydrolysis of substrate was inhibited in a concentration-dependent manner by diprotin A, a specific inhibitor of DPP4 activity, indicating that this activity was due to the presence of DPP4. The crocodile serum DPP4 exhibited classical Michaelis-Menten kinetics, with K(m) and V(max) extrapolated, by double-reciprocal plot, to be 14.7+/-1.3 muM and 75.5+/-4.3 nmol/min, respectively. Crocodile DPP4 catalyzed the hydrolysis of Ala-Pro-AFC rapidly, with substantial activity measured within 5min of the addition of substrate. After an initial rapid increase in activity, near maximal activity (7.43+/-0.24 nmol product formed) measured at 180 min. Crocodile serum DPP4 activity was temperature-dependent, with steadily increased activity from 5 to 40°C.

Dalzell, P., Miles, L.G., Isberg, S.R., Glenn, T.C., King, C., Murtagh, V. and Moran, C. (2010). Standardized reference ideogram for physical mapping in the Saltwater Crocodile (*Crocodylus porosus*). Cytogenet. Genome Res.

Abstract: Basic cytogenetic data, such as diploid number and general chromosome morphology, are available for many reptilian species. Here we present a detailed cytogenetic examination of the saltwater crocodile (*Crocodylus porosus*) karyotype, including the creation of the first fully annotated G-band standard ideogram for any crocodilian species. The *C. porosus* karyotype contains macrochromosomes and has a diploid number of 34. This study presents a detailed description of each chromosome, permitting unambiguous chromosome identification. The fully annotated standardized *C. porosus* ideogram provides the backbone to a standard nomenclature system which can be used to accurately identify specific band locations. Seven microsatellite containing fosmid clones were fluorescently labeled and used as fluorescent in situ hybridization (FISH) probes for physical localization. Chromosome locations for each of these FISH probes were successfully assigned, demonstrating the utility of the fully annotated ideogram for genome mapping.

Brochu, C.A., Njau, J., Blumenschine, R.J. and Densmore, L.D. (2010). A new horned crocodile from the Plio-Pleistocene hominid sites at Olduvai Gorge, Tanzania. PLoS One. 2010 Feb 24;5(2):e9333.

Background: The fossil record reveals surprising crocodile diversity in the Neogene of Africa, but relationships with their living relatives and the biogeographic origins of the modern African crocodylian fauna are poorly understood. A Plio-Pleistocene crocodile from Olduvai Gorge, Tanzania, represents a new extinct species and shows that high crocodylian diversity in Africa persisted after the Miocene. It had prominent triangular "horns" over the ears and a relatively deep snout, these resemble those of the recently extinct Malagasy crocodile *Voay robustus*, but the new species lacks features found among osteolaemines and shares derived similarities with living species of *Crocodylus*. Methodology/Principal Findings: The holotype consists of a partial skull and skeleton and was collected on the surface between two tuffs dated to approximately 1.84 million years (Ma), in the same interval near the type localities for the hominids *Homo habilis* and *Australopithecus boisei*. It was compared with previously-collected material from Olduvai Gorge referable to the same species. Phylogenetic analysis places the new form within or adjacent to crown *Crocodylus*. Conclusions/Significance: The new crocodile species was the largest predator encountered by our ancestors at Olduvai Gorge, as indicated by hominid specimens preserving crocodile bite marks from these sites. The new species also reinforces the emerging view of high crocodylian diversity throughout the Neogene, and it represents one of the few extinct species referable to crown genus *Crocodylus*.

Sue Hamilton (2010). Attacked by a Crocodile. ABDO & Daughters: Minneapolis 32pp.

John Thorbjarnarson and Xiaoming Wang (2010). The Chinese Alligator: Ecology, Behavior, Conservation and Culture. Johns Hopkins University Press: Baltimore.

This book on the Chinese alligator represents one of the last works of the late John Thorbjarnarson (see page 4), and was released on 15 April 2010. The CSG has been advised by the publishers that a 25% discount can be obtained if the book is purchased from Johns Hopkins University Press website - "www.press.jhu.edu" (you will need to quote NAF code).

Submitted Publications

CROCODILUS SUCHUS IN TROUBLE AGAIN**.** The type locality of *Crocodilus suchus (*Geoffroy-Saint-Hilaire 1807), is ancient Thebes (Luxor today), Egypt, as the juvenile *Crocodylus niloticus* skull that bears the name *Crocodilus suchus* was removed from a wrapped and mummified specimen that Etienne Geoffroy-Saint-Hilaire personally collected at the catacombs under the Thebes temple. This individual skull is the fundamental basis behind Geoffroy-Saint-Hiliare's original 1807 hypothesis that there were two species of *Crocodylus* in the classical Egyptian stretch of the Nile River, exemplified by the Luxor and Aswan region.

