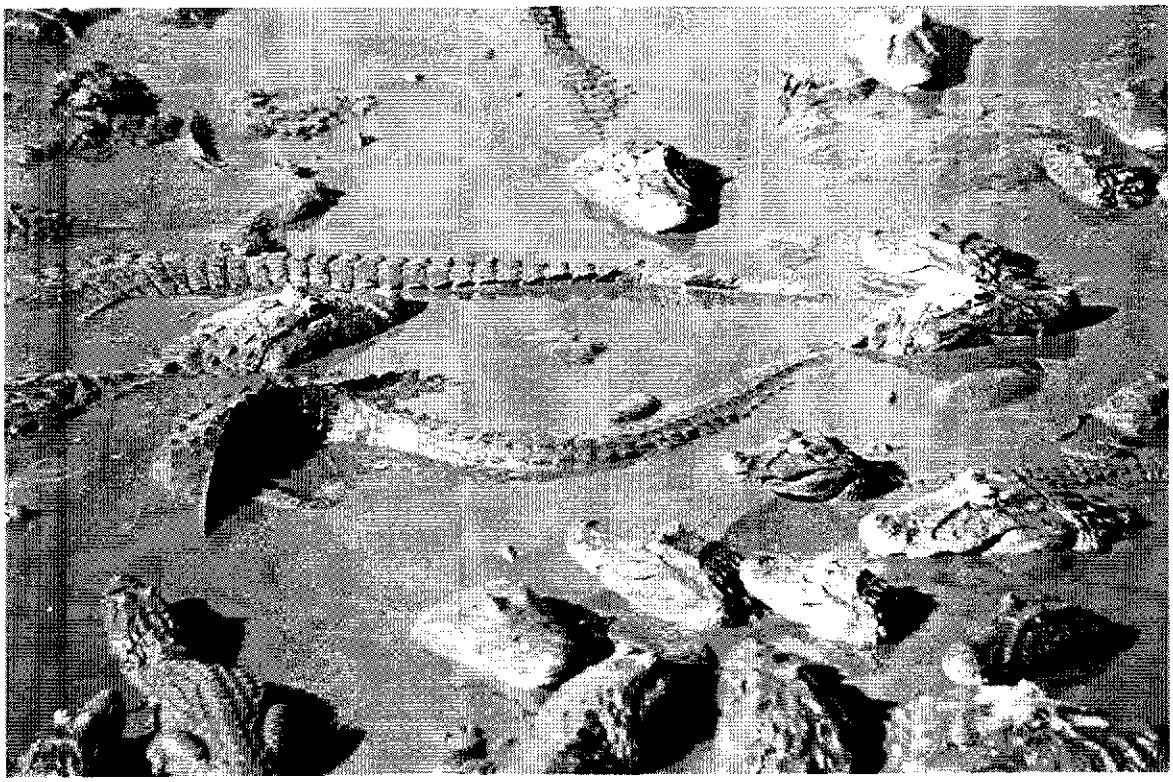
CROCODILE SPECIALIST GROUP

NEWSLETTER

VOLUME 19 No. 3 ■ JULY 2000 – SEPTEMBER 2000



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. *Caiman latirostris*, broad snouted caiman, concentrated by drought, Santa Fe, Argentina, see pg 10. A. Larriera photo.

The CSG NEWSLETTER is produced and distributed by the Crocodile Specialist Group of the Species Survival Commission, IUCN - World Conservation Union. CSG NEWSLETTER provides information on the conservation, status, news and current events concerning crocodilians, and on the activities of the CSG. The NEWSLETTER is distributed to CSG members and, upon request, to other interested individuals and organizations. All subscribers are asked to contribute news and other materials. A voluntary contribution (suggested $40.00 US per year) is requested from subscribers to defray expenses of producing the NEWSLETTER. All communications should be addressed to: Dr. J. P. Ross, Executive Officer CSG, Florida Museum of Natural History, Gainesville, FL 32611, USA. Fax 1 352 392 9367, E-mail prosscsg@flmnh.ufl.edu

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We gratefully express our thanks to the following patrons who have donated or pledged financial support to the CSG conservation activities and program for the last 12 months.

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Enrico Chiesa, Italhide S.R.L., Milan, Italy.
S. & J. Puglia, Alligator Adventure at Barefoot Landing, Myrtle Beach, SC, USA.
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Keith Cook and Alicia Darbonne, Australian Crocodile Traders Pty. Ltd., Cairns, Australia.
John Hannon, Australian Crocodile Exporters Pty. Ltd., and Lagoon Crocodile Farm Pty. Ltd., Darwin, Australia.
Phil Steel, Crystal River Alligator Farm, FL, USA.
A. Handoko, PT Binatankar Perdana, Indonesia.
American Alligator Council, Tallahassee, FL, USA.
Somkiat Wannawatanapong, Wabin Crocodile Farm and United Leather Product Co. Ltd. Thailand.
Newport Aquarium, Kentucky, USA.
M. Temsiripong, Sriracha Farm, Thailand.

Contributors. ($500 - $1000)
Peter Freeman, Hartley's Creek Crocodile Farm, Queensland, Australia.
Paul H. Slade, Nell and Hermon Slade Trust, Mona Vale, Australia.
Terry Cullen, Cullen Vivarium, Milwaukee, WI, USA.
Mauri USA, Inc., New York, NY, USA.
Antonio Quero Alba, Eurosuchus SA, Malaga, Spain.
Mike Husby, Savannah Leather, Cairns, Australia.
George Saputra, C.V. Alona Jaya, Indonesia.
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Robert Young, Alligator Bob's, Thonotosassa, FL, USA.
Colin Stevenson, Egham, Surrey, UK.

EDITORIAL

For a change, I do not have to harass you all about fund raising. Revenues from all of our patrons for the year total $\54,250 which will (barely) meet our anticipated expenses and leave a small reserve to meet the new year. I have been able to pay portion of the costs of the Executive Officer position from other grant funds. While this requires me to apply a proportion of my time to meet the requirements of those projects, on the balance, CSG has 'sold' my time to other projects at a very favorable rate, resulting in a net gain.

Newsletter subscription renewals have run a little below the normal rate with a total of 142 responses, of which 75 sent donations of $40 or similar amounts resulting in additional revenues of $3,500. Our revenues from sales have been modest this year because most of the CSG publications (our main 'product') have been out of print. To redress this lack, I have had additional copies of the Singapore Proceedings printed. I am also pleased to report that the Proceedings of the Cuba Meeting were delivered to me this week and I will begin to distribute these to all registered participants, hopefully in time to avoid the Christmas mail rush. These will also be offered for sale in the next Newsletter. Other successful activities are the growing momentum for conservation of the Chinese alligator in the wild (see report page 5) and our Task Force on Market Driven Conservation (following report). — Perran Ross, *Executive Officer*.

Views and Opinions

CSG GLOBAL TRADE STUDY. The price of raw skins of alligators and crocodiles fluctuates greatly, as producers know to their cost! The Crocodile Specialist Group is interested in this problem because we have linked the conservation of many crocodilian species, and the protection of their habitats, to the incentives generated by commercial use under well-regulated conditions. If these commercial incentives disappear or are unstable, the conservation programs they support are in jeopardy.

Everyone has a theory about why these fluctuations occur. Commonly mentioned causes of price fluctuation include, on the supply side: the general economic climate, overproduction, competition from other exotic skins (such as lizard or ostrich), currency exchange rate fluctuations, shortage of processing facilities, excessive regulation, high regulatory costs, and on the supply side; unpredictable fashion market changes, reduced demand due to animal welfare and conservation concerns, and speculation by traders. Economic factors in Asia, the major consumer of finished crocodilian goods, are thought to exert a large effect.

Despite the important effect of price fluctuation on producer success and profits, there are few studies of the real causes. A single analysis of global price change and economic factors (Woodward et al. in the 1994 Darwin Meeting Proceedings) noted that these are not new but can be seen back at least 100 years in the industry. They concluded that marketing promotion, control of supply and sophisticated economic analysis were needed if prices are to be stabilized.

Recognizing the common interest shared between conservation and industry, the CSG initiated a task force on market driven conservation in 1998 and produced a general policy to address this problem in 2000 (CSG News 18 (4):26-27) One component of this policy was to initiate a formal economic analysis, conducted by an expert with experience in international resource economics. Working through John Hutton, the Task Force has engaged the interest of Dr. Tim Swanson at the University College of London UK, a renowned expert in this topic, who is advising the project. The task force is working with World Conservation Monitoring Center to find ways to improve crocodilian skin trade data quality. Other aspects of this important work include a review of Custom's information at ports of entry, a review of CITES regulations with respect to personal possessions in the most important importing countries and an investigation into the possibility of certification and 'Green' labeling to promote sales. Recognizing the importance of this work, the Louisiana Fur and Alligator Council has assigned a grant of $10,000 to the CSG. This proposal seeks matching funding of $10,000 to allow this study to continue.

Price fluctuations are a common component of international trade in primary products and have attracted considerable research. Raw materials produced in tropical countries and consumed in developed countries seem particularly affected in this way, for example, fluctuations of price for bananas, cocoa, Brazil nuts and heart of palm all show price patterns similar to crocodilian skins. The price to the consumer varies by several fold (for alligators $2.50/cm belly width - $8.50/cm belly width in the last decade) although the price of the end retail products (e.g., fashion handbags) stays relatively stable and does not reflect these wild fluctuations. This is in marked contrast to some other commodities like petroleum, where producer prices are reflected in end user price. The reasons for these price patterns are complex and reflect the particular structure of each trade. While some simple economic relationships are widely known, such as increased supply = reduced price, the actual behavior of these variables can only be understood by detailed analysis. For example if supply increases by 10% will price drop 10% or 20% or 50%, why is this the case, and what might be done to strengthen the producer's hand and stabilize the conservation incentives?

