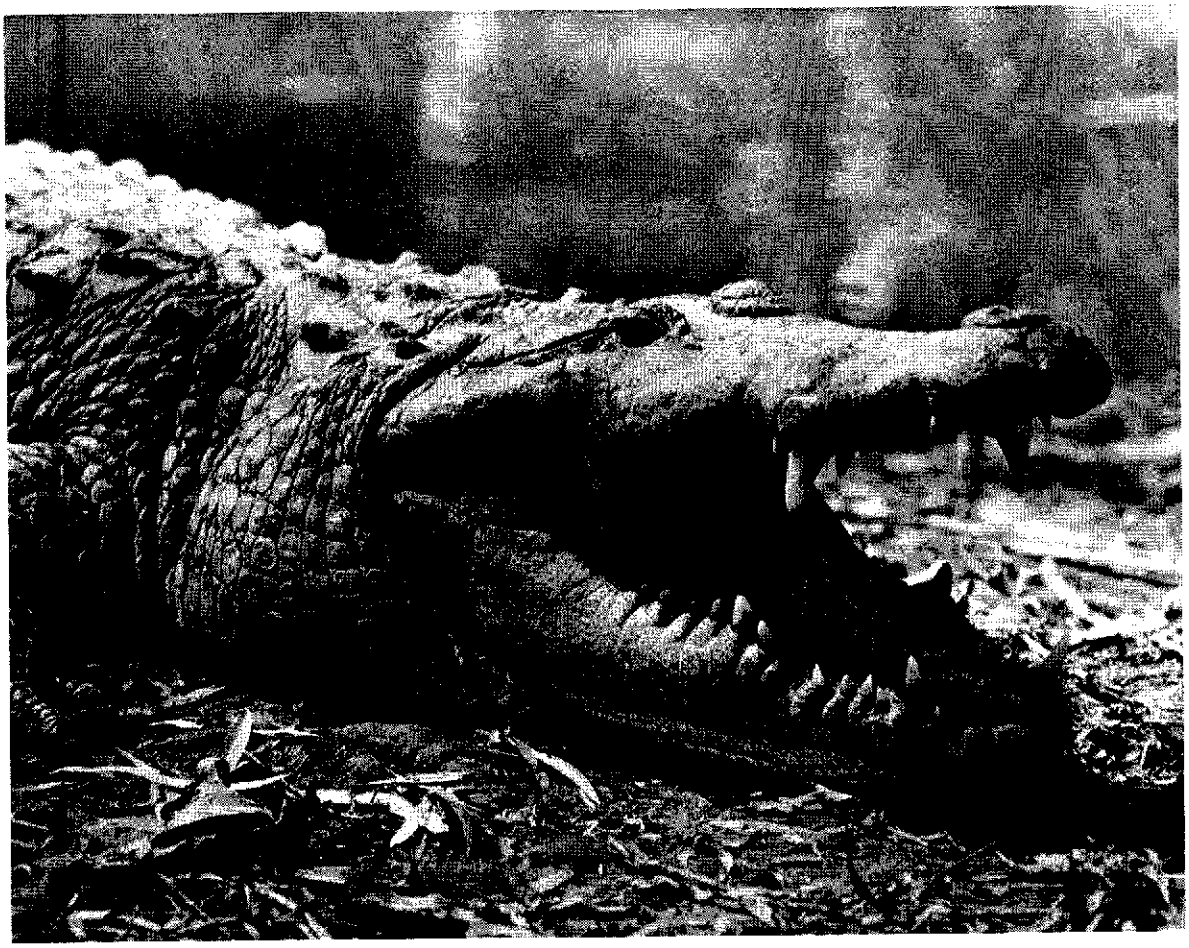
CROCODILE SPECIALIST GROUP

NEWSLETTER

VOLUME 19 No. 1 ■ JANUARY 2000 – MARCH 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. *Crocodylus moreletii*, male 2.6 m at Cocodrilos de Chiapas Crocodile Farm, Mexico. M. Muniz 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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Enrico Chiesa, Italhide S.R.L., Milan, Italy.
S. & J. Puglia, Alligator Adventure at Barefoot Landing, Myrtle Beach, SC, USA.

Chicago Zoological Society, Brookfield, IL, USA.
Wayne Sagrera, Vermilion Farms, LA, 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.
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American Alligator Council, Tallahassee, FL, USA.
Somkiat Wannawatanapong, Wabin Crocodile Farm and United Leather Product Co. Ltd. Thailand.
Newport Aquarium, Kentucky, USA.

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.
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Alian Ruswan, Medan, Sumatra, Indonesia.
Manuel Muñiz, Cocodrilos de Chiapas, Mexico.
Dave Durland, Durland-Larson Sales Inc.,

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Netherlands Foundation for International Nature Conservation, Leiden, Netherlands.
Howard Kelly, Ramsgate, South Africa.
National Geographic Society TV, Washington DC, USA.
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J. Caraguel, Cartagena, Colombia.
Ferrini Italia Inc., Dallas, TX, USA.

ERRATUM

ESTIMATES OF CURRENT CROCODILE SKIN PRODUCTION CAPACITY. NEWSLETTER VOL 18 NO. 3. Page 18. Table 1. The figure of 41,489 *C. porosus* skins given for Papua New Guinea in 1997 is erroneous. The correct figure, reported by the PNG Office of Environment and Conservation to the CSG is 8,578 *C. porosus* skins exported in 1997. The erroneous figure reported is the sum of *C. porosus* and *C. novaeguineae* exports. The Editors apologize for misreading the information supplied.

EDITORIAL

NEWSLETTER SUBSCRIPTION. This issue contains the annual request for every recipient of the Newsletter to renew your mail address information and confirm your continued interest in receiving the CSG Newsletter for the current year (Volume 19). We also invite those of you able to do so to make a donation to support Newsletter production and distribution. This is also an opportunity for readers to suggest others who might like to receive the Newsletter.

We send the Newsletter to all CSG Members and to anyone else who requests it. Subscriptions are for one calendar year. If you return the subscription request, or a donation or submit materials for the Newsletter we keep your subscription active. If we hear nothing at all from you, sooner or later we get around to inactivating your subscription. If we hear from you, we re-activate it.

We encourage all Newsletter recipients to return the subscription form and keep their subscription active. Donations to support the Newsletter and materials to include in it are very gratefully received. We also take this opportunity to remind readers of our 'Views and Opinions' section, a forum for the discussion of provocative ideas that has been inactive due to the lack of your submissions. If you have a bee in your bonnet or a hair up your you-know-what about a crocodilian issue, this is the place to share it with croc researchers the world over. -- *The Editors*.

REGIONAL REPORTS

AFRICA

Madagascar

CAVE CROCODILES OF MADAGASCAR. I have recently seen one of the most exiting sites for crocodiles in the last 15 years that I have been looking for them. The area is a limestone karst massif which comprises a least 100 km of underground river systems. There has been talk for years that a few people reported crocodiles in the caves but these had never been seen by a "crocodile specialist."

I visited the area last year and in a cave open to the outside with water holes on its side which are the opening of underground rivers I saw crocodiles. The first impressive thing - for people like us who spend hours and hours in the dark on rivers - is that there is nothing darker than a cave. Indeed, I do not understand how the path that I saw on the sand along the cave river could be followed by crocodiles with absolutely no moon or sky reflection light. Second, the crocodiles are indeed living in the cave, at least during that dry period, as I saw many tracks coming out of water holes in the rock and going into other water holes a bit further along the quite dry river in the main cave.

The small crocodiles I saw closely were quite fat as there was lots of fish in the water as well as crawfish (very low water level). There are lots of people as soon as the river gets out of the caves. I could not check the temperature but I have doubts that it could allow hatching. I therefore went down the river. At the beginning of the mangroves I found two huts of local people. The head of the family brought me to see the crocodiles, 5 minutes walk away (this is two hours away from an international airport). There was there a group (I saw 6 at once) of real big crocs (cattle eaters from time to time). I had found the breeding site where apparently 15 females lay eggs. The site is peat over the mangrove between fantastic blooming *Pachypodium grevei* and endemic birds.

We have been able in Madagascar - with lots efforts - to structure the egg collection for the benefit of local populations and are on a good way to be able to structure the killing of nuisance crocodiles. The local market has proved to exist up to now without threatening the wild population. This being said it is little controlled and young animals are mainly used because they are easier to find and to kill.

If a hunter sees what I saw it would look like a great opportunity to make good money. The site could easily be visited by tourists coming to a nearby reserve. One guide, good in reptiles, is interested in organizing the trip with the local people. This is going to take a minimum of time and I am looking for a way to involve the local guy right now. If he could be employed as a crocodile guard the difference could be made. I have now enough good contact with some good willing people of the water and forest department to set a project to acquire the breeding island of the mangrove.

An interesting salary for such a guard would only be 150.000 Malagasy Francs a month (30 US $). We could probably get the few tens of hectares of the breeding island for less than $10,000 US. The question is simple: "Who could help?" -- Olivier Behra, *Responsable Recherche et Développement - Research and Developement Officer, BioSave, Lot IBG 24 Isoraka, Antananarivo, Madagascar.*

Malawi

CROCODILE MAGIC KILLS MALAWIANS. Crocodiles in southern Malawi's Lower Shire Valley kill at least two Malawians every day, and some experts blame this in part on the government's obligations under the Convention on Endangered Species (CITES). The toll in human lives is apart from all the livestock killed in the area. A professional hunter, Khaled Hassen, says the reported killings of two Malawians every day is probably just the tip of the iceberg. "People in the area no longer report every death to the police or the district commissioner because it happens every day," says Hassen who recently carried out a survey on crocodile attacks on humans in the area.