All assertions that the type locality of *C. suchus* (or *C. niloticus suchus*) is Niger (sic) or Senegal (sic) are derived from a secondary discussion about climate change in northern Africa. The logic is that because *C. niloticus* occurs in the Egyptian Nile and also lives naturally in the Senegal and Gambia Rivers, it would imply that if (hypothetically) there actually was a second Nile River *Crocodylus* species, then it too (hypothetically) would probably also occur at the western coast of North Africa (Senegal).

There is a Senegal *C. niloticus* in the MNHN (Paris) that claims to be the type (sic) of *C. suchus* Geoffroy, but the real meaning of the specimen's identity label is that it is the one that Duméril and Duméril (1851) used to exemplify Geoffroy's range extension of *C. suchus* to Senegal. It is an important animal (essentially a paratype of Geoffroy's *suchus*), but the Senegal (Niger) animal from Adanson is not the true holotype specimen for the name *C. suchus* Geoffroy-Saint-Hilaire, 1807. The real *suchus* skull, the sacred crocodile of Egypt ("Croc. sacré" of Duméril and Duméril 1851) that was collected at the Thebes catacombs, is probably in the MNHN-Paris. I have seen photographs that confirm the general accuracy of the 1807 illustrations. The little skull, without mandibles, has a glass dome covering it, and is on a rod elevating it above its circular plinth (Fig. 1).

Figure 1. The Thebes mummified skull of *Crocodilus suchus* Geoffroy in the MNHN-Paris. Photograph: courtesy of Mark Van Tomme (Brussels, Belgium) and Edio-Ernst Kischlat (Porto Alegre, Rio Grande do Sul, Brazil).

Recently, Trutnau and Sommerlad (2006) recognized *C. niloticus suchus* as a subspecies, and simultaneously also *Crocodylus suchus* as a species, in both cases meaning the Senegal ("Niger") animal from northwestern Africa, officially considered taxonomically different from the Nile Crocodile of Egypt. It is unclear whether Trutnau and Sommerlad's (2006) taxon *suchus* is restricted to the large and riverine *C. niloticus* in northwestern Africa, or if it also includes the pedomorphic populations of *C. niloticus* scattered in isolated inland situations in the Sahara (Mauritania and Chad), but it is pretty much clear that their basic concept of *suchus* is the Senegal (=Niger) one (and also Mauritania). However, Trutnau and Sommerlad (2006) have introduced a new and additional *suchus* problem: the Syria and Palestine *C. niloticus* that lived until recently where Israel is today.

Because the 2007 Nilekroko map in CSG Newsletter 26(2): 21-23 did not include Israel, I now expand my Nilekroko system to include Nilekroko-Israel (NK-I) meaning the Zerka River near Caesarea and Benjamina, the Kishon River (inland from Haifa), the Yarkon River (Tel Aviv), and probably also formerly including the Jordan River. The Trutnau and Sommerlad (2006) assertion can now be rephrased without scientific names as follows: Nilekroko-Westafrica-North (NK-WA-N) and Nilekroko-Pedomorph (NK-P) are individually and collectively distinguishable from Nilekroko-Vulgar (NK-V) in Sudan and Egypt, but simultaneously NK-WA-North (and NK-Pedomorph) are the same as NK-Israel. Additionally, for the Mediterranean Sea coastal zone in Libya, Tunisia and Algeria, I propose Nilekroko-Barbary (NK-B). Now the zoogeographic question becomes whether NK-WA-N (and NK-P) are more closely related to NK-B than they are to NK-Vulgar, and further whether NK-Barbary is genetically closer to NK-V (newly defined as including the entire Egyptian Nile, and its delta), or alternatively more similar to NK-Israel.

The traditional hypothesis was that the Nile crocodile of Sudan inhabited Egypt and the Nile Delta, and that during times of low sea levels the easternmost distributaries of the Nile River actually intersected the Yarkon and Zerka Rivers, creating a freshwater faunal connection between the Egyptian delta and the Israeli coastal plain. Thus, Nilekroko-Vulgar is the closest relative of NK-Israel. There is no evidence that NK-I was specially saltwater-adapted, but the surface currents in the southeastern corner of the Mediterranean flow from Alexandria to Haifa, so rafting from the Nile Delta is possible. However, Alexandria is Nilekroko-Vulgar (the classical Egyptian and adjacent Sudan animal known to the ancient Greeks). My guess is that Nilekroko-Vulgar is a genetic barrier separating NK-Barbary from NK-Israel, and thus NK-Israel (located east of Egypt and Sudan) should not be directly connected to Nilekroko-Westafrica-North or Nilekroko-Pedomorph (located west of Egypt and Sudan).