The study is proceeding under John Hutton's guidance and will form part of a series of case studies of market effects on conservation assembled by the Organisation for Economic Cooperation and Development. Initial findings dealing with the Nile crocodile will be available shortly. The study will be extended to include the Alligator, caimans and other crocodile species once accurate pricing information is obtained. These data have already been committed by the Florida Fish and Wildlife Conservation Commission, Louisiana Fur and Alligator Council (*Alligator*), Crocodile Farmers Association of Zimbabwe (*Nile crocodile*), the Government of Venezuela (*Caiman crocodylus*) and Mainland Holdings, Inc. of Papua New Guinea (*C. porosus*), in addition to published sources. Because of the sensitivity of price and volume data from individual producers and traders, all these data are treated in strict confidence and will be amalgamated into general economic parameters and presented in general terms of averages, trends and combined sums. In this way the macro-economic trends can be understood but the individual business dealings of data sources are protected. Following internal review by CSG and sponsors, the results of the study (but not the raw data) will be freely

disseminated to any interested individual or group.

The output goals of the project are:

A better understanding of the global structure of the crocodilian skin trade.

Trends of production volume and price for major components of the global trade.

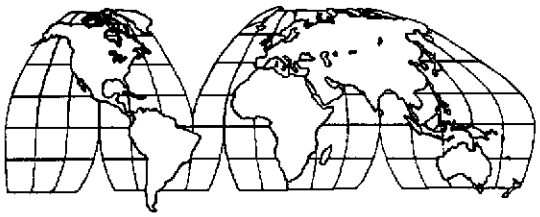
A macro-economic analysis of demand-supply curves and relationships.

Analysis of price flexibility and price elasticity in response to supply and demand.

Increased understanding of the effects of different components of the trade, e.g., producers, traders, processors, wholesale and retail marketing.

Information that could be used to stabilize both producer economic returns and conservation incentives for all crocodilians. — Modified *from a proposal developed by the CSG Task Force on Market Driven Conservation*, D. Jelden, J. Hutton, D. Ashley, G. Webb.

Regional Reports



AFRICA

Madagascar

CONSERVATION OF UNIQUE CAVE CROCODILES. I just went into the crocodiles caves in the north of Madagascar to look at the crocs there. The site is really fantastic and I called a few friends for support. The Crocodile Park of Pierrelate in France has agreed to support the project to set up an education exhibit in the park and to support the reconstruction of a guard hut at the entrance of the croc cave. The National Association for the Protected Areas of Madagascar has agreed to oblige all the guides and Tour Operators to come to a training session that I'll make to make sure that they understand that they can value these crocs for the tourists. AlaSoa Ecotourism has agreed to support the family of one of the fisherman living by the side of the breeding site to involve him in the conservation of these big adults and also to promote a special tour to bring the tourist to see the crocodiles directly to enhance their value and their chances of not being killed. I agreed that I would guide a croc tour in exchange. You could may be make a link on our web page. www.lk-oi.com/alasoa — Olivier Behra, *Lot I BG, Isokara, Antananarivo, Madagascar.*

Niger

PROPOSAL TO PROTECT CROCODILES. Located 900 km from Niger's capital, Niamey, the town of Zinder is home to a population of crocodiles who live in local ponds and gutters. Two pairs of crocodiles were introduced to Zinder by the local government in the 1970's in an attempt to curb the number of drownings. In 1997, the crocodile population was estimated at approximately 80.

The ponds in which the crocodiles live only contain water from July to April. During their period of hibernation the animals have to seek refuge in gutters or puddles of stagnant water. When the rains return and the crocodiles go back to the ponds they pose a threat to local people and domestic animals. The ponds to which they return are surrounded by villages and littered with refuse and garbage. The conflict between the crocodiles and the people of Zinder has resulted in a proposal to eliminate all of the animals despite their protected status.

The department of Environment in Zinder aims to address this problem by

- Protecting the crocodiles through constructing and managing a dedicated habitat for the crocodiles,
- Limiting the amount of human injury and loss of livestock,
- Promoting the economic benefits gained from crocodiles, for example tourism,
- Promoting a craft industry based on crocodile products and
- Promoting scientific study of the animals.

The first priority for this program is the development of suitable habitat. This will be done by cleaning up, deepening and enclosing a designated pond and managing inflow and outflow of water. This will stop the flow of refuse into the pond and help to ensure that the pond will retain water all year. The crocodiles will be fed by the introduction of fish to the pond

and by meat supplements. It is hoped that revenue generated from visitors will cover the cost of maintaining the infrastructure and feeding the crocodiles. The Deputy Director for the Environment in Zinder will be responsible and execution will be undertaken by the local head of environment who will dedicate two staff for maintenance, feeding and protection of crocodiles. Funding of approximately £40,000 (US$ 58,000) is being sought to begin the project. — *from material submitted from the IUCN headquarters, Gland Switzerland.*

Eastern Asia, Australia and Oceania

China

CONTINUED ACTION ON CHINESE ALLIGATOR CONSERVATION. The vigorous efforts by CSG members and other cooperators to promote action to conserve the Chinese alligator have continued and are beginning to bear fruit. A further exchange of letters between the CSG Chairman, Professor Messel, and officials of China's State Forestry Administration has been very positive and made our discussions more concrete. As a result the proposal for a resolution from the IUCN World Conservation Congress was adopted by our Chinese colleagues. This proposal was presented at the World Congress in October by the Chinese Ministry of Foreign Affairs and Co-sponsored by 17 other IUCN members, far in excess of the five sponsors required. After discussion and minor amendment the following resolution was approved by the assembled IUCN Congress in the closing session of the meeting. This represents a twofold step forward. It is evident from this action that China is committed to action on the Chinese alligator at the highest level. Equally, the very broad support for this resolution indicates a widespread recognition by the world conservation community of the urgency of this issue. These initial goals of our program proposed in January have been achieved. The task is now to transform these encouraging words into effective action.

RESOLUTION ON CHINESE ALLIGATOR CONSERVATION

RECALLING that the status of the Chinese alligator (*Alligator sinensis*) in the wild has long been of concern to the Government of the People's Republic of China.

AWARE that the Chinese Alligator was classified in 1996 as Critically Endangered in the IUCN RED List of Threatened Animals 1996, and has been given the highest priority for conservation action by the IUCN-SSC Crocodile Specialist Group;

ACKNOWLEDGING the success of actions initiated by the People's Republic of China nationally and Anhui Province regionally, in: declaring a Chinese Alligator Reserve in Anhui Province, in building a large research center dedicated to Chinese Alligators; in carrying out extensive research on Chinese Alligators; in developing the technology for captive breeding; and now being in a position to produce over 2000 hatchlings per year in captivity;

CONCERNED that the very recent survey results now confirm the single remaining wild population of Chinese Alligators, within the Chinese Alligator Reserve, is fragmented and continuing to decline because of a suite of socio-economic and environmental factors that are difficult to resolve;

RECOGNISING that in addition to national concerns about the survival of wild Chinese Alligators, a very high level of international concern was expressed at the recent meeting of the IUCN/SSC Crocodile Specialist Group about the need for urgent action to ensure this unique crocodilian does not become extinct in the wild.

The World Conservation Congress at its 2nd Session in Amman, Jordan, 4-11 October 2000:

1. URGES the People's Republic of China to continue its efforts to save the last wild population, and to use this year, the Chinese Year of the Dragon, as an opportunity to foster and build international co-operation in solving this challenging and critically important conservation problem;

2. ENCOURAGES all IUCN members to support the Government of the People's Republic of China in their efforts to:

a) maintain a strong research presence dedicated to this species;

b) maintain their captive stock and breeding program with the primary aim of improving the status of wild populations so that restocking can be accomplished in the future;
c) take such actions that are necessary to ameliorate current threats to the existing wild population;
d) set in train programs aimed at improving the status of the remaining population;
e) investigate options for reducing the risk of extinction by reestablishing some other wild populations somewhere within their former range.

3. REQUESTS the Species Survival Commission, within available resources, to offer assistance to China through the IUCN/SSC Crocodile Specialist Group, in convening technical workshops to implement the foregoing actions.

Sponsors of the resolution were Ministry of Foreign Affairs PRC, China Wildlife Conservation Association, WWF Norway, European Bureau for Conservation and Development, Belgium, Conservation International, USA, Zimbabwe Trust, Inuit Tapirisat of Canada, Africa Resources Trust, Inuit Circumpolar Conference Greenland, Fondation Internationale pour la Sauvegarde de la Faune France, Forestry Commission Ghana, Fauna and Flora International, UK, Federal Ministry of the Environment Germany, Parks and Wildlife Commission of the Northern Territory, Australia, Vereiniging tot Behoud van Natuurmonumenten in Nederland. Professor Messel and CSG members Dietrich Jelden, Grahame Webb, Jon Hutton and Hank Jenkins with SSC staff managed the passage of the resolution and thanks are due to all who made this possible and primarily our Chinese colleagues for their support and response.

In other action, John Thorbjarnarson of Wildlife Conservation International, visited China again in August and reviewed potential release sites for re-introduction of Chinese alligators. Of four sites visited, two Yancheng reserve in Jiangsu province and Chongming Reserve near Shanghai have potential for experimental release sites, although they have some climatic limitations and potentials for use conflicts. Two other sites were deemed not suitable without some modification in current management. These sites and the discussions held with their managers form a foundation for further development of the re-introduction option.