Hassen has been in the crocodile business since 1963 and has recorded killing at least 17,000 crocodiles in Malawi since then. He mainly exports crocodile skins to fashion houses in France. "I think the government should seriously consider culling the growing number of crocodiles in the Lower Shire Valley," says Hassen, adding that ever since Malawi signed the CITES treaty, the crocodile population in the area has grown at an almost uncontrollable rate.

Before signing the treaty, Malawi used to kill about 800 crocodiles annually but the treaty only allows 200 crocodiles to be killed per year, a quota which, according to Hassen, is not enough to control their growing numbers. According to Hassen, since crocodiles are multiplying at such a rate and are hungry, they inevitably will claim a large toll in human lives. "Malawi's crocodile population can be controlled if 500 of them were killed annually," Hassan says, adding that when the situation got out of hand during one week last month, he killed 100 crocodiles at the request of the Department of Parks and Wildlife and other people in the area. The issue of crocodiles in Lower Shire is so serious that it has been brought up in parliament as well.

Answering a question from a member of parliament in the area on what the government intends to do about the crocodile problem, Wildlife Minister George Ntafu said his ministry suspected witchcraft in the proliferation of crocodile attacks on human beings. -- *Environmental World News, Blantyre Jan 14 Sapa-DPA.*

Nigeria

CROCODILE DISTRIBUTION IN S.E. NIGERIA, PART II: Previous surveys suggested that both *Crocodylus* species are seriously threatened in Nigeria, and that *C. cataphractus* is critically endangered and possibly near to total extinction (e.g., see Dore, 1991. CSG Newsletter 10 (3): 5-6; Dore, 1996. CSG Newsletter 15 (2): 15-16; Dore, undated. "Status of Crocodiles in Nigeria", report to Flora and Fauna Preservation Society, 45 pp; Akani et al., 1998a. Bull. Soc. Herp. France 87/88: 35-43). In this note, we report a short updated synopsis of our data on these two species, whose status and distribution in southeastern Nigeria have been monitored since 1996. The territory surveyed extends from the Niger River to the political border between Nigeria and Cameroon, and includes the following states: Bayelsa, Rivers, Abia, Akwa-Ibom, and Cross River. The main habitats are swamp freshwater forests, forest-plantation mosaics, and coastal mangrove forests. The surveyed area is under heavy anthropic pressure. Oil and Gas companies (ENI Group, Snamprogetti S.p.A., T.S.K.J. Nigeria Ltd), and Environmental institutions (Aquater S.p.A., Demetra S.r.l., Ecosystem S.r.l.) financially supported our expensive trips.

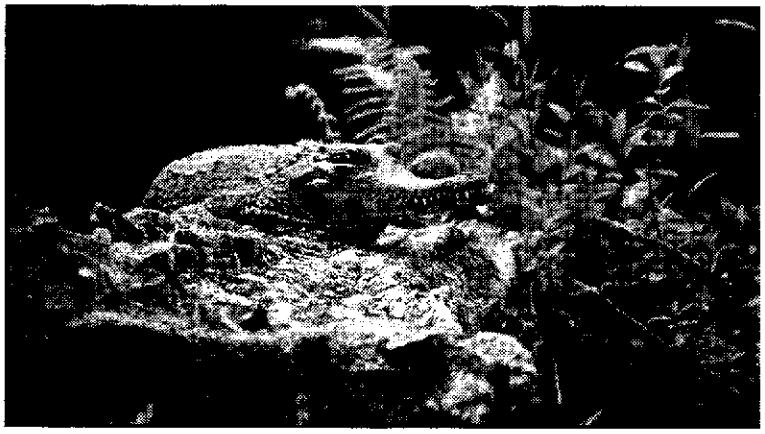
To survey crocodile distribution and status, we used a combination of (i) interviews, (ii) day time river cruises (prolonged for hundreds of kilometers throughout the creeks, lagoons, and river mosaics of this part of Nigeria), and (iii) bush-meat market surveys (Akani et al., 1998b. Anthropozoologica 27: 21-26).

C. niloticus was sporadically observed in the Niger Delta (Bayelsa State: surroundings of Yenagoa and Taylors Creek; Rivers State: Orashi River and Sambreiro River), and in the Cross River-Calabar River system (Cross River State). Although Nile crocodile sightings occurred in quite a good variety of habitats (including both freshwater river tracts with rainforest blocks along the banks and brackish water river tracts with mangroves), the species appeared very rare everywhere. For instance, we have never observed aggregations of communal basking individuals, and all the adults observed were quite little in size (< 3 m long). We suspect that the wild populations are very fragmented, and consist of less than 10-15 adults per site. According to Dore (undated report to FFPS, page 25), Nigerian Nile crocodiles avoid the main bodies of water and restrict their movements in the main to the inaccessible mangrove and Pandanus mesh. We could not confirm whether these patterns are right, but also our interviews with local fishermen confirmed Dore's opinion.

No adult *C. niloticus* was found in local bush-meat markets, whereas juvenile specimens were occasionally offered, together with *Osteolaemus tetraspis*, in the markets of Ahoada and Rumuehuo (both in Rivers State). A few *C. niloticus* skins and leather objects were offered in big hotels in both Port Harcourt ("Presidential Hotel") and Calabar ("Metropolitan Hotel"), but it was impossible to establish whether these skins originated from Nigerian specimens, either farmed or wild. Several souvenir shops in Port Harcourt, Aba, and Calabar offered stuffed

young and subadult *C. niloticus* specimens. We tried to investigate the origin of these latter specimens by interviewing the owners of the shops and/or the sellers. Curiously, nearly all the interviewees agreed in considering those specimens as coming from Kano (northern Nigeria), where we were told crocodile farms exist. However, we were unable to check for the correctness of these assertions. The species was well represented by groups of specimens in both public and private zoos, e.g., in Port Harcourt and Calabar.

C. niloticus is well known to most villagers in southeastern Nigeria. It is always called "crocodile" by english-speaking persons, but assume a variety of native names ("aguiyi" by Igbos; "ofiom" by efiks, "isatim" by Calabaris, etc). *C. cataphractus* is no doubt the rarest of Nigerian crocodiles. Throughout all of our surveys, we were able to see only a single wild specimen. It was an adult, about 1.8 m long, killed by an hunter along a creek of the lower Orashi River course (Rivers State), with mangrove and rainforest along the banks. The fact that we saw just a single specimen could be per se a good indication of the extreme rarity of this species in southeastern Nigeria. However, interviews with local people further confirmed how critical should be the status of Nigerian *C. cataphractus*. Indeed, most tribes did not know the species at all (even after showing them photographic records of *C. cataphractus*), and the people of the unique site of this species' ascertained presence testified that it is the rarest aquatic animal of their territory, together with the manatee. Areas of probable presence of *C. cataphractus* should be the mosaics of creeks, swamps, and forested flood plains in Bayelsa State (central axis of the Niger Delta), as testified by several fishermen belonging to the Ijaw ethnic group who perfectly described this animal. They used a variety of native names for this species, including "igere", "usaki igere", and "zon-igere" (see also Dore, undated report to FFPS, page 18). According to Dore, very small *C. cataphractus* populations should be present in the coastal part of the Cross River basin, especially in the mangrove swamps. However, we were able to find there only very few specimens of *C. niloticus* and *O. tetraspis*.



C. cataphractus, captive individual, R. Sommerlad photo

Conservation measures. - Both *Crocodylus* species are seriously threatened in south-eastern Nigeria. We assign them to the IUCN categories "Endangered" (*C. niloticus*) and "Critically Endangered" (*C. cataphractus*). Thus, their conservation requires much attention and careful planning in the very next years. Southeastern Nigeria still presents wide wet areas with good potential habitats for crocodiles. However, the main problem is that the rapid human population growth (Nigeria is the most populated country of Africa, e.g., see De Montclos, 1994. "Le Nigéria", Kartala, Paris) and the deteriorating economic situation (Marengo and Riganti, 1995. "Enciclopedia Geografica Garzanti", Garzanti, Milano, pp. 1377) constrains the people to abuse of natural resources, and thus to kill an excessive amount of crocodile specimens for leather and domestic consumption. In practice there are still wide forested areas which can sustain large populations of crocodiles, but very few crocodile specimens to live in them!

Based on this evidence, we are led to think that a functional conservation strategy for Nigerian *Crocodylus* would be (1) a better understanding of the remnant distribution and population abundance of the two *Crocodylus* species. (2) the creation of a crocodile-oriented mosaic of protected areas in some crucial areas (e.g., in Niger Delta and in coastal lagoons), and (3) the organization of well-working farms for sustainable development of the crocodilian resource.