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DO CROCODILES EVER OVERTURN CROCODILES? Many decades ago, I watched a Seminole man wrestle American alligators at a performance for tourists near Palm

Beach, Florida. At one point in the show, he turned a fairly large animal onto its back, and then rubbed its belly with his hand, stroking its collar-vent region from sternum to umbilicus, repeatedly, and eventually the reptile appeared to fall asleep. Belly up, it went into a trance. The eyes closed, the whole body went limp, and the helpless and vulnerable creature was unable to right itself. The showman was then able to stand up and talk to the tourists, while his overturned crocodilian remained immobile, lying on its back in the sand. It is possible that stroking the belly in this special anterior to posterior way was an exaggeration for the public, and that actually the trick is to press on some special small spot, but later I often performed the stunt of turning a crocodile about a metre long onto its back, across my lap, and once it had settled down a little, I would stroke its belly skin in the exact same way as I had seen near Miami, and got the same result.

Has anyone ever witnessed a captive or wild crocodilian that was overturned and put into a trance by another crocodilian? If so, were they both adults? Were they both in the same species? Was it male against male, female against female, or one sex immobilizing another? Can a copulatory female become overturned and get her belly rubbed and pressed in such a manner that she goes to sleep? It would have to be in shallow water or on land, but as far as I know, the female crocodilian retains her normal orientation while being mated. The reason that I ask is that long before Seba's and Laurenti's times (the 1700s), there was an existing and well known story from 1511 (Martyr's "Legatio Babylonica") about a male Nile River crocodile turning his mate onto her back on the sand, and then mounting her belly to belly for copulation. When the sex act was finished, the male dismounted, and needed to again overturn his female, because she was unable to right herself. The excuse was that her legs were too short. Without help from her mate, she can not turn herself over.

I hesitate to say that belly to belly combat never happens, and I think it is possible that an overturned crocodile could be put into a helpless trance, and lay on its back temporarily unable to right itself, but surely this is not normal copulatory behavior. The fact that Seba's famous "female" was illustrated lying belly-up and showing her cloaca is not evidence of a copulatory adult animal's sex. However, facts are not important in the case of Seba's female (sic), because all that really matters today is what J.N. Laurenti thought (from reading Martyr about Egypt) was true about the behavior of *Crocodylus niloticus* when it was named in 1768.

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SEBA'S GENDER CORRECTNESS NOW TRIVIA. Type specimens belong to nomenclatural science. There are no crocodilian taxa where knowing the real and verifiable gender of a type specimen is required for the stability of names. If a type description includes wrong sex data, it is of historical interest only.

More than three and a half centuries ago, a prominent author asserted that his book contained illustrations of both the male and the female of the same individual crocodilian species. Of these two specimens, the sex of the latter was claimed to be evidenced by the peculiar scales surrounding its cloaca. Today I suspect that neither the putative male nor the animal claimed to be female was dissected to reveal its genital anatomy, and I believe that both of these two pictures depict juveniles that are physically far too small for the cloaca to be probed with a human finger. Although the cloacal vent of a neonate can be probed with an appropriate tool, it would require detailed knowledge of the location and dimensions of the cliteropenis in larger animals before being able to reliably judge the results of such probing on juveniles. However, in the case in question (Seba 1734: plate 105, figs. 3 and 4), these were the first two figures of crocodilians in all of history to have their sex reported in the literature. Thus, Seba (1734) was probably guessing.

Back in 1734, the scales surrounding the slit of the cloacal opening were claimed to identify Seba's figure 4 individual as a female, but if crocodilians could be visually sexed by just looking at the external surface of their cloacal zone skin, then the modern probing method would not have been necessary. Rather, I believe that Seba (1734) wanted figure 4 to be female, and invented fictitious evidence to support his assertion that this ventral view depicted an adult animal posed as she would be during copulation (which is also fiction). A female crocodilian does not lay on her back with her belly and cloacal side up while being mated, but Seba (and later probably also J.N. Laurenti) thought that they did. These two Seba (1734) crocodilians are amongst the most important in modern nomenclature. It is crucial that science determines whether or not figure 3 is the dorsal view of the figure 4 animal, but the actual sex of the specimen(s) is today irrelevant. It is necessary to determine whether figure 3 is today identifiable to the same species or subspecies as figure 4, but accurate gender data is not a normal taxonomic factor.

I solicit ways to sex whole crocodilians without probing or dissecting them. Is it possible for historians to check Seba's plate 105 sex data visually? I believe that the specimens have been found in museums, and that one is in Berlin, the other in Paris. Further, I believe that they are both identifiable to the same CITES taxon, and are babies in alcohol. They are not a copulatory pair of adults, and Seba (1734) got their locality data wrong, but his plate 105, figures 3 and 4, and the specimens depicted, are still types. Thus, because nomenclature does not need to know if Seba was guessing about gender, the modern and verifiable truth does not matter. In this case, only what Seba (and later Laurenti) thought was true back in the 1700s is of significance now.

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