John was also able to assist with surveys of the remaining groups of wild alligator and held discussions with senior members of the Division of Wild Fauna and Flora Management of the State Forestry Administration. A proposal to convene a technical workshop to bring Chinese and international experts together was initiated.

Other CSG members have also been adding their weight to the global momentum for Chinese alligator conservation. Obdulio Menghi hosted a delegation from China in Latin America and Grahame Webb will be part of an official delegation in the Northern Territory, Australia, to discuss cooperative relations with China. These both provided additional avenues to communicate on the issue.

Fundraising for the Chinese Alligator Fund has begun slowly with $3,700 raised since the initiation of the fund in July. Our thanks to Kevin Wang, John Binns and an anonymous donor for major support and to all the other contributors. Details of the fund can be seen at <http://www.flmnh.ufl.edu/alligatorfund/>. Adam Britton must be applauded for his continuing efforts on the web for the Chinese alligator.

Discussions of re-introduction possibilities, technical workshops, further contacts and other meetings in China are all underway. — Perran Ross, *Executive Officer CSG, from correspondence.*

Malaysia

CROCODILE PENISES CONFISCATED. The anti-smuggling unit confiscated 22 dried crocodile's penises from a medicine dealer in Chang-lun. The strange looking objects being sold at the road side prompted a curious officer of the unit to take a second look. The seller offered to sell the officer the items, claiming that they could cure medical problems such as low sexual drive, impotence, high blood pressure, heart disease, shortness of breath, asthma and arthritic pains.

The penises were dried and measure about 20cm long, covered in tiny spikes and with a three pronged end. After showing the officer a considerable number of the penises, the man was detained and is being held for contravening

customs regulations. — *From The New Straits Times, Singapore, June 2000.*

Western Asia

India

CHANGING ASSESSMENTS OF STATUS OF INDIAN CROCODILIANS. Dr. Lala Singh provided the following historic account of the changing information base and perceptions about crocodilian status in India.

Status in 1971, (First Working Meeting of Crocodile Specialist Group of IUCN). No numerical estimates. Gharial extremely rare. Mugger exterminated in most areas of its range. Saltwater crocodile no concern, apparently thought to be safe.

Status in 1974 (after survey by FAO Expert Dr. H. R. Bustard). Gharial, Rare, survival is in jeopardy. Mugger, greatly depleted in numbers and rare in most of its range. Saltwater crocodile, no reliable scientific information available, number greatly reduced.

Status in 1977 (situation before the release of any captive-reared young into the wild). Gharial, Endangered, estimated wild population 230. Mugger, vulnerable, estimated wild population 1000 approx. Saltwater crocodile, Endangered. Estimated wild population 550.

Status in 1980. Gharial, Endangered, extremely depleted. Mugger, Vulnerable, heavily depleted throughout its range. Saltwater crocodile, Endangered, now seriously depleted and rare or extinct in most of its former ranges in India.

Status in 1984. (at the time of 7th Working Meeting of IUCN/SSC Crocodile Specialist Group). Gharial, Improving, Estimated 354, +1518 released. Mugger, Improving, Estimated 1000, + 600 released, + 5500 captive. Saltwater crocodile. Improving, estimated 598, + 415 released, + 700 captive.

Status in 1993 (at the time of regional meeting of West Asian Crocodile Specialists of IUCN/SSC-CSG). Gharial Estimated 1500, +466 in captivity. Mugger 3000-5000, +12,000 in captivity. Saltwater crocodile 1000, +650 in captivity.

Status in 1995 (Gharial only at the Gharial PHVA). Estimates of fewer than 300 wild adults total and modeling studies indicated continuing decline of most populations despite continued restocking.

Status in 1998 (at the time of regional meeting of West Asian Crocodile Specialists of IUCN/SSC-CSG) The estimates provided in 1993-95 were generally accepted. However, for the three species, Gharial, Mugger, and Saltwater crocodile there was no recent published information and habitats continue to be under pressure on an all-India basis. Despite successes in the National Chambal Sanctuary (Gharial) and Bhitarkanika (Saltwater crocodile) the crocodilian situation was facing a crisis. Recommendations to address this crisis were formulated but remain to be implemented on a national basis.

Status in 2000. Subsequent to the 1998 regional meeting, a volume of ENVIS –Biannual Bulletin of the Wildlife Institute of India , Vol. 2, No 1. June 1999 published status reports including survey data up to 1997, for 14 Indian States and for Nepal. This remains the most recent, quantitative and accurate assessment of the status of crocodilians in the region. — Lala A. K. Singh, *Project Tiger, Similipal Tiger Reserve, Khairi-Jashipur, Orissa, 757091, India.*

SALTWATER CROCODILES IN BHITARKANIKA, ORISSA. The gradual shrinkage of mangrove forest due to anthropogenic pressure has been posing a constant threat for the future survival of the saltwater crocodile (*Crocodylus porosus)* in Bhitarkanika. In addition, illegal fishing in the creeks and rivers by local communities is making the existence of the population very difficult. During the 1999 winter census a total of 672 crocodiles were counted which included 150 hatchlings, 146 yearlings, 160 juveniles, 144 subadults and 72 adults. There was a marginal increase in the number counted in the previous year (669 crocodiles in the 1998 census). We are at a loss about the fate of the subadult crocodiles (only 144) although 2000 young crocodiles of about 1m length have been released in phases into the Bhitarkanika river systems since 1977. In addition there is natural recruitment from 150 – 200 hatchlings annually that enter the system directly since egg collection for the project was stopped.

[*Eds.* It seems probable that after 25 years protection, this population is achieving a normal adult size distribution and that adult crocodiles inhibit recruitment of subadults, as has been

clearly demonstrated in recovering crocodilian populations elsewhere.]

On the other hand, crocodile attacks on people and cattle are an increasing trend. This has posed some serious conservation problems. Most recently, an attack by a semi-wild crocodile 8.5 feet length on one of our attendants at the Saltwater Crocodile Research Center in Dangmal has put us in an embarrassing situation. The Research Center is surrounded by rivers and creeks and a crocodile released earlier had entered an open fresh water pond located within the center. The attendant, who worked for us for over two decades, entered the pond to clean buckets and other items used to feed crocodiles. He was seized and dragged to the center of the pond. Other attendants managed to free him from the crocodile's mouth but he had profuse bleeding from his left hand and chest (perhaps he was bending over when seized). He was immediately rushed to the local hospital, but succumbed to his injuries on the way. He was a responsible and hard working person and his loss is a great loss to us and to all his family.

Usually the records show that it is larger crocodiles responsible for killing cattle and people. This case is an exception of a smaller captive raised and released crocodile responsible, which returned and killed one of the people who raised and released it.

We also have data from two Ph.D. studies on wetland birds of the Chilika lagoon, a RAMSAR site and India's largest brackish wetland, that was ideal habitat for *C. porosus*. Due to loss of mangroves and intensive fishing activities the crocodile populations has been completely wiped out. — Dr. Sudhakar Kar, *Research Officer, Wildlife, C/O Chief Wildlife Warden, Orissa 7 Saheed Nagar, Bhubaneswar 751 007, India.*

Iran

STATUS OF MUGGERS IN IRAN. There is a small population of mugger crocodiles (*Crocodylus palustris*) estimated to number between 200 and 300 individuals in the southeastern part of Iran in the Bahukalat protected area. The main water sources in the area are the Sarbaz, Kaju and Bahukalat rivers, and crocodiles are found in ponds along these rivers. The crocodiles occupy natural and artificial water bodies such as dams, fish farming ponds and reservoirs. Artificial ponds are constructed near villages in the area to hold rainwater for people's daily use and in any of these ponds 1 or 2 muggers can be seen and their burrows are visible.

The population is therefore very scattered, spatially in the rainy season when additional ponds are formed by flooding and the crocodiles move freely between the ponds and rivers. Crocodiles are found from village of Rask to Kolany village near the coast at Gowarter Bay. Although the crocodiles occupy many ponds close to villages, due to religious and social beliefs, people respect the crocodiles and do not disturb them.

The present condition of the mugger population is very bad due to drought, that has dried out most of the water bodies. There has been no rain for 30 months and even the largest reservoir at Pishin has been reduced to a pond. It is hoped that the crocodiles can survive these conditions. Another notable observation are unconfirmed reports that some crocodiles move between Iran and adjacent Pakistan. This requires more research to confirm, and if true will need research and cooperation between Pakistani crocodile experts and ourselves. — Asghar Mobraki, *Dept. of Environment, P.O Box 5181 - 15875, Tehran, Iran.*

Sri Lanka

TOMISTOMA SCHLEGELII BREEDING AT THE NATIONAL ZOOLOGICAL GARDENS. Between the 2nd and 12th August, I had the pleasure of visiting Yala National Park in southern Sri Lanka, seeing mugger (*Crocodylus palustris*) and other herps in numbers and circumstances like I'd never before seen in the wild. My primary reason for going to Sri Lanka was to assist in identifying areas suitable for filming the mugger for Draco Films, a film division which Romulus Whitaker heads. I also visited the National Zoological Gardens, in Dehiwala, on 11th & 12th August.

At the zoo, besides the 2 crocodilian species found on the Island (*C. porosus* & *C. palustris*) I was surprised to find *Crocodylus rhombifer*, *Caiman c. crocodilus*, *Gavialis gangeticus*, and a pair of *Tomistoma schlegelii*.