We are presently trying to elaborate a rationale for developing these conservation strategies, and we will be pleased for any help we will receive from the expertise of the "Crocodile Specialist Group" of IUCN. In a further article, we will explain in detail the logistics, working phases, and proposals of our "crocodile rehabilitation project" for southeastern Nigeria. -- Luca Luiselli, *F.I.Z.V., via Olona 7, I-00198 Rome, Italy, and Demetra S.r.l. <lucalui@iol.it>*, Edoardo Politano, *Aquater S.p.A., via Miralbello 53, I-61047 S. Lorenzo in Campo (PS), Italy and Demetra S.r.l., via Rossini 15/A, I-61032 Fano (PS), Italy <demetr@tin.it>*, and Godfrey C. Akani, *Department of Biological Sciences, Rivers State University of Science and Technology, P.M.B. 5080, Port Harcourt (Rivers State), Nigeria <rsust@alpha.linkserve.com>.*

Kenya

COVETED CROCODILE GENITALS. Kenyan wildlife wardens had to intervene to stop a group of prostitutes from stealing the genitals from the carcass of a crocodile they killed in Lake Victoria, the Kenya Times reported. The newspaper said prostitutes at Mbita town attempted to remove the crocodile's genitals after wildlife officials had killed the beast while hunting for a rogue hippo. It reported that crocodile genitals were highly regarded by prostitutes as a strong love potion.

Many wananchi (people), including the whores, left the scene disappointed after the wardens hired a boat that carried the carcass, tied it to a boulder and sank it to the bottom of the lake," the newspaper said. -- *From Nairobi Times, 21 January 2000, Nairobi. Submitted by* Paul Weldon, *pweldon@osf1.gmu.edu 1604 Shakespeare St. Baltimore, MD 21231, USA &* Mike Griffin, *Ministry of Environment and Tourism, Prvt. Bag 13306, Windhoek, Namibia.*

Uganda

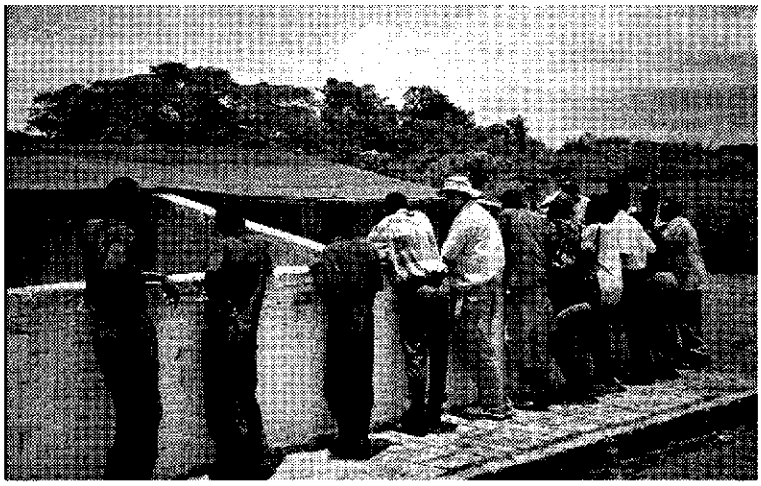
WORKSHOP ON CROCODILES HELD IN UGANDA. From 14 - 15 September 1999 a Workshop on the Management of Crocodiles was held in Uganda, East Africa. The aim of the Workshop was to promote the health, welfare, and conservation of the Order Crocodilia, especially the Nile crocodile (*Crocodylus niloticus*). This was achieved by providing lectures and practical sessions at which field biologists, veterinarians and others could benefit from one another's experiences of working with these reptiles.

The Workshop was organised and co-ordinated by Dr Gladys Kalema MRCVS (Uganda Wildlife Authority), Mrs Margaret Cooper LLB (Wildlife Health Services, UK) and Professor John E Cooper FRCVS (Wildlife Health Services and Durrell Wildlife Conservation Trust). Lectures on Day 1 covered a range of subjects. The biology of the Nile crocodile was discussed with the aid of a young live specimen and an excellent papier maché model produced (and demonstrated) by Nicholas Nandala David, a young Ugandan art student. This was followed by a presentation on the management of captive crocodiles (Gladys Kalema) and an interactive session on legal issues (Margaret Cooper). The afternoon was devoted to lectures relating to maintenance of health, treatment of disease and an analysis (presented by Dr John Bosco Nizeyi, Uganda) of problems that had hampered productivity at Uganda's only crocodile farm at Buwama. An array of relevant literature was on display and all registrants received a set of course notes.

On Day 2, a bus from Makerere University took participants on the one- hour journey to Buwama, on the edge of Lake Victoria, where Uganda Crocs Ltd, a company licensed to hatch and rear animals taken from Murchison Falls National Park, have a ranching enterprise (farm) for Nile crocodiles. The farm's Manager, Mr Duncan Majane, first led a tour of the premises. Participants took notes, asked questions and offered advice on a range of subjects relating to the health and welfare of captive crocodiles and the conservation implications of captive breeding and ranching.

The remainder of the day was spent on practical work. Sick crocodiles were examined clinically, blood and urine samples were taken for investigation (some of it in the field) and anaesthesia and euthanasia were demonstrated. Post-mortem examination of two crocodiles provided an opportunity for participants to gain experience in the identification of internal organs, the recognition of pathological lesions and the selection and processing of samples for diagnostic purposes. Finally, all present gathered together in a shaded area near the lake - an

idyllic wooded spot through which large papilionid butterflies glided and over which African fish eagles called - and discussed the lessons learned over the previous two days. A group of three was charged with drawing up reports and recommendations. It was agreed that Uganda, which in the past has contributed much to our knowledge of the Nile crocodile, could serve as an important source of information on this species and that this needs collaboration between those who work with crocodiles in the wild and those who keep or study them in captivity. The farming and ranching of crocodiles for their skin and meat are not universally acceptable but the evidence is that since 1971, when the IUCN/SSC Crocodile Specialist Group was formed, the status of 16 of the world's 23 species has been improved by ensuring that these have value to those who live in proximity to them.



Workshop field trip to Uganda Crocs Ltd. Farm at Lake Victoria. M. Cooper Photo.

Workshop participants examine Nile crocodiles. M. Cooper photo

This workshop, the first of its kind in Uganda, was an unqualified success. It brought together staff of the Uganda Wildlife Authority (UWA), the Department of Wildlife and Animal Resources Management (WARM) of the Faculty of Veterinary Medicine, Makerere University, research workers and crocodile farmers. It provided a forum for debate and encouraged views about ranching and captive breeding of crocodiles to be aired. Above all, it offered an opportunity, in the country which boasts the 'source of the Nile', for *Crocodylus niloticus*, studied by scientists for many hundreds of years, to be discussed. This Workshop would not have been possible without the support of the Uganda Wildlife Authority, the British Herpetological Society (BHS), the British Veterinary Association (BVA), Mrs Helena Cotton and a number of private individuals - especially in Great Britain - who provided financial help or donated equipment.

Further information about this Workshop - or future similar ventures planned in Uganda is available from either -- Dr Gladys Kalema *Uganda Wildlife Authority, P O Box 3530, Kampala, Uganda, gkalema@starcom.co.ug or* Professor John E Cooper *Wildlife Health Services, P O Box 153, Wellingborough NN8 2ZA, UK, NGAGI@compuserve.com.*

WESTERN ASIA

India

INTERPRETING VISUAL SIGNS OF THE INDIAN CROCODILE. The various signs that may be available in the field for interpretation are the spoor marks of head, body, tail and pug, the faecal pellets and feeding signs. From these field evidences an idea can be obtained about the sizes of crocodilians in the area.

Feeding signs for species identification: Feeding signs, particularly half-eaten fish, fish-heads and dead fish with jaw marks are often met with in the field. These are, however, difficult, except in exceptional circumstances, to interpret for size of crocodilians. This difficulty persists even when the gharial (*Gavialis gangeticus*) and mugger (*Crocodylus palustris*) are occurring in the same habitat although gharials have the characteristic long saw-like snout with finer teeth than the mugger. Only occasionally the jaw impressions on dead fishes are very clear when a fish had escaped the jaw-hold of a gharial.

Faecal pellets as field evidences: Faecal pellets are very seldom found for gharial as they defaecate mostly in water. Mugger pellets, however, are very common on the land. When pellets are in proper shape, an idea can be obtained about the size or age-class (juvenile, young adult, large adult, etc.) of the crocodilian.

Using head impressions for size estimation: Head impressions on sand or mud can sometimes give an accurate measurement for the total body length of the animal. The length of the lower jaw is almost equal to the length of the head from snout-tip to the back of the post-occipital scutes in gharial and mugger. In gharial the body size is roughly five times this head length, and in the mugger it is about 6.5 times. In saltwater crocodile (*Crocodylus porosus*), it is also six and a half times.

Using hind pugmark for size estimation: The clear pugmarks are usually of the hind limbs because of quadruped locomotion. The hind pugmark is easier to interpret than the front pugmark, if present. The hind pug consists of four digits – three clawed and one soft and fleshy. On good substratum, the pugmark may even show the scute impressions from which an otter pugmark can be separated out. Otter will not have the scutes but have hairs. A pugmark selected for size interpretation must show the distance between the heel and the point up to the beginning of the claws. The length of the pug is about one twelfth to one fourteenth of the total body length in mugger. Gharial pugs are relatively small. The use of hind pugmark length for size estimation is more reliable in *palustris* than the use of tail scute length.

Using tail scute spoor for size estimation: The most often met spoors in case of a crocodilian are the tail spoors. These show characteristic curved lines running parallel to each other. The space between two lines indicates the size of a ventral tail scute. Measurements (length in mm) of at least two or three 'large' scutes are required to correctly interpret the size of gharials. The body length TBL=53.6+62.7(mean scute length)mm. A thumb rule for field workers is TBL = 70 times the mean tail scute length (in mm) in case of gharial. The relationship has not been established in mugger and saltwater crocodiles. It is, however, approximately 65. The reason for this change from 70 to 65 appears to be related to the number of caudal scutes. In gharial, the number of such scutes is about 24 whereas, in mugger it is from 16-18, sometimes only 14, depending on a geographical race of *palustris*. Hence, the size of each tail scute in gharial is smaller than that of mugger. Therefore, the conversion factor for scute length to TBL is higher in gharial than mugger.

Distinguishing tracks of crocodilians, turtles and otters: The body spoor is a sure indication to determine the species when there is a possibility of confusion between gharial, mugger, otter and turtles. To a new observer the drag impression from a log of wood may appear as a crocodilian body drag. In such cases the tail spoor and pugmarks must be searched.

A crocodilian track (of a juvenile), a turtle track and an otter track may also appear similar to an untrained eye. Crocodilian body spoor is accompanied with the impressions of scutes from the body, tail and pugs. In a turtle track a tail drag may be there, particularly if it is a male, but the pug marks are spaced apart over a small distance and these draw two parallel impressions on either side of the body drag. In an otter, the tail drag may have a brooming effect due to the hairs, apart from the fact that the spoors due to moving pug are curved inside too much.

Tracks of 'high-walk' to distinguish gharial and mugger: For gharial and mugger, when a tail drag is without a body drag, it is that of a species that can perform a high walk. Gharials have weak limbs and cannot lift their body to perform a 'high walk'. Therefore, gharials must leave their body spoor along with the tail track. In habitats where gharial and mugger occur together it is a sure procedure to distinguish mugger tracks from the gharial. But, if a tail drag is accompanied with body drag, other visual indications are considered for species identification.

Application of these and similar visual indications should be developed on a species

specific basis for other crocodilian species. -- Lala A.K. Sinhg, *Project Tiger, Similipal Tiger Reserve, Khairi-Jashipur, Orissa, India 757091*

STATUS AND DISTRIBUTION OF GHARIALS IN MADHYA PRADESH. The most recent reported survey of gharials (*Gavialis gangeticus*) in the National Chambal Sanctuary is from 1996-1997. In a total survey distance of 415 km between Pali and Bhare, 1,242 gharials were sighted. These comprised 226 adults above 10 feet estimated total length, 459 sub adults, 322 yearlings (3-4 feet TL) and 232 hatchlings (less than 3 feet). The mean density of gharials sighted was 2.9 / km. This is the largest and most secure population of gharial in India.

In the Ken gharial sanctuary no gharials occurred prior to the reintroductions of captive reared animals begun in 1985. Since that time a total of 74 gharial have been released, most recently 20 were released in 1998. Surveys conducted in the Ken Sanctuary showed 19 gharial in 1994, 22 in 1996 and 15 in 1999. The 15 gharial seen in 1999 belonged to six spatially distinct groups separated by mean distances of 2.4 km. The animals below 1.2 m seen in 1999 and the 20 gharial of this size class released in 1998 are assumed to be a transient size class with a low probability of residence in the sanctuary. If these are eliminated from the analysis then of 54 gharial released prior to 1998, 11 or 20.4% remain in the sanctuary limits and at least 6 have become resident adults. Consideration of available nesting sites, which are the main limiting factor of the carrying capacity of the sanctuary, indicates the sanctuary can support 10 - 15 breeding females and is presently at 40 % capacity. At the observed retention rate of 3-5% at least an additional 200 - 250 gharial should be released. These surveys were conducted in early summer and the count could be lower than the actual number of gharial present. Special efforts should be made to introduce male gharial to ensure a healthy population of both sexes.

The Son sanctuary was declared in 1981 and includes 161 km of the Son river and an additional 48 km of the Gopad and Banas rivers. A survey undertaken prior to the declaration of the sanctuary indicated a total of 13 gharial varying in size from 2-5 m. Following the establishment of the sanctuary and up to 1989, 105 captive reared gharial have been released in groups of 20 - 30. By 1996, surveys indicated a minimum of 32 - 35 gharials remained resident. The size class distribution of gharials indicates an increase in the numbers of adult females from 4 in 1981 to 21 in 1996. However, there were no adult males in the sanctuary until the release of a single adult male in 1997. The retention rate of released gharial is 19.3% comparable to the Ken Sanctuary, but without any natural breeding or recruitment the density of gharials remains very low at 0.22/km despite the favourable habitat. -- R. K. Sharma, *National Chambal Sanctuary, P. O. Box 29, Morena, 476 001 MP, India*

PROBLEMS OF PLENTY (of crocshit!). With 3,300 mugger crocodiles at Madras Crocodile Bank consuming a tonne of feed a week, we are quite overwhelmed with the pile of manure being cleaned out of the enclosures every day. While we expect it is good manure we have no takers yet. The waste is mixed with a lot of sand from the substrate in the enclosures as well as bone pieces from left overs. If anyone out there can advise us how to get rid of it (besides just trucking it away, which is very expensive), we would value all suggestions, contact: -- Nikhil Whitaker, *Assistant Curator, Madras Crocodile Bank*, sthiru@giasmd01.vsnl.net.in.

CROC RECAPTURED IN GUJARAT. The Gujarat Society for the Prevention of Cruelty to Animals (GSPCA) conducts an animal rescue program and collects and releases dozens of snakes, monitor lizards and some crocodiles (*C. palustris*) as well as other wild and domestic animals each year. The animals are released back to the wild to prevent people from killing them. After attending the Indian Regional Meeting of the CSG in Gwalior in 1997, GSPCA leader Ms. Snehal Bhatt began capturing and marking crocodiles in this program. To date 38 crocodiles have been rescued, marked and released, mostly at the Ajwa reservoir, a large relatively remote and protected area that supports a healthy crocodile population. In October 1999, a crocodile was rescued from Kopraj village which is about 10 km from Ajwa reservoir. This animal was recognized from its marks (cut tail scutes) as the same individual that was captured at another village approximately 30 km from Ajwa reservoir in November of 1998 and released into the reservoir. At the time of first capture the crocodile was 6 feet in length and looked very healthy. This time it has grown to 6

feet 8 inches and appears to have gained about 20 kg. This crocodile appears to make regular migrations at this time of the year. The animal was released again and we will keep records to further understand its movements. -- Snehal Bhatt, *Hon. Secretary, GSPCA, 60 Kunj Society, Alkapuri, Baroda 390 007 Gujarat, India.*

Iran

IRAN NAMES 1006TH RAMSAR SITE. The Islamic Republic of Iran has designated Govater Bay and Hur-e-Bahu (75,000 hectares) its 19th Wetland of International Importance. The area comprises the riverine and estuarine wetlands of the lower Sarbaz River, including permanent freshwater pools and marshes, mangrove swamps and intertidal mudflats, and also the sandy beach of the adjacent Gulf of Oman coast in the extreme southeast of Iran (Persian Baluchestan) right to the border with Pakistan. The site is important for *Crocodylus palustris* and wintering waterfowl, notably *Pelecanus crispus*, shorebirds, gulls and terns. The Department of Environment notes that, "The fact that Iran has established a Ramsar Site for its numerous values, among them the Marsh Crocodile, as opposed to the animal being simply a protected species, would create a greater national and international concern for the crocodile." This is evidently the westernmost population of this south Asian species.

The site is also a BirdLife International "Important Bird Area". Govater Bay is the Convention's 1006th Ramsar site, bringing Iran's total protected surface area to 1,432,150 hectares and the global total to 71,824,492 ha. -- Scott Frazier, *Senior Wetland Inventory Officer, Wetlands International Africa Europe Middle East, Droevendaalsesteeg 3A PO Box 7002, 6700 CA Wageningen, The Netherlands.*

Pakistan

REGIONAL UPDATE. One of the important crocodile areas in Baluchistan province is the Hingol river draining into the Arabian Sea, that gives its name to the Hingol National Park which is the largest National Park in Pakistan (619,043 ha). Hingol is one of the three National Parks, out of 220 Protected Areas, selected for management planning and subsequent implementation, a GEF funding program of the World Bank.

Preliminary surveys have been conducted in the area and the presence of crocodiles has played a major role in the selection of the National Park as a priority management area. As a consequence of this there would be at least one area where crocodiles would hopefully be saved in a natural state.

Deh - Akro Wildlife Sanctuary in Sindh province is an aggregate of about 25 lakes which have come into existence as a result of seepage from irrigation channels, mainly the Nara Canal. A population of 500 to 1000 crocodiles has been reported from the area. The wetlands also support a variety of fish species and hordes of migratory waterfowl during winter. The wetlands are, however, facing drainage threat from the proposed construction of a large water reservoir "Chottiari". An Environmental Impact Assessment carried out has shown the adverse impacts that the water reservoir would have on the ecology of the area. The construction has however, been delayed due to opposition of the environment oriented organizations.

For the first time seven crocodile hatchlings were seen at crocodile ponds at the Punjab Wildlife Research & Training Institute, Faisalabad, in July 1998. By January 1999, only three had survived. We could not locate the other four hatchlings, what happened to them is a mystery. They might have been taken by the birds of prey - kites, pond herons or even crows. No hatchlings were seen during the year 1999.