I met the Reptile Curator there, who was extremely helpful in explaining to me the origins of the exotic crocs, (all of which have come from

"American zoos") and he then told me that their Tomistoma had been "breeding for several years". He showed me 10 eggs laid by the female which were kept in a mud pot with fairly moist sand, and the remaining 15 eggs were left to incubate in the nest (clutch size = 25 eggs total, 2000 clutch). I examined all of the ten eggs which were being incubated in the mud pot, and all but two appeared to have almost fully developed embryos in the eggs (I used a flash light in a dark room to candle them). The other 2 eggs were blotched with black spots, and appeared to have either been infertile to begin with or fertile eggs which died earlier on in incubation. The eggs were laid on June 7th, 2000, and in 1999 a clutch was laid in the same month (number of eggs not known). In 1998, 30 eggs were laid, of which 5 hatched. Unfortunately all died within a month, as they did not feed.

The male Tomistoma at the National Zoological Gardens was estimated to be 350 cm Total Body Length (TBL), and the female around 320 cm TBL. Both animals appeared to be in very good body condition, and the female was seen near the site of the nest on both days I visited the zoo (the nest site was partially shaded by bamboo saplings). Apparently the mound nest for the current year and previous years comprised mainly gravel and sand, as tree cover is sparse (therefore there is not much leaf litter) and no vegetation was added to the enclosure to aid in construction of the nest.

The enclosure which the Tomistoma are kept in is not spectacular in any respects. A small concrete canal, only ½ filled with water (not enough for the animals to completely submerge) is the sole water source in the enclosure. The enclosure is irregularly shaped, and measures around 25 feet x 12 feet at the longest and widest points respectively. The distance between the animals and the public is usually only 4 – 5 feet. Sparse clumps of bamboo provide shade on the land area, substrate is gravel and sand. The Tomistoma are fed on a diet of principally fish. Several species of fresh-water turtles including *Melanochelys trijuga*, and *Lissemys punctata* andersonii are also to be found in the water body of the enclosure. Pictures of the nest site, enclosure, and the male and female Tomistoma are available on request. I thank M/s Draco Films for giving me the opportunity to visit Sri Lanka and provide endorsement for the duration of my stay. — Nikhil Whitaker, *Curator, Madras Crocodile Bank/Centre for Herpetology, Mamalpuram TN, India.* <*vattelco@md3.vsnl.net.in*> & <*nikhilwhitaker@usa.net*>

ECOLOGICAL STUDY OF CROCODILES IN RUHUNA NATIONAL PARK. A study was carried out in a 140 sq. km block of Ruhuna National park in SE Sri Lanka. Opportunistic daytime sightings of crocodiles were recorded between October 1991 and October 1994 incidental to a larger study of mammals during which most of the waterholes in the park were visited. A total of 341 sightings were made on 77 occasions, 307 sightings of *C. palustris* and 34 sightings of *C. porosus*. Among *C. porosus*, solitary animals made up 55.8% of observations while pairs accounted for 13%. Mixed species groups up to 44 animals (39 *C palustris* and 5 *C. porosus*) were seen. Of the 22 water holes that were surveyed, 13 (59%) had only one crocodile.

Crocodiles were observed to move between waterholes and from smaller waterholes to larger permanent water as the dry season progressed. At the peak of the drought, mugger numbers along the main river, the Menik ganga can reach 35 animals/km. Although both species could be seen at any time of the day, the number of basking crocodiles increased with temperature and peaked around noon. *C. porosus* basked alone while *C. palustris* often basked communally. The population structure of *C. palustris* consisted of 44% hatchlings, 6% juveniles, 24% subadults and 26% adults. Only adult *C. porosus* were observed. The minimum numbers and crude density of *C. palustris* are estimated to be 101 individuals or 0.72 animals per km^2 and *C. porosus* 10 individuals and 0.07animals /km^2 respectively. As these crocodiles are part of a larger population existing throughout the park the populations of both species in the study block appear to be secure and viable.

There has never been any conservation program designed specifically for crocodiles in Sri Lanka. While they are killed as vermin or poached for meat and skin outside protected areas, their long term survival prospects appear good in protected areas such as Ruhuna National Park and Wilpattu National Park in the northwest. The approach to management of crocodiles in the park is therefore a conservative

one, in that the crocodile habitats are secure and remote from centers of human population. — *extracted from* Charles Santapillai, M. de Silva, S. Dissanayake, B.V.R. Jayaratne and S. Wijeyamohan. *2000. JOURNAL OF THE BOMBAY NATURAL HISTORY SOCIETY. 97(1):33-41.*

South America

Argentina

DROUGHT CONCENTRATES *CAIMAN LATIROSTRIS*. Lack of rainfall and low water levels in the southern winter caused unusual concentration of broad snouted caiman in Santa Fe Province in northern Argentina. Accumulations of hundreds of caiman of all sizes, but mainly adults and large subadults, were observed in remnant water bodies in this agricultural region. The photographs, by A. Larriera show one such aggregation in a locality called El Espin, Santa Fe province, Argentina, that is adjacent to one of the study areas of the Projecto Yacare research team. — Alejandro Larriera, *Bv. Pellegrini 3100, (3000) Santa Fe, Argentina.*

Central America and the Caribbean

Belize

MORELET'S CROCODILES INVADE NEIGHBORHOODS IN WAKE OF HURRICANE KEITH. Three days after Hurricane Keith pounded the cayes and mainland of northern Belize, a Belizean radio station reported that numerous crocodiles have been spotted cruising the flooded neighborhoods of Orange Walk Town, presumably in search of food. Orange Walk Town is situated along the banks of the New River which has risen several feet as the result of torrential rains brought on by the Category 4 hurricane from September 30 through October 2. Many streets and homes along the river have been flooded and the water level was expected to continue rising.

The radio station reported that a crocodile devoured one family's pregnant pig outside of their home, and that other crocodiles have been seen attempting to get into fenced-in pens and

yards containing chickens, pigs, and dogs. Families in flooded areas have been cautioned to secure pets and other animals and to keep small children out of the water.

In recent years, Orange Walk residents have complained about the presence of crocodiles in the stretch of river adjacent to town and the unusually "bold" nature of some animals. In July 1997 (confirmed) and again in September 2000 (unconfirmed) two men were attacked (bitten on the arm) by crocodiles while swimming in this area. Part of the problem may be that the local slaughterhouse is situated along the river on the edge of town, and up until three years ago waste from the slaughterhouse was routinely dumped into the river. Over time, crocodiles likely became habituated to this food source and were said to have congregated in the area in hopes of procuring easy meals.

In light of the these events, particularly the presence of crocodiles in close proximity to people's homes as a result of Hurricane Keith, indiscriminate killing of crocodiles in the area may occur. Hopefully, however, the swollen river will soon recede and crocodile-human conflicts will be minimized. — Thomas Rainwater, *Lamanai Field Research Center, P.O. Box 63, Orange Walk, Belize. <thomas.rainwater@tiehh.ttu.edu>.*

Cuba

AMICRO MEETING REPORT. On 19 January 2000, the Associacion MesoAmericana de los Investigadores de los Cocodrilos (AMICRO) held an ordinary general assembly in conjunction with the CSG Working Meeting in Varadero, Cuba. AMICRO is the growing network of crocodilian workers in the Meso American and Caribbean region. The meeting opened with a brief resume of the motives for the origin of the association by Fabio Buitrago and a statement of CSG's support from Alvaro Velasco. Following this, a discussion of the draft statutes governing AMICRO was held and the statutes were adopted. A Directive Committee was elected comprising of Fabio Buitrago, Nicaragua, President; Juan Sanchez, Costa Rica, Vice President; Luis Sigler, Mexico, Secretary and Gladys Vallerino, Panama, Treasurer. Country representatives were elected as follows: Mexico, Manuel Muniz; Guatemala, Francisco Castaneda; Belize, Jan Meerman; Honduras, Eric Fernandez; Nicaragua, Norwing Torres; Costa Rica, Lilliana Piedra; Panama, Miriam de Anaya; Cuba, Roberto Soberon; Rep. Dominicana, Andreas Shubert and Jamaica, Charles Swaby. Election of representatives from El Salvador, Puerto Rico and Haiti was left pending.

A work plan including development of a directory of regional researchers in the field, a data base of available research, the development of legal advisors and the next meeting were discussed. AMICRO intends to conduct much of its business by e-mail and a discussion list <amicro@egroups.com>. Full minutes of the meeting and contact with the AMICRO group can be requested from — Fabio Buitrago, *Presidente AMICRO, <fbuitrag@samara.una.ac.cr>.*

Dominican Republic.

TWO NEW PUBLICATIONS ON CROCODILES. Andreas Shubert and his team at Subsecretariat of Protected Areas and Biodiversity have produced two new booklets featuring their work on the crocodiles (*C. acutus*) of Lago Enriquillo. MONSTRUOS SIMPATICOS (Sympathetic Monsters) is a glossy 45 page booklet with a general introduction to crocodiles and their lives. Eight chapters cover survival in a changing world, status and distribution, a detailed report on the population in Lake Enriquillo, people and crocodiles, conservation, a description of the ongoing radio telemetry project and 'the future of crocodiles on our island'. A short bibliography introduces general sources and the bulk of published reports from DR. The tone and style make this very suitable for the general intelligent public, as a guide and resource for teachers and as an introductory text for students at the high school and college level. The booklet is abundantly illustrated with well executed graphs, diagrams and maps and with numerous photographs illustrating many aspects of the crocodiles life and habitat. While specific to one location, this Spanish language booklet is a useful resource for crocodile workers and educators throughout Latin America.