Successful breeding of crocodiles has been reported from the province of Sindh at Haleji Wildlife Sanctuary (a wetland) and Khar Wildlife Breeding Centre located at the edge of Kirthar National park. The offspring have, however, not been released in the wild. Government of the Punjab has placed request with the Government of Sindh for some crocodile young. Some interest has also been generated in the private sector, to raise the Crocodiles on commercial basis. -- Dr. Abdul Aleem Chaudhury, *Director General, Wildlife & Parks Punjab, 2 Sanda Rd. Lahore, Pakistan.*

Sri Lanka

CROCODILE KILLERS USE DOGS AS BAIT. A group of people in Matara are reported to be killing dogs to be used as bait to kill crocodiles in the

Nilwala Ganga for the suspected sale of crocodile skins. This follows the recent death of a 22 year old youth, killed by a crocodile while he was bathing in the river at Piladuwa, near the new railway bridge. This part of the river is known for the presence of crocodiles.

A few days ago, some people of the area baited, trapped and killed a 16 ft. long crocodile close to the place where the youth was killed. The people believe it to be the same crocodile that killed the youth. Arrangements were made to hand over the carcass of the crocodile to the wild life authorities at Hambantota. Since then, crocodile baiting is being resorted to by a group of people, in what they say is an attempt to clear the Nilwala Ganga of these protected reptiles that have been living in the Nilwala Ganga for centuries. The method adopted by these crocodile killers is to kill dogs and use them as bait to attract the crocodiles, and when trapped beat them to death. Two other crocodiles have been killed in this manner after the crocodile that was suspected of killing the youth was killed. This group of dog and crocodile killers are reportedly directing operations from a house at Thotamuna.

There are now reports that two more dogs have been killed by this group of people to bait more crocodiles for killing. It is suspected that these killings are now being done for the purpose of selling the crocodile skins, while attempting to show the public that they are trying to make the Nilwala safe for bathing.

The Matara police have been informed of these illegal killings. It is expected that the wildlife protection authorities and the police would intervene to put a stop to these illegal and brutal killings, and bring the offenders to book. -- Sagarica Rajakarunanayake *Letter to Editor DAILY NEWS (Columbo, Sri Lanka) 21October 1999.*

East Asia, Oceania & Australia

Australia

QUEENSLAND TRIAL INTENSIVE MANAGEMENT AREA. Crocodiles are an important part of the norths wetland ecosystems. Until 1974, crocodiles were hunted commercially in Queensland and their numbers declined significantly. Crocodiles are now protected in Australia but estuarine crocodiles (*C. porosus*) continue to be threatened in Queensland by habitat loss from urban, rural, residential and agricultural development. Although estuarine crocodiles are a valued part of Australia's natural and cultural heritage, they are also large and dangerous predators. The extension of human settlement into crocodile habitat has brought humans and crocodiles into increasing contact. Several recent crocodile attacks have occurred on the east coast. Crocodiles at popular beaches north of Cairns have concerned local residents and are considered detirmental to the tourist industry.

In response to public concerns about crocodiles, the Department of Environment and heritage is testing a new management program for crocodiles in the far north. The Trial Intensive Management Area for Crocodiles (TIMAC) began in May 1998 for a trial period of three years. The goals of the program are:

- To remove estuarine crocodiles from clearly defined areas near several cities making the beaches and waterways in these areas safer for water based recreation.
- To increase scientific knowledge of estuarine crocodiles to improve their conservation and management in Queensland.
- To teach people about crocodiles and promote safe behavior in crocodile habitat.

The program has four parts; crocodile removal, surveys and monitoring, research and public education.

Crocodile removal. All crocodiles and their eggs will be removed from the TIMAC zone. The zone will be closely monitored and any new crocodiles moving into the zone will be removed. Following existing policy, crocodiles outside the zone considered a threat to human safety will also be removed. Crocodiles will be captured using baited traps, snares and by harpooning. Several traps will be permanently positioned in high human use areas. Crocodiles removed under the program will be sold to crocodile farms or released in remote areas. Some initial difficulties have been encountered with low demand from farms for some size classes and a number of animals are being maintained on farms at the programs expense. The TIMAC zone is not expected to become crocodile free. Crocodiles are highly mobile and are expected to move in and out of the zone. The zone will

monitored and new arrivals removed but there can be no guarantee that it will be crocodile free. However, the risk of crocodile attack will be significantly reduced.

Surveys. The Department conducts surveys to determine the distribution, abundance, habitat use and breeding areas of crocodiles.

Research carried out over the three year period will provide biological information to answer two important questions. Will new crocodile move into the TIMAC zone and will relocation of crocodiles to remote areas be an effective way to manage these animals. Crocodiles caught in the TIMAC area will be measured, weighed, sexed and given an identifying mark and released. Selected crocodiles will be fitted with radio transmitters and released a long distance from Cairns and then tracked by radio telemetry. Their movements and their impact on local crocodile populations will be recorded.

Public education. People who are better informed about crocodiles are less likely to place themselves at risk in crocodile habitat and more likely to recognize crocodiles as an important part of the wetland ecosystem.

The public can assist the program by reporting any crocodile sightings to the Department and following these simple safety guidelines.

- Be aware the crocodiles can live in freshwater streams lagoons and swamps as well as the tidal reaches of rivers, and travel along the coast and to islands and coral cays.
- Heed all warning signs.
- Always supervise children in crocodile habitat.
- Do not swim in crocodile habitat. If you are not sure, don't swim.
- Stand well back from the water's edge when fishing and do not clean fish, prepare food or engage in other activities at the water's edge.
- Dispose of food scraps, including fish, away from areas where people gather.
- Camp at least 50 meters from the water's edge.
- Keep arms and legs in the boat at all times.

-- adapted from Living with Wildlife, Crocodile Management Brochure, Queensland Dept. of Environment and Heritage, 10-12 McLeod St. Cairns, Qld 4870, Australia.

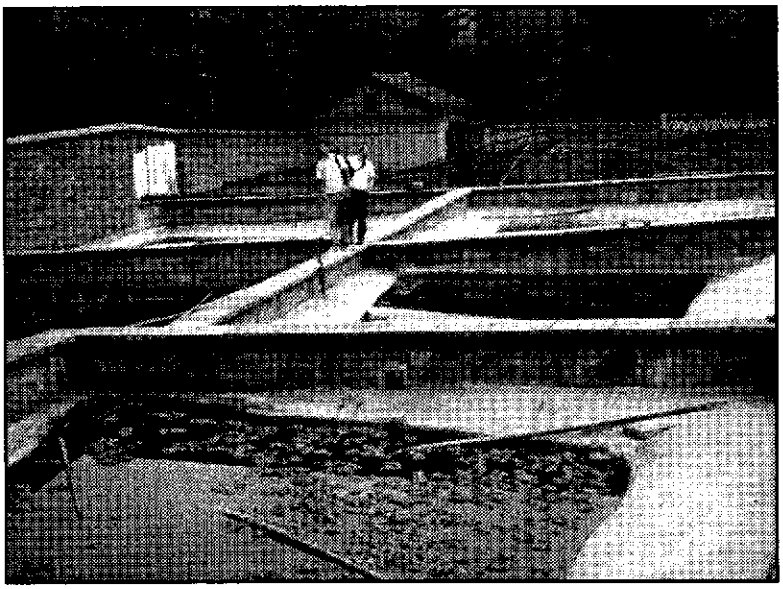
China

EXPORT OF ADDITIONAL CHINESE ALLIGATORS. As in 1997 and 1998, Rene Hedegaard (Director, Danish Crocodile Exhibition), and I managed again in 1999, to buy some additional *Alligator sinensis* from the Anhui Research Centre of Chinese Alligator Reproduction (ARCCAR). We purchased two skulls, and 22 Chinese alligators which, along with a resource management fee and consulting service, provided an income of US$12,530 for the ARCCAR. Unfortunately, due to improper handling by the airline, 6 animals died in transit back to Denmark.

We are aware that it can be quite problematic to offer crocodilians for the pet trade. For this reason we took care that all Chinese alligators were made available only to people with the appropriate knowledge, and proper financial background to ensure that they would be able to meet all requirements for keeping Chinese alligators. This also presents a problem in that the number of those people is very limited and, it is our thought that, the European market can't take many more specimens. We are of course still very interested in providing additional funds for the ARCCAR, and the conservation of *A. sinensis*.

As mentioned previously in the CSG Newsletter Vol.18. (1), there exists a good potential for ecotourism, so I think this will be step two of our efforts to raise funds for Chinese alligator conservation. Our experiences from three stays in China, and the fact that we have good contacts with the ARCCAR, and the Shanghai Zoo will be a valuable help in preparing an 'ecotour' to China. I have also held a series of lectures about *A. sinensis* in Germany and, my impression is that, there are definitely many people who would like to go to China to see all the things that were presented in my lectures.

My plan is to first prepare such an ecotour on a small scale to get more experience with a project of this type. If this evaluation phase turns out successfully the project could be handed over to a professional travel agency and run on a larger scale to increase funding for alligator conservation in China. Such a tour could include a stay in Shanghai which provides several attractions, such as the historical city of



ARCCAR Chinese alligator breeding facility, Anhui, PRC. T.Wiegmann photo.

Shanghai, the Shanghai zoo, and its special breeding facility for endangered species. The main thing on such a tour would be of course a bus trip to the ARCCAR. This facility contains a small hotel building, and tourists could stay there, possibly for a couple of nights, to see the farm. I suggest a price of US$ 100 to US$ 150 for each night per visitor, which could provide a considerable income for the ARCCAR. One or two days could also be used for organized trips to the surrounding protected areas to observe some of the wild Chinese alligators. Some of the local people could be hired as tour guides, and they could charge a fee from all participants for this service. This additional income for the local community could possibly become a step in changing the way they look at the resident alligators. Mr. Xie Wan-Shu (Director, ARCCAR) informed us that, in 1999, the ARCCAR released 8 Chinese alligators of about 1.5m (5 feet) to the protected areas. The release of further farm stock would be possible but the protest of the local people, which look upon the alligators as a danger or vermin, is still a hindrance. ARCCAR would like to set up an educational program that should consist of an information brochure for the local communities, and the publication of a supplemental book for the local schools. For this reason ARCCAR asks for the help and advice of organizations which are more experienced with programs of this type. Additional assistance is also required to raise funds for this educational program.

The Shanghai zoo could also provide a kind of educational program to their visitors, which could be a great help to increasing the number of native visitors to the ARCCAR. As with the above mentioned international ecotourism project, local tourism could provide considerably stable financial support. The idea of tourism as a financial support for the Chinese alligator conservation is of course only a rough draft at this stage, and everything needs to be discussed in detail with all involved parties.

I would also appreciate it if other organizations that are working on conservation strategies for *A. sinensis* could get in touch with me, to make sure that all efforts are coordinated in the best possible way.-- Tim Wiegmann, *Chairman, AG Krokodile, Grossensieker Weg 121, 32584 Loehne, Germany <Tim@crocodile-library.de>*

Indonesia

CROCODILE STUDIES. In September 1999, the author visited Indonesia for the third time, after having conducted an ecological field study in 1996/1997 in West Kalimantan on three major harvested reptiles for the skin trade, *Varanus salvator*, *Python curtus* and *Python reticulatus*. The aim of this visit was to evaluate the development of a long-termed field project on palustrine crocodiles in eastern Indonesia (Sulawesi eastward to Irian Jaya), taking into consideration the taxonomic status, distribution, biological and ecological aspects. Some questions of concern are the taxonomical status of the New Guinea crocodile *Crocodylus novaeguineae* in Irian Jaya, and to reconstruct its present distribution. Furthermore, niche partition of two sympatrically freshwater crocodilians,

e.g., *T. schlegelii* and *C. siamensis* in East Kalimantan shall be documented, and the taxonomic status of *Crocodylus mindorensis* shall be enlightened together with its recent distribution.

Several personal comments (Jelden 1999, Yuwono 1999), state that observations of freshwater crocodiles were made in Sulawesi (*Tomistoma schlegelii*) and Halmahera. Also the islands Ceram, Obi and Buru need thorough investigation for the occurrence of crocodiles. The overall objective is providing information on status and conservation on the background of intense field studies, and new distribution records in this geographical range.

Additionally, the author visited the Ujung Kulon National Park in West Java, a Natural World Heritage Property, popular for the last distribution of the Javan Rhino, *Rhinoceros sondaicus*.

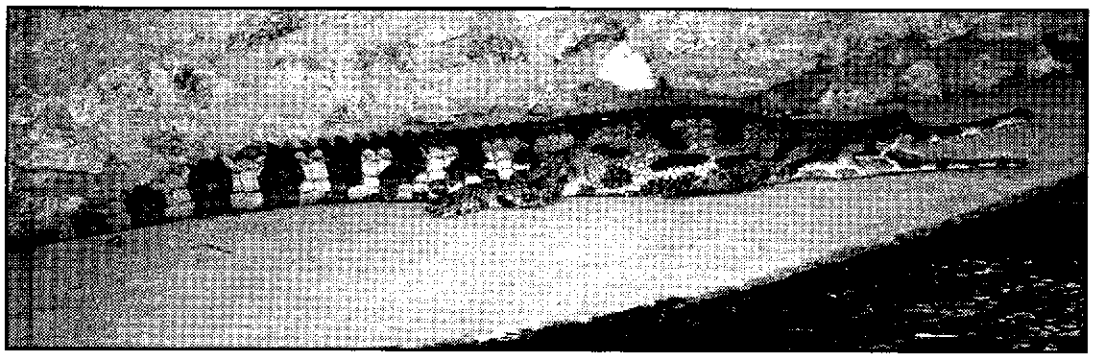
During a four day visit, no crocodiles were observed, probably due to a dry season lasting seven months in 1999. Personal comments (Mirzas 1999, PHPA 1999) as well as photographs of Ujung Kulon's Flora and Fauna in an exhibition in the PHPA office, Labuan, West Java, revealed the occurrence of the False or Sunda Gharial (*Tomistoma schlegelii*) in the Ujung Kulon National Park. It occurs in the southern part of the peninsula, near Cibunar, besides the more common *Crocodylus porosus*. According to a description of the National Park by the WCMC, also both taxa occur in the Ujung Kulon National Park. (http:// www.wcmc.org.uk /protected_areas/data/wh/ujungk.html, 1999). The False Gharial was reported for the Panaitan Island, offshore of the peninsula of the Ujung Kulon National Park (Blower & van der Zon 1977). Messel et al. (1992) state that "remnant populations" of *Tomistoma schlegelii* may occur on Java. During the Oxford University Herpetological Expedition to the Ujung Kulon National Park in 1990, only the Estuarine Crocodile was recorded. In more recent literature, it is thus remarkable that the range of *Tomistoma schlegelii* within Indonesia is described solely in Sumatra and Kalimantan (Indonesian Borneo), and the Malay provinces of Sarawak and Sabah (Bezuijen et al. 1995, Ross 1998). The records in Java and Sulawesi need urgent verification.

The author is grateful to George Saputra, IRATA (Indonesian Reptile & Amphibian Trade Association), who financially supported the trip to the Ujung Kulon National Park in September 1999. -- Mark Auliya, *Zoologisches Forschungsinstitut und Museum Alexander Koenig (ZFMK), Section: Herpetology, Adenauerallee 160, 53113 Bonn Germany. Email: M.Auliya.ZFMK@uni-bonn.de*

Europe

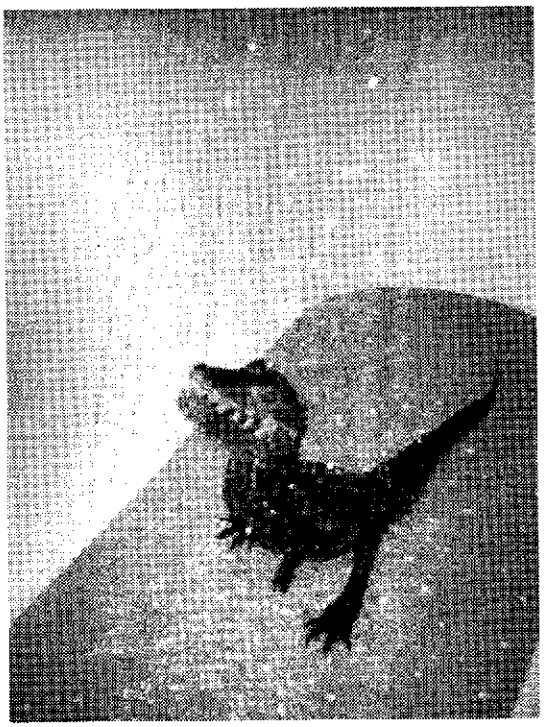
Germany.

UNUSUAL BEHAVIOR OF DWARF CAIMAN. Several members of the European herpetological group AG Krokodile have observed an unusual behavior in Cuvier's dwarf caiman, *Paleosuchus palpebrosus*. When they placed their dwarf caimans under the shower the animals stood up on the hind legs in a fully erect posture (see photo). This behavior was first described by H.-



Tomistoma schlegelii, juvenile photographed at Samutprakan farm and Zoo, Thailand by R. Sommerlad. Presence of this species in Java and Sulawasi needs verification.

W. Rudloff in ELAPHE 1985, Vol 7(2):29-30. Prompted by this article, one of us (T.W.) encouraged members of AG Krokodile to observe the behavior of their crocodilians when placed under the shower. Several *Alligator mississippiensis*, *Caiman crocodilus and P. palpebrosus* went for a shower in bath tubs across Europe!



P. palpebrosus standing in the shower. Daniela Wiener photo.

All the specimens seemed to enjoy the warm shower, but only juvenile *P. palpebrosus* stood up on their hind legs. The behavior was not observed in dwarf caiman hatchlings or adults. Possibly the musculature of hatchlings is too weak and the adults have too much body mass to support. It would be interesting to know if this behavior has ever been observed in the wild. It would also be interesting to know, because of their close relationship, if this has ever been observed in wild or captive smooth fronted caiman, *P. trigonatus*. Another question of course is why does only *P. palpebrosus* show this behavior pattern and what could be the reason for this mysterious part of dwarf caiman ethology? -- Billy Heinbuch, *5617 Selford Rd., Arbutus, MD 21227, USA* gator_boy@juno.com & Tim Wiegmann, *Chairman, AG Krokodile, Grossensieker Weg 121, 32584 Loehne, Germany* Tim@crocodile-library.de.