El Lago Enriquillo, Patrimonio Natural y Cultural del Caribe. (Lake Enriquillo, Natural and Cultural Heritage of the Caribbean) is a more general booklet in the same general style but

covering the Geography, Geology, Flora, Fauna, Ecology, Human activities and conservation themes for this unique hypersaline lake and its surrounding drainage. The crocodile project occupies just a few pages but the booklet presents these in the general setting of the whole system. Understanding the significance of the crocodile population to human activities and use including fishing and ecotourism is a useful juxtaposition of themes.

Both books are authored by Andreas Shubert and published by the National Parks Directorate with funding from INDIBIO, Pronatura and the John D. and Catherine T. McArthur Foundation. Press runs of the first edition were quite small (500 ea) but subsequent updated editions are expected. — *from material submitted by* Andreas Shubert, *Asesor Cientifico, Subsecretaria des Areas Protegidas y Biodiversidad, Santo Domingo, Dominican Republic. <crocodile.andy@codetel.net.do>.*

North America

Mexico

A VERIFIED RECORD OF THE AMERICAN CROCODILE (*CROCODYLUS ACUTUS*) IN YUCATAN. In April 1997, a dead subadult crocodile was confiscated from local fishermen in Puerto El Cuyo by personnel of the Reserva Especial de la Biosfera Río Lagartos, Municipality of Tizimín. The specimen was deposited at the Herpetological Collection of the Museum of Zoology, El Colegio de la Frontera Sur, campus Chetumal, Quintana Roo (ECO-CH-H 0883). This specimen shows the distinctive characteristics that differentiate *C. acutus* from *C. moreletii*. The ratio of head length to head width was over 1.8 (185.7 mm head length/101.5 mm head width) and inclusions of additional scales between the regular whorls of the tail were almost absent, just 3 small scales on each side of the tail. Scalation of the dorsal scutes was very irregular (only the two central rows were regular). The specimen was captured in sea water. On this basis the specimen is confidently assigned to *C. acutus*.

Several anecdotal reports indicate that *C. acutus* occurs at Rio Lagartos but confirmation from museum specimens has not been available. This specimen represents the first confirmed record of *Crocodylus acutus* for the state of Yucatán. There was a previous report from Río Lagartos (Morfín, 1918. *In*: P.C. Sánchez and S. Toscano, Informe rendido por la Comisión Geográfico-Exploradora de Quintana Roo a la Secretaría de Fomento, México, pp. 40-48. México) which was doubtful because of the lack of evidence, and it was suspected to be actually a Morelet's crocodile (A. C. Ross, in litt. *In*: Lee, 1996. The Amphibians and Reptiles of the Yucatán Península. Cornell Univ. Press. Ithaca, N.Y. 500 pp.). Since we lack of any study or surveys of the species in Yucatán, it is a good opportunity to start research to know its current status in that area — J. Rogelio Cedeño-Vázquez. *Museo de Zoología, El Colegio de la Frontera Sur, Unidad Chetumal, Apartado Postal 424, 77000 Chetumal, Quintana Roo, México.*

CROCODILES AND CAIMAN STOLEN. One hundred juvenile American crocodiles were stolen from the Los Palomos caiman ranch in Tapachula, Chiapas in July. The crocodiles, which were the production of the previous year, legally belong to the State and are part of a conservation recovery program. The loss was discovered after a count of animals at the company's facility located near the river Cahoacan. In November 1999, 230 juvenile caimans, property of Cocodrilos de Chiapas and Manuel Muniz were stolen from the same facility under similar circumstances. The caiman are marked with numbered stainless steel tags inserted in the web of the right foot. Preliminary investigations by police suggest that at least four people using four pick-up trucks were involved in the robbery. The facility did not have a security watchman present. It is unclear what the motive for the robbery is as the animals are too small to provide skins of useful size.

The robbery received wide publicity in the Mexican press but remains unsolved. Other caiman farms in the region have also been subject to theft in the last couple of years. Prompted by these crimes, and the increasing value of crocodiles and caimans as Mexico's crocodilian industry becomes established, the Society for the Study and Conservation of Crocodiles in Mexico (SECOCOM) denounced the crimes as undermining the national program for crocodilian conservation and intends to

develop special measures with local police to prevent further occurrences. — *From SECOCOM, Bull. Informativo, Vol 2. No. 2 May-August 2000 and press reports submitted by* Manuel Muniz, *President SECOCOM, A.P. 41-601, Lomas de Chapultepec, Mexico DF. CP 11000, Mexico.*

ILLEGAL WORKSHOP CLOSED. Personnel of the Federal Police and Procuraduria Federal de Protecion al Ambiente (PROFEPA-Environmental law enforcement) raided a workshop in Tapachula, Chiapas, Mexico, in early July, seizing illegal caiman skins and closing the facility. Skins, parts and pieces of about 40 caiman skins, one live caiman and manufactured products including belts, boots, bags were confiscated. Skins and materials of boa constrictor skin were also seized. Acting on an anonymous tip, federal agents visited the facility and found that the owner had no documents or evidence of legal origin of the skins. Permits for operation of a tannery and the sale of endangered animal products were also lacking. The confiscated materials and the case have been assigned to the Public Ministry for disposition.— *From press reports submitted by* Manuel Muniz, *President SECOCOM, A.P. 41-601, Lomas de Chapultepec, Mexico DF. CP 11000, Mexico.*

USA

NEW ALLIGATOR SKIN MARKETING PARTNERSHIP. The Alligator Trading Company Inc. (ATC) of Dade City, Florida, announced a new partnership with Toronto based North American Fur Auctions (NAFA, formerly Hudsons Bay Company) to market alligator leather directly to the fashion trade. This agreement will bring over 3,000 alligator hides to NAFA's New Jersey auction house in February and increasing volumes of hides will be offered at later sales.

Alligator's popularity has grown substantially over the past year as more and more designers use it for accessories, boots and clothing. The ATC/NAFA partnership represents a new step that should bring greater stability to the alligator hide marketing process through open bidding and direct sales. Alligator producers will benefit by knowing their clients and their needs. Prices that reflect true market value will benefit producers through an open public bidding process. Hides will be crusted and graded before final sale to reduce concerns over price changes once sales are completed.

The sale this coming February will be by private treaty. These sales occur year round as hides are listed in NAFA's catalog. Purchasers can see what is available and purchase hides for immediate delivery. Eventually, alligator hides may be sold via open auction in conjunction with NAFA's regular fur auctions. NAFA is owned by trappers and fur farmers and is the worlds largest auction house of wild and farm raised fur for the fashion trade. "This agreement will open the door for the US alligator trade to national and international fashion markets. NAFA offers a new opportunity for us to increase demand for our products, boost profits, and deliver better value to fashion designers, manufacturers and retailers," said Rob Southwick of ATC.— from *press release, 12 October 2000, Alligator Trading Company Inc., P.O. Box 1261, Dade City, FL 33526, USA.*

ALLIGATOR DESIGNS. An educational and promotional multi-media kit has been produced in cooperation with the Florida Alligator Marketing and Education Advisory Committee, the Florida Department of Agriculture and Consumer Services, Louisiana Department of Agriculture and Forestry, Louisiana State University and the alligator industry. The kit includes a ten minute video tape and 24 page booklet that targets designers, product developers and manufacturers.

Both elements of the kit provide the buyer of finished alligator skins with information and visual materials explaining the attributes and characteristics of alligator leather. Important aspects of the information include suggested techniques for measuring, constructing, sewing and cleaning alligator leather products. The material is lavishly illustrated with high quality color images showing a variety of traditional and new design concepts for alligator leather. In addition to traditional handbags, luggage and shoes, new design concepts for furniture inlay, jackets, cell phone covers, golf bags and accent accessories (picture frames, vases) are shown. The versatility and variety of finishes and colors available is well presented and there is a page

that briefly explains conservation status and trade controls to reassure buyers of the legal nature of the product. A demonstration of 'faux' (artificial) leather and a list of suppliers and sources round out this useful material. Copies are available from *<mccranp@doacs.state.fl.us>* or in the USA call 850 488 0163. — From *GATOR TALES, the American Alligator News Magazine Vol 7.issue2, Spring 2000* and Phyllis McCrannie, *Florida Department of Agriculture & Consumer Services, Bureau of Seafood, Tallahassee, FL, USA.*

WANTED: ALLIGATOR WRESTLERS. MUST BE BRAVE AND A RISK TAKER. NO EXPERIENCE NEEDED. Officials of the Seminole Nation said there are immediate openings for alligator wrestlers for their tourist attractions in Florida, USA. Health insurance, Seminole officials pointed out, is available.

But despite decent pay and benefits, "we just don't have enough alligator wrestlers," said Alexandra Frank, operations manager at Seminole Okalee Village, a small museum and tourist stop between Miami and Fort Lauderdale on the Seminole Reservation. For decades, Seminole Indians here have entertained tourists — and relieved them of their vacation dollars — by wrestling alligators. But now there is a shortage of young people within the tribe who want to go into the line of work, preferring college, e-commerce, casinos and, well, anything else.