LATIN AMERICA

Argentina

NEW BROCHURES FOR SUSTAINABLE CAIMAN USE. As part of the public relations and environmental education program associated with the Argentina *Caiman latirostris* ranching program, two new brochures have been produced by MAGIC/MUPCN, the agency developing the project.

One brochure titled 'El Yacare Overo' details the habitat, geographical distribution, food habits, size and general characteristics of the species. A final section on population status explains, "As with the majority of crocodilians, the species is recuperating thanks to the international controls and the stimulation of programs for commercial use and conservation, or sustainable use. Although most of the species remains on Appendix I of CITES, in 1997 the population of Santa Fe province was transferred to Appendix II due to its clearly recovered status. However, there remain some concerns about the future of the species, curiously not because of illegal hunting or commercial use, but because of habitat loss caused by ranchers drying lagoons by building canals. This activity has caused the decline of thousands of animals in recent years. The only tool to slow this process is to increase the economic value of the wetlands in their natural state. To put it in other words, the wetlands are prized for the value of their contents, and only if they are valued will they be conserved."

The second brochure entitled 'Proyecto Yacare, a proposal for sustainable use' Expands this theme. " Harvesting eggs from the wild and raising them in ranches has its basis in the high natural mortality of eggs and hatchlings. The philosophy of the technique is simple. Thanks to egg collection and artificial incubation a large number of caimans are now found in nature. Some of these can be diverted to commercial uses and stimulate the interest of landowners to conserve their wetlands and stop the canalization and drying of lagoons.

Proyecto Yacare begins egg harvest in January using airboats, helicopters, boats, and for our regular work, horses. An average of 37 eggs per female are collected in plastic containers with natural incubation materials and transported to

our incubator in Santa Fe city. After incubation, about 90% of the eggs produce live young. These are marked, weighed and placed in concrete pens. Following the winter period, the hatchlings have been released in the same locations where their eggs were collected. Since 1990 we have released more than 10,000 young caiman in Santa Fe Province.

The CITES Convention in Zimbabwe in 1997 changed the CITES listing of *Caiman latirostris* in Argentina, permitting the commercial exploitation by ranching in Santa Fe province. This allows a portion of the animals collected and incubated to be diverted for feeding and growing in commercial facilities, producing an economic return that favors the conservation of wetlands. Regular monitoring by spotlight surveys has shown that in all the study areas there has been a recovery of the caiman population amounting to an increase of 1,500% since 1990.

It may seem to be a contradiction, but to guarantee the conservation of ecosystems it is necessary to develop programs of sustainable commercial harvest for some of their inhabitants. From a biological point of view the commercial use of caiman, which now survive in excess due to human intervention and can support commercial use, produces an economic return that favors conservation. It may be difficult, but we have to explain the advantages of killing some animals as a tool for conservation. A good way to understand this is to realize that giving value to nature, and allowing some inhabitants of the system to be taken and killed, allows the whole system to continue to function. Perhaps the caimans, or some other swamp creature will be used in future to feed people. Perhaps there is some substance in the swamp that will be a cure for disease or a component of chemicals vital for production of some product, or possibly just as a reservoir for clean water, or maybe none of these. However, if we destroy the land to support only

cows and cultivation who knows what we have lost?" -- *Freely translated from Proyecto Yacare Una propesta de uso sostenible, Magic/MUPCN.* Alejandro Larriera, *Bvd. Pellegrini 3100 Santa Fe, Argentina.*

Ecuador

CENSUS OF BLACK CAIMAN. As part of the developing program for collecting hatchling black caiman (*Melanosuchus niger*) for ranching in Ecuador, we are conducting counts of the caiman. This project will try to establish preliminary data on the impact of hatchling harvests on the population dynamics of *M. niger.*

The objectives of the program are to obtain preliminary data on the population density and size structure. The study was conducted on lagoons in the northeast of the Ecuadorian Amazon region. INEFAN data indicates hatchlings have been collected at Bragacocha and Challuacocha. I also sampled Anangucocha as a control. Anagucocha is part of the Yasuni National Park and the other two lagoons are part of the buffer zone of the Park. All three lagoons contain 'black' (heavy organic tannin) water with deep deposits of organic mud and are surrounded by inundated forests. The vegetation of the area was characterized as part of the study. The area is located at 300 - 600 m elevation with rainfall of 3,000 mm annually and median temperatures of 24 - 26° C.

Each water body was examined during the day before the survey and marked using plastic string. Surveys at night on 20 and 24 December 1999 were conducted from a canoe paddled around the open water of the lagoon and caimans were located with a 12 volt spotlight. Standard climatic and location data were recorded at the beginning of each survey. As animals were sighted they were approached as closely as possible and the species, total length and behavior were noted. Following Magnusson 1983 and De Vos 1982, I assigned animals estimated at greater than 2 meters as adults, 61-199 cm as juveniles and 30 - 60 cm as neonates (or young of the year). Animals that could not be assigned a species or length were noted as ND. The surveys involved two people in the canoe, an observer-recorder and a paddler.

Nocturnal surveys are subject to high variability due to the conditions encountered and the results of a single survey cannot be used to estimate the population, although they do give an estimate of the minimum number present. However, night counts repeated in the same lagoon are practical, cheap and provide comparative data. To minimize survey variables I suggest surveying at low water and avoiding

unsuitable conditions such as wind and rain. Surveys should also be conducted at the same season to avoid bias due to seasonal changes in the population such as females moving to nesting sites.

In our control lagoon, Anangucocha, I sighted 7 adults, 17 juveniles and zero neonates in a survey of 2.36 km. In Challuacocha, I saw 10 adults, 5 juveniles and 2 neonates in a survey of 4.56 km and in Bragacocha, I saw only 4 juveniles in 0.95 km. Including the unidentified (ND) class I saw a total of 3 neonates, 40 juveniles and 22 adults in our survey in 7.87 km. Converting our figures to density I saw a median of 6.6 caiman/km which is comparable to the densities reported in this region by Hines and Rice 1994 (4.65/km) and Ron 1995 (4.28/km) but lower than the 23.59/km and 23.59/km reported by Asanza in 1992 in Zancudococha and Lagartococha.

I did not identify any common caiman (*C. crocodilus*) but it is possible that there were some of this species in the unidentified category which may account for the small increase in our estimates over those of Hines and Rice and Ron. The scarcity of neonates in our sample may be due to the season. Black caiman are reported to nest in March and April in this area and at that time the percentage of neonates observed has been reported as 70%.

Black caiman are subject to a management system regulated by INEFAN with a collection quota of 1,500 eggs or neonates each year for ranching with the provision that for the first three years 5% of the animals harvested must be returned when they are 1.2 m long. It is not yet possible to determine if this quota is in balance with the population dynamics of black caiman in the area.

For these reasons population studies and surveys are vital for the conservation of *M. niger* in the Ecuadorean Amazon and for the success of the ranching program. Although I found small differences between our results and earlier surveys in these areas, with only three surveys there are insufficient data to conclusively decide if the harvest is having an effect. For this reason I recommend continued studies and surveys to determine the ideal harvest level for eggs and hatchlings that will allow use of the natural resource in a safe manner. -- Maria Alexandra Endara, *De Los Virreyes # 148 y Diego Mendez, Quito, Ecuador.*

MESO-AMERICA

Trinidad & Tobago

CAIMAN IN HIGH DEMAND. Caiman is the latest craze in wild meat cuisine. Caiman meat now sells for $35 (Trin)/ pound. A close relative of the alligator, caiman can be found in swampy areas, in dams, large ponds and some rivers in Trinidad. People are hunting, killing and cooking the animal, they curry it, stew it and broil it as steak. "If you like shark then you will eat caiman meat easy," declared one lover of the delicacy.

An alligator/lizard hunting permit can be issued in the open season to permit legal catch and the permit can be obtained at any Forestry Division office for $20. In the closed season the caiman is supposedly a protected animal. People used to kill them for their tails but since it is in such demand nowadays they eat the entire thing. Hunters are even taking them during the closed season and caiman hunting is becoming more popular than night crabbing for land crabs in coastal areas.

Caiman are trapped in large canals with fishing nets or by leaving trails of meat to attract them then they are lanced, or hunters go after them with hounds and guns. Fishermen and hunters also kill the animals during the closed season since they sometimes attack livestock. Caiman can also be seen in the Emperor Valley Zooin a close to natural habitat, eating fish and basking in the pleasure of not being the main course of your meal. -- *from The EXPRESS (Trinidad) 3 January 2000, submitted by* Hans Boos, *C/O P.O. Bag 50B General Post Office, Port of Spain, Trinidad and Tobago.*

NORTH AMERICA

Mexico

CROCODILES CREEP INTO MEXICAN CITY. City residents who've put up with flooded homes and streets here for a month are dealing with another crisis: crocodiles. The reptiles are crawling into the streets of the flooded city of Villahermosa, seeking higher ground to rest and sun themselves. "Last night, one came out and stopped in the middle of the street, blocking

traffic," taxi driver Ruben Mendoza said. "It was very big. No one wanted to move it. It was frightening."

Local environmental officials are warning residents to call authorities rather than try to move or overpower the crocodiles, which range in size from 3 feet to 8 feet. Manuel Aysa, of the federal environmental protection agency, said that between Thursday and Friday authorities captured nine of the animals, "in very populated areas that are flooded and in public parks."

Dangerous snakes have also been a problem. The Red Cross said five people have been bitten by snakes whose poison can kill a person within 40 minutes. All of the bite victims, however, were treated in time.