So, tribe officials are trying to recruit alligator wrestlers, and "just because someone's not a Seminole, doesn't mean we'll look down on them," Ms. Frank said. The tribe even advertised in The Sun-Sentinel newspaper in Fort Lauderdale. So far, only a few people have applied. Earlier this year, a Seminole chief, James Billie, lost a finger while wrestling an alligator in a tourist stop in the Everglades, as about 100 tourists looked on. "More and more, Seminoles pursue other careers," Ms. Frank said. "They're being told again and again to go pursue a college education. It would be nice to keep it a tradition, but it's their choice."

Alligator wrestlers put on four shows a day at the Okalee Village, and every move, they said, is carefully thought out. For decades, tourists passing through South Florida have paid — the going rate now is $5 — to watch the spectacle. It is all for show, but it was not always so. Alligator wrestling runs deep in Seminole history, long before the tourists came. Once, the Seminoles captured the alligators and kept them as a ready source of food, much the same way sailors once stowed live turtles in ship holds on long journeys.

Animal rights activists have complained that the wrestlers abuse the alligators during the shows, which end with the wrestler sitting on the animal's back, gripping its snout. But the alligators are difficult to hurt. "I don't believe there's any physical harm done," at least to the alligator, said Kent Vliet, an alligator biologist at the University of Florida. "But the animals definitely don't like it. They try to turn and run. I think they'd prefer to be left alone" — By Rick Bragg, Hollywood, FL. September 20, 2000.

GATOR TALES REBORN. Gator Tales, the magazine produced by American Alligator Cycle of Protection (AACOP), has undergone a change of editorship, publisher and a facelift to re-appear as 'the American alligator news magazine'. AACOP is a non-profit organization dedicated to actively educating all on the need to protect, manage and sustain the American alligator and its habitat. Formed initially by the Florida Alligator Trappers Association, AACOP has broadened to represent the whole industry and undertaken some significant national level activities. Among these the regular publication Gator Tales and an alligator Awareness and Safety Program 'Be Gator Safe' with brochures and posters adopted throughout the Southeast.

AACOP and Gator Tales were guided through their formative years by President Mike Fagan and executive director Lynanne Lawhead, whose energy, vision and dedication laid a firm foundation for the next step. The excellent professional layout and design of Gator Tales were inspired by the work of Karen Smittle of Smittle Associates (who also designed the CSG brochure). Lynanne stepped down early this year and Mike announced in the Spring issue of Gator Tales a new partnership with Schatz Publishing of Oklahoma to produce Gator Tales. The magazine has now been placed on a paying subscription basis, $25.00 for four issues a year as well as AACOP membership.

Layout of the Magazine is smart and professional with glossy cover, good quality

illustrations and graphics. Content covers a wide range of topics from current skin price ranges, product design, market research and analysis, featured skin producers, general conservation and state alligator program reports. Gator Tales and CSG Newsletter have arranged a reciprocal subscription and often reprint each others articles with permission (see ALLIGATOR DESIGNS below). Gator Tales and AACOP strive to be a non-partisan forum for the American alligator industry. To join AACOP and receive Gator Tales contact — *Schatz Publishing Group, 11950 W. Highland Ave., Blackwell, OK 74631, USA <schatzpub@aol.com> or AACOP, P.O. Box 1637, Dade City, FL 33526-1637, USA. <aacop@gte.net>*

Veterinary Science

CAIMAN POPULATION HEALTH MONITORING IN THE ARGENTINE CHACO. Ranching of caiman (*Caiman yacare and C. latirostris*) in the Argentine Chaco is being developed by Fundación Vida Silvestre Argentina (FVSA) <refugios@vidasilvestre.org.ar> at Estancia _El Cachapé_ <cachape@fibertel.com.ar>, as a wildlife sustainable use project directed towards wetland ecosystem conservation (see CSG Newsletter April-June 2000). With quotas on the harvest of wild caiman nests and captive incubation and raising of youngsters, this ranching system (in an experimental stage at El Cachapé) intends to provide enough young to both satisfy market demands and the restocking of wild populations. To minimize disease risks associated with this "catch and release system", strict sanitary controls on the captive raised animals together with baseline wild population health information is necessary. In 1999, the Field Veterinary Program of Wildlife Conservation Society (FVP-WCS), began a collaborative effort with FVSA to survey caiman population health. During January 2000, a total of 17 samples were collected from wild caiman and 18 from captive raised animals of both species. Blood samples (5% of total blood volume) were collected for later analysis and all sampled animals received a complete physical examination and were marked prior to release. Analysis performed in the field included white cell counts (WBC), total solids (TS), packed cell volume (PCV) and direct blood smear evaluation for hemoparasites. Blood was then centrifuged and plasma frozen on dry ice (-70°C). Biochemistry and mineral determinations were performed by Wild Life- Lab (Dr. Maria Cristina Ferreryra Armas). Fecal samples from captive caiman were analyzed by Dr. Pablo Beldoménico at Lab. Parasitología, Fac. de Cs. Veterinarias (UNL), with negative results. Samples for infectious disease serology were submitted to several diagnostic centers. Laboratorio Azul (Drs. Alfredo Martinez and Juan Carlos Bardon) analyzed 8 *Leptospira interrogans* serovars, resulting negative for all individuals. Instituto Nacional de Enfermedades Virales Humanas (Dra. Gabriela Avilés) performed IHA (hemagglutination inhibition analysis) for arboviruses, including Easter Equine Enchephalitis (EEE), Western Equine Encephalitis (WEE), Venezuela Equine Encephalitis (VEE) and San Luis Encephalitis (SLE). All animals (captive and wild) were negative. Finally, Dr. Carlos Rossetti from Instituto de Patobiología (CICV, INTA Castelar), analyzed the samples for 24 *Leptospirosis interrogans* serovars, including many uncommon strains. All caiman were strongly positive to *L. sarmin*, and the highest antibody titers were found in five captive *C. latirostris*. Twenty five samples also tested positive for other serovars, specially *L. pyrogenes* (15) and/or *L. ranarum* (19). This is the first report of the presence of this pathogen in free-ranging caiman in Argentina, and is only comparable to previous findings by Dr. William Karesh (FVP-WCS, pers. communication) in Belize, Brazil and Bolivia. Analysis for *Chlamydia* antibodies are currently underway.

These preliminary results suggest a low incidence of pathogens in both wild and captive populations, therefore sanitary conditions of artificially raised animals must continue to be strictly monitored. Additionally, other important pathogens, such as *Mycoplasma* sp. and *Salmonella* sp. have not yet been searched for, and must be included in future sampling efforts. To improve our knowledge on *Leptospirosis* role in these populations, attempts of isolation of *L. sarmin* will be conducted during the next nest harvest season, in addition to a second phase of population health assessment. For more information, visit <www.wcs.org> or <www.fieldvet.org> & <www.vidasilvestre.org.ar> — Lic. Diego

Moreno, Programa Refugios de Vida Silvestre, Fundación Vida Silvestre Argentina, Defensa 251 6ºK - 1065 - Capital Federal, Argentina. <refugios@vidasilvestre.org.ar> & Dr. Marcela Uhart <muhart@satlink.com> Wildlife Health Fellow for Latin America, Field Veterinary Program, Wildlife Conservation Society, 185 Southern Blvd, Bronx NY, USA.

KIDNEY MORPHOLOGY PROJECT, CALL FOR SPECIMENS. In crocodiles the kidney consists of two apposed sheets of tissue, cortical and pelvic, which fold in patterns that appear to be specific for the individual species of crocodiles (Fig. 1). A team consisting of John Soley and Herman Grunewald of the Dept Anatomy of the Faculty of Veterinary Science at Onderstepoort of the University of Pretoria, Vivian de Buffrénil of the National Museum of Natural History in Paris, France, and me, is planning to do 3-dimensional reconstructions of these apparently species-specific folding patterns by computer analysis of serial sections of the kidneys.

Kidney of *Caiman crocodilus*, the pattern of folds is species specific. F. huchzermayer photo.

We have already obtained or been offered the kidneys of *Crocodylus niloticus, C. moreletii, C. acutus, C. porosus, C. novaeguineae* and *Caiman crocodilus fuscus* from farms where crocodiles are being slaughtered anyhow. We are very excited about this huge response. Please let us know if you can help with kidneys from other species. We should like this study to embrace as many species as possible, but we do not wish for any crocodiles to be killed for the sole purpose of collecting kidneys for us.

For this study we need whole kidneys from fresh dead animals, preferably both kidneys from the same animal and a maximum of 10 pairs of kidneys per species. The age of the animal does not matter. The kidneys should be fixed in 10% formalin before being sent to us. Of those species which are not exploited commercially, even a single specimen from an animal that has died will be of great value to us. Please notify me at one of the above addresses, if you are able and willing to help. I shall then supply you with further information. — F W Huchzermeyer, P O Box 12499, 0110 Onderstepoort, South Africa. e-mail: <fritz@moon.ovi.ac.za> or: <crocvet@mweb.co.za>

SCIENCE

GROWTH RATES OF THE 'TERROR CROCODILE.' *Deinosuchus* is a giant crocodylian from the Cretaceous period of North America. It was 8 to 10 m long and weighed between 2,500 and 5,000kg, three to five times more than the largest crocodiles today. How *Deinosuchus* attained sizes to rival its dinosaurian contemporaries, on which it undoubtedly preyed, has remained a mystery. Did it exhibit accelerated growth like its dinosaurian cousins, or did it maintain primitive reptilian growth rates for decades (as was once proposed to explain giantism in dinosaurs)? We find that growth indices from *Deinosuchus* skeletons reveal rates comparable to those of smaller crocodylian taxa, indicating that gigantic proportions were attained by prolonging development.

We reconstructed growth patterns in *Deinosuchus* by coupling age and size estimates throughout development and determined longevity by counting growth rings in dorsal osteoderms from several individuals from the Campanian Judith River formation of Montana and the Aguja formation of Texas. Such rings form annually throughout the skeleton in extant members of the crocodylia. We based estimates of total length on a large mandibular ramus from Texas and published regression curves for the

American alligator and saltwater crocodile. We used proportions of linear increase per growth ring as standardized measures to estimate annual increases in body length throughout ontogony, and conducted comparable analyses of large individuals from clades closely related to *Deinosuchus*.

We estimate longevity in the *Deinosuchus* specimens to be 50 and 51 years. Extant crocodilians rarely live this long in the wild and none of the fossil specimens from related lineages attained such ages. We estimated the total lengths for the *Deinosuchus* specimens to be 8.43 to 9.10m. Growth in non-gavialoid crocodylians was characterized by rapid linear increases early in development, with rates typically declining by the first decade after hatching. *Deinosuchus* showed similar rates (about 0.3 m/year) but maintained these juvenile growth rates for several decades. The histological structure of *Deinosuchus* skeletal elements supports the interpretation that primitive developmental growth rates were retained. Bones from the giant crocodylian showed slowly deposited lamellar-zonal bone tissue typical of non-gigantine crocodylians. This is in contrast to dinosaurs, which show evidence of derived, accelerated rates in the form of rapidly deposited fibro-lamellar bone.

The evolution of increased metabolic rates in dinosaurs is believed to have facilitated the evolution of giantism by enabling them to build their skeletons swiftly using fibro-lamellar bone. Dinosaurs of similar size to *Deinosuchus*, such as hadrosaurs, reached adult size in only seven to eight years whereas the giant crocodylian required more than 35 years. We believe that the retention of an ectothermal physiology constrained *Deinosuchus* to the deposition of slow forming tissues throughout development, necessitating a greater time to reach dinosaurian proportions. — *adapted from* Erickson G. & C. Brochu, 1999. *NATURE, Vol 398:205-206.*

ON THE USE OF CAMERA TRAPS TO STUDY CROCODILIAN NESTING BEHAVIOR. The study of crocodilian nesting behavior in the wild is a difficult thing because, like subatomic particles, the very act of trying to determine what is going on through measurement will change the system being studied (with apologies to Werner Heisenberg). One of us, who shall remain anonymous, has, while doing his Ph.D. research in Venezuela in the late 1980s, tried to watch wild spectacled caiman nest while remaining motionless on his belly in the dark. A much more satisfactory method is through the use of an automated camera triggered by a passive IR motion (& heat) detector to photograph female crocodilians on the nest. These camera systems are readily available commercially and offer exciting new opportunities to understand what goes on at night (or even during the day)

We have used a system made by Camtrakker in Cuba on hole-nesting American crocodiles and in Brazil with mound-nesting black caiman. The same camera system is also available through Forestry Suppliers and costs about $480 per unit. The following brief description of the system is adapted from the Camtrakker web site.

CamTrakker uses a fully automatic (auto focus/advance/flash), 35mm Yashica T4 Super camera (with Zeiss lens) combined with a passive infrared motion detector designed specifically for detecting animals in the wild. The entire system is self-contained in a weather-tight ABS housing that you can attach to a tree with wire or a bungy cord, or even with duct tape. On open nesting beaches we have made a camera stand from branches either as tripods or as stakes pushed down into the soil.

CamTrakker is powered by four "C" alkaline batteries. The camera operates on a single 3-volt lithium camera battery. CamTrakker is equipped with a "light sensor" which allows you to select continuous 24-hour operation, day-only operation or night-only operation.

You then select among six delay options - 20 seconds, 90 seconds, 3, 5, 25 or 45 minutes. This feature allows you to control the incidence of multiple photos of the same animal. However, the model I have purchased through Forestry Suppliers only had 3 delay settings (3, 6 or 10 minutes).

The Yashica T4 Super camera uses standard 35mm film (from 100 to 3200 ISO), and, it lets you choose between day/month/year and day/hour/minute imprints on each photograph. The day/hour/minute option helps you pinpoint exactly when animals are using your monitored area. The camera's Zeiss lens can focus as close as 20 inches and will focus on subjects not centered in the frame (a critical feature for a surveillance camera). After selecting a location for the unit, you "aim" it using the view finder on the top of the camera, or the small red aiming light. Once aimed, simply activate the

CamTrakker and it's ready to go! When you retrieve your CamTrakker you simply remove the used film, (have it processed as you would any roll of 35mm film) add a fresh roll and set up the CamTrakker for another stint in the woods.

The unit uses a passive IR system, that is it detects movement and temperature differentials. As these systems are developed more for warm-blooded animals, I was uncertain how well they would work with ectotherms. Our experience in Cuba suggests that this is no problem. However, in Brazil, on one occasion a female opened a nest right in front of the camera and it only took one photo! More work will have to be done to tell if the passive IR system is adequate under all conditions, but another alternative is to use an active IR system (detects any motion), and these are available at a slightly greater cost through companies such as Trailmaster <www.trailmaster.com>. Another problem with the passive IR system is that rapid temperature shifts apparently can trigger the camera. In Brazil, we have several hundred photos of black caiman nests taken during the day, with no animals in sight. We believe this is due to clouds, which when the sun reappears and suddenly heats the nest mound, will trigger the camera. Under these conditions, it would best to put the camera in night-only mode.

The cameras also give you the opportunity to see what else is walking around nests and or eating croc eggs. In Brazil, we have some very nice photos of *Cebus* monkeys eating spectacled caiman eggs, and tegu lizards opening both black and spectacled caiman nests. In Cuba, we have taken lots of photos of turkey vultures, night herons and doves, and also a large assortment of *Cyclura* iguanas which nest on the same beaches (the cameras are promising to study activity patterns of these lizards).

Our experience in Cuba gives us great hope that these cameras will allow us to better understand both the nesting and nest-opening behavior of crocodiles. We have now photographed females carrying young (see cover of CSG Newsletter 1999, Vol. 18(2)) as well as females digging open nests and listening for the vocalizations of the young. The camera systems are a bit expensive and do use a lot of film, however, Camtrakker has just now come out with a system that uses a digital camera (for $1,250). — John Thorbjarnarson, Roberto Rodríguez Soberón, Manuel Alonso Tabet, Roberto Ramos Targarona and Ronis Da Silveira.

GPS TRACKING SYSTEMS FOR LARGE ANIMALS. The establishment of the global positioning satellite network, the widespread availability of hand held Global Positioning Systems (GPS) and associated miniturization of this technology, and the recent removal of technical constraints on position resolution, allowing 1-3 m accuracy, combine to make GPS animal tracking feasible. Battery and package sizes of from 70g to 1800 g and battery life exceeding 1 year make this technology suitable for applications on medium size and large animals. Televit Positioning of Lindsberg, Sweden, has pioneered this application for moose, elk, deer and bears in Europe and are now marketing their products internationally and since 1996 in the USA through Telemetry Solutions in California. Televit president Per Arne Lemnell and representative Quentin Kermeen recently demonstrated their equipment at the CSG office in Gainesville and are interested in expanding their application for use on crocodilians.

Televit makes two basic systems that are available in a variety of configurations to meet researchers needs. The 'Posrec Science' is their smaller unit available in backpack and collar form weighing from 70g – 900 g depending on battery capacity. The unit can be programmed for automatic separation from the collar for recovery. The unit has a built in VHF beacon and back-up battery that allows recovery of the unit after the main battery is exhausted. The unit will receive and store between 730 and 19,600 GPS positions and is pre-programmed at the factory to the users specified position collection schedule from 1/minute to 1/week intervals. Recovery of the data from the unit has to be done at the Televit factory or Telemetry Solutions and the unit can be refurbished with new batteries and programmed for re-use.

The more sophisticated and larger unit is the GPS-Simplex available in sizes recommended for deer and mountain lions (600g and 1 'C' battery) up to the Large Moose model (1800 g and 5 'D' batteries). These are programmed by the researcher and can collect and store between 2,000 and 15,000 GPS positions. The unit will transmit the data to a remote location by VHF radio. Data can also be directly downloaded after automated collar drop off and retrieval. A high performance GPS antenna improves signal reception in dense cover and battery replacement and 7day/week technical support are available.

Both the Posrec and GPS Simplex are robustly housed in completely watertight epoxy resin housing. The present attachments are designed primarily for terrestrial mammals and are, therefore, collars of industrial belting with antennas (GPS and VHF) integral in the collar. The attachments appear very robust and well designed, but not immediately applicable to crocodilians. However, the stainless steel bolts attaching the housing to the collar could be easily adapted for crocodilian use, either as modified collar or for direct attachment to dorsal scutes.

An unresolved question is the effect of continuous immersion and the ability to detect and calculate a position in the periods when the unit might be exposed above the water. However, for studies requiring courser time resolution (e.g. daily positions), it is likely that exposure during basking at the surface or on land will be adequate. The unit, like all GPS applications, has limited application under a closed forest canopy, although tests in rain forest indicate up to 60% successful position acquisition. Costs are comparable to similar satellite tracking systems and sophisticated radio tracking and remote sensing, falling around $2,000 - $3,000 per unit. Televit is eager to work with researchers to develop new and useful applications of this technology. More information is available at <www.televit.se> and <www.telemetrysolutions.com> and inquiries can be addressed to — Quintin Kermeen, *Telemetry Solutions, 1130 Burnett Ave. Suite J., Concord, CA. 94520, USA. <qkermeen@telemetrysolutions.com> or* Per Arne Lemnell, *Televilt Positioning AB. Bandygatan, P.O. Box 53, SE-711 22, Lindsberg, Sweden <per-arne.lemnell@televit.se*

CITES

APPROVED TAGS FOR CROCODILIAN SKINS. Notification NO. 2000/042 Geneva, 31 July 2000. Universal tagging system for the identification of crocodilian skins Implementation of Resolution Conf. 9.22 (continuation)

1. In accordance with paragraph 1 of Annex 2 to Resolution Conf. 9.22, the Secretariat is communicating details of the following additional manufacturer able to produce tags for the marking of crocodilian skins in accordance with that Resolution:

BROOKS-TODO SA. France, 7, rue du Raisin, F-68100 Mulhouse France Tel.: (33-38) 936-0161 Fax: (33-38) 946-0774

2. This Notification is an addendum to Notification to the Parties No. 962 of 7 March 1997 which lists the following approved tag manufacturers:

ALBCO (PVT) Ltd, Attn: A.L. Balarin, Harare, Zimbabwe, Telephone: (2634) 754002/7 Telefax: (2634) 754008

ALPHEX, Industrias Plásticas, Gerente: Juan Manuel Florez Zamorano, Calle 163A No. 35 – 17, Santa Fe de Bogota, Colombia. Telephone: (571) 6777205; 6776855, Telefax: (571) 6776866

American Castings & Manufacturing Corporation, 51 Commercial Street, Plainview, NY 11803, United States of America, Telephone: (1516) 3497010, Telefax: (1516) 3498389, Toll free: (1800) 3420333

E.J. Brooks Co., 164 N. 13th Street, Newark, NJ 07107, United States of America, Telephone: (1201) 4830335, Telefax: (1201) 4831936

FASTEX, P.O. Box 112, Oakleigh South, Victoria 3167, Australia, Telephone: (613) 5795111, Telefax: (613) 5792862

GRAFIMET, c. a., Equipos e Instrumentación para la Ciencia y, la Industria y Precintos de Seguridad, Calle Capitolio o República Dominicana, Edificio Alpha, Planta Baja + Local No. 4, Caracas, Venezuela, Telephone: (582) 2390218; 2396969, Telefax: (582) 2394949

— *from CITES web page, <http://www.wcmc.org.uk/CITES/eng/index.shtml> 'Documents', 'Notifications'.*

CSG On-Line

NEW CAIMAN WEB PAGE. Walter Prado, in Argentina, has posted an outstanding new web page concerning caimans in Argentina. This excellently presented page is filled with valuable information, useful illustrations and valuable links. This puts a significant amount of information on caimans and crocodilians generally up on the web in Spanish and will be a valuable resource throughout the region. See it

at <www.yacare.net> Walter S. Prado, *Proyecto de Conservacion y uso sustentable de yacares en la Provincia de Chaco, Refugio de Vida Silvestre 'El Cachapé', Chaco, Argentina. <walterprado@yahoo.com>.*

THE 'CITES IDENTIFICATION GUIDE – CROCODILIANS' is now available on the World Wide Web at <http://www.flmnh.ufl.edu/natsci/herpetology/CITEScroc/default.htm>. The printed edition of the guide (ISBN 0-662-61957-9) was published by Canada's Minister of the Environment in 1995. The idea for the guide originated with Yvan Lafleur, Chief of the Wildlife Division, Office of Enforcement, and was researched and produced by Richard Charette, Inspector, Office of Enforcement. F. Wayne King, Rene Honegger and Perran Ross of the CSG provided scientific advice.

The CITES guide was designed as an aid to Customs officials, wildlife inspectors, and law enforcement personnel who need to identify live crocodilians, skins and products that are being imported, exported or moving in international commerce. The use of the guide requires no previous knowledge of biology and relies on a simple visual approach.

The guide contains a section that explains the working of CITES; how to determine the validity of CITES permits; how to identify live crocodilians, skins and products; illustrations and descriptions of each species and many products; tables that detail the morphological characteristics; a list of range states from which shipments may originate; and a complete list of common names that might appear in the trade. Most importantly, the guide contains a fast key to the identification of crocodilians. The illustrations of every species, prepared by Swiss wildlife artist Urs Woy in consultation with CSG member Rene Honegger, are the finest ever done of crocodilians.

The printed guide is trilingual, which increases its usefulness. Separate introductory sections are in English, French and Spanish, and every species page is labeled in all three languages. The guide is so useful that copies were sought by dealers who were striving to comply with CITES regulations, by herpetologists and by amateur crocodile fanciers, but the initial press run was too small to supply the demand.

A memorandum of understanding was drawn up that protected Environment Canada's copyright and the integrity of the original guide and allowed the CSG to format the guide for the web.

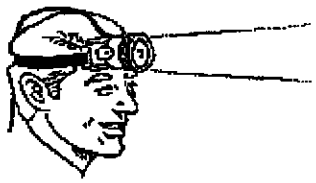
The online guide differs from the printed edition in that rather than having English, French or Spanish on every page, the user is asked to choose one of the languages and from that point on the online web pages are in that language. Every page has links to the same page in the other two languages, to the table of contents, to the next page, and to pages that explain the many identifying features and the CITES listings. Visit <http://www.flmnh.ufl.edu/natsci/herpetology/CITEScroc/default.htm> and then choose among: CITES Identification Guide – Crocodilians, Guide d'identification CITES – Crocodiliens or Guía de identificación de CITES – Cocodrilos,

The first CITES Identification Guide produced by Environment Canada was for birds (parrots, macaws, and other species in commercial trade), the second was for crocodilians, and the third was for turtles and tortoises. The crocodilian guide has been reprinted and other CITES guides on butterflies, sturgeons, hunting trophies, tropical woods, and CITES enforcement are planned. If you would like to obtain any of these printed guides, the online guide provides a link to the Environment Canada web page where they can be purchased.

The online crocodilian guide can also be accessed from the Crocodile Specialist Group website <http://www.flmnh.ufl.edu/natsci/herpetology/Crocs.htm>, and the online guide, the CSG, the CSG Newsletters, the Status Survey and Conservation Action Plan for Crocodiles, the Crocodilian Photo Gallery, and Crocodilians Natural History & Conservation, can all be accessed from <http://www.flmnh.ufl.edu/natsci/herpetology/herpetology.htm>. — F. Wayne King, *CSG Deputy Chairman.*

CSG PROCEEDINGS, SINGAPORE 1998 ($40) AND CUBA, 2000 ($50). AVAILABLE FOR SALE SOON.
ORDERING AND PAYMENT DETAILS IN THE NEXT NEWSLETTER.

Personals



Mr. Akira Saikyo, Chairman of the CITES Promotion Committee of Japan Leather and Leather Industries Association, founding member of Asian Conservation and Sustainable Use Group and long time member, supporter and friend of the CSG announced his 'partial retirement' from active work to follow personal interests in business, sustainable use and conservation issues. At a 'Thanking Mr. Saikyo' Party convened in Tokyo on October 19 to thank Saikyo San for his many contributions, the following statement from Professor Harry Messel, chairman of CSG was presented.

"This is a party I wanted to attend very much to pay tribute to Mr. Saikyo and because of my high regard and warmest feelings for him. Every time I think of Japan I think of him. He is a truly outstanding leader and a very clever one. He has done so much for so many and I am confident that his leadership abilities are as great as ever. It has been a great privilege to be associated with Saikyo-san and to work on projects with him. I truly thank him for his wonderful support and for all that he has done. My best wishes to him for an exciting retirement."

John E Cooper & Margaret E Cooper, *P.O. Box 153, Wellingborough, Northants, NN8 2ZA, UK,* continue their veterinary outreach in Africa, described in a recent letter: We made Makerere University our base and our work with the University included organising a research day at Uganda's only crocodile farm. In addition to supervising some routine veterinary duties there, we initiated a study on parasites, with particular emphasis on searching for a species of schistosome (fluke) that has been reported from crocodiles in Australia but not, so far, from *Crocodylus niloticus* in Africa. Two recent graduates from the Faculty, Innocent Rwego and Lawrence Mugisha, accompanied us on the trip and they are following up the research.

Our interest in crocodiles took us also to Murchison Falls Conservation Area where *C. niloticus* breeds in large numbers and where eggs have been regularly collected for incubation and hatching. WARM may participate in a census of Nile crocodiles.

Tom Dacey, *Executive Officer, Wet Tropics Management Authority, P.O. Box 2050 Cairns Qld, 4870, Australia*, writes- "We recently spent three weeks fishing for barramundi in the Northern Territory, in northwestern Arnhem land. The fish, wildlife and crocodiles were plentiful. I had one 'salty' try to take some fish out of the small dingy I was using and I had to break an oar over his head. Then I had to row back to the river bank with half an oar! I can assure you that there is no shortage of crocs in that part of NT."

Meetings

MEETING ANNOUNCEMENT

FOURTH WORLD CONGRESS OF HERPETOLOGY
COLOMBO, SRI LANKA
2 – 9 DECEMBER 2001
(note change of date)

For details and expressions of interest contact the Conference Director, Anslem de Silva, Faculty of Medicine, Univesity of Peradeniya, Peradeniya, Sri Lanka, or visit the updated website <http://www.4wch.com> — Michael J. Tyler, *Secretary General, World Congress of Herpetology, <ellatyler@msn.com.au>*

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

Steering Committee of the Crocodile Specialist Group

Chairman: Professor Harry Messel, School of Physics, University of Sydney, Australia.
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