Severe rains that started in mid-September caused flooding and mudslides across a wide swathe of southeastern Mexico, killing at least 381 people. Many homes in Tabasco state, whose capital is Villahermosa, have been underwater for a month. Crocodiles were first sighted last week in Villahermosa neighborhoods inundated by overflowing rivers. Only one of the reptiles is said to have tried to attack anyone. No one was injured in that case.-- By Luis Lopez, *Associated Press Writer, Villahermosa, Mexico.*

ZOOS

ST. AUGUSTINE ALLIGATOR FARM UPDATE. The St. Augustine Alligator Farm is rolling the calendar to double zeros for a second time. Started in 1893, the St. Augustine Alligator Farm is now 107 years old. It is a place of traditions, as well as new beginnings. 1999 was a great year for us. We promoted two of our Keepers to Assistant Curators. David Kledzik is now the Assistant Curator of Reptiles, and Amanda Whitaker is now the Assistant Curator of Birds and Mammals. We also hired a new General Curator. John Brueggen comes to us from Discovery Island, Walt Disney World. John was the Zoological Manager for Discovery Island, and worked for the mouse for over six years.

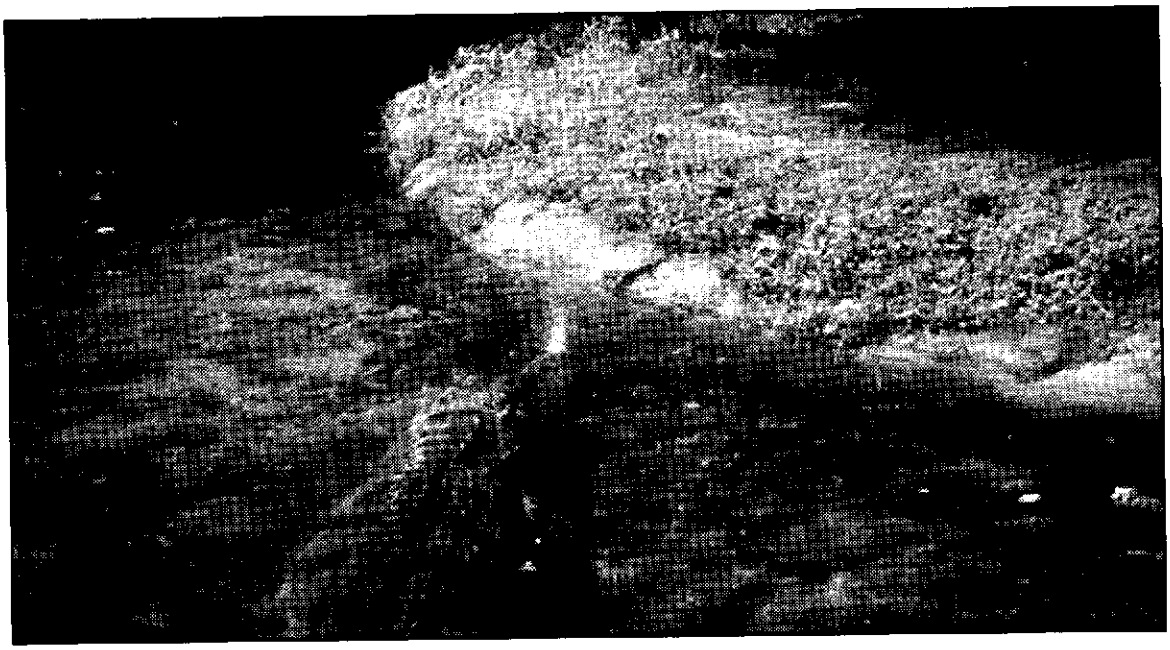
Things are going well with the animals also. We are still the only place in the world that you can see every species of crocodilian! We managed to hatch several crocodilian species last year, and hope that 2000 will see even more captive breedings. We are currently working with five SSP (Species Survival Plan) species, and plan to raise that to seven or eight this year. Our reaccreditation for AZA (the American Zoo and Aquarium Association) went very well, and we are officially accredited for another five years. 2000 is an ambitious year for us. There is a lot on our project list, including: a brand new education facility, a new animal treatment room, an exhibit for our albino alligators, a new Australian reptile exhibit, and a new Reptiles of Florida exhibit.

We hope you will stop by if you are in Florida. CSG members, please ask for John Brueggen at the front window, so he can give you a personal welcome and tour. -- John Brueggen, *General Curator, St. Augustine Alligator Farm, P.O. Box 9005, St. Augustine, FL 32085, USA*

TOMISTOMA HATCHED AT CYPRESS GARDENS. On 1 October 1999 one *Tomistoma schlegeli* was hatched in captivity at Cypress Gardens in Winter Haven, Florida. The adult pair have been reared by Bruce Shwedick and his brother Michael since the early 1970's. The pair was first introduced together at Cypress Gardens in September 1996. They are maintained in a large outdoor exhibit featuring an island with a large oak tree and banana trees for shade and unshaded areas for basking surrounded by a circular pool with a depth of 80 cm. The pair are fed weekly with whole feathered chickens, rats and rabbits.

Breeding behavior was first observed in March and April of 1997. The pair was observed blowing air and water from the nares, a behavior we call 'narial geysering', during and after courtship (fig. 1). The female geysered with her nostrils above the surface of the water to initiate courtship. This behavior was followed by the male's approach and copulation. When the female was no longer receptive to the male's approach she geysered with her nostrils below the surface (fig 2).

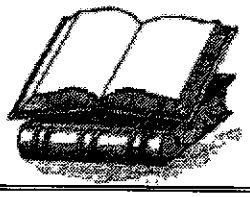
The three meter female constructed a nest of leaves, grass and sphagnum moss in May 1997. She was observed using all four limbs to scrape and kick material toward the nest.



Male *Tomistoma schlegelii*, 3.8 m TL. "geysering" breeding behavoir, Cypress Gardens FL. USA. B. Shwedick photo

Female *Tomistoma schlegelii*, 3.0 m TL. "geysering" breeding behavoir, Cypress Gardens FL. USA. B. Shwedick photo

The female laid infertile eggs in June 1997 and June 1998. In the spring of 1999, the 3.8 m male was observed copulating with the female until early May, several weeks later than in previous years. On 4 July 1999, the female laid eleven eggs of which five banded. The eggs were removed and incubated artificially at 32 °C and the surviving hatchling attempted to break out of the shell on the 87th day of incubation. A portion of the eggshell was removed and the hatchling remained inside the egg until the 89th day of incubation. The hatchling measured 31.1 cm and weighed 68 g. It has been fed a diet of small fish and by 25 January 2000, measured 41.3 cm and weighed 105 g. -- Bruce Shwedick, *Wildlife Curator, Florida Cypress Gardens, P.O. Box 1, Cypress Garden,s FL 33884, USA. E-mail shwedick@aol.com.*



PUBLICATIONS

NUMUNWARI REPRINTED. For those who have not read Grahame Webb's novel Numunwari, and despaired of ever finding a copy of this long out of print treasure, you have another chance. A large saltwater crocodile is the focus of this action packed clash of cultures in Australia's last frontier. Aboriginal cultural values are pitted against political forces and the ability of one sympathetic biologist to balance these forces. Although a work of fiction, many of the scenes are based on the experiences of the author, his colleagues and friends. The story races toward an inevitable and sobering conclusion and readers will increase their understanding of the issues that lie at the root of several problems experienced in the Australian north today. The cultural alienation of Aboriginals, the conflict between development and conservation and the realities of co-existence with a large predator are all examined. Grahame Webb is CSG Vice Chairman for the SE Asian, Australian and Oceania region and a prominent proponent of sustainable use and adaptive management. This 1980 novel examines many themes emergent in his later scientific work in a background of Aboriginal mystics, heroic but realistic conservationists, really unlikeable villains and some truly scary accounts of big crocs in muddy waters. Reprinted by popular demand, the book is available from the publishers, Surrey Beatty & Sons,Chipping Norton, N.S.W., Australia

Veterinary Section

THE 'ZILKA', A NEW DEVICE FOR HUMANE KILLING OF CROCODILIANS. For reasons of both humane treatment and of efficiency, methods of effectively dispatching large numbers of small and medium size crocodilians on farms are constantly under development. In Brazil, in anticipation of the development of caiman farms and ranches there, CSG member Zilca Campos of EMBRAPA-Pantanal, has been working with livestock management interests to develop a humane killer suitable for caimans. In conjunction with GIL - Techno Abate, a Brazilian Company, Zilca has assisted in the development of a captive bolt, compressed air driven device. Modelled on a line of similar devices designed for dispatching pigs and cattle, the Gil-Zilka is specially designed for caiman size animals, as well as sheep and goats, and claims it can instantly destroy the brain of up to 200 animals/hr. The unit operates from a portable air compressor driving a pneumatic bolt and can be assembled for a static, automated function or as a hand held field unit. The device is named, most appropriately, after Ms. Campos both being small, energetic and effective means for dealing with large numbers of caimans. Those who know Zilca wonder if a new Brazilian or perhaps even international verb will arise, -- "How do you kill caiman? Why you Zilk 'em." Inquiries can be addressed to: GIL- Fabricacao e Projetos Especials, Av. Brasil 192, Ribeirao Preto, Sao Paulo CEP 14.075 030, Brazil. e-mail gilequip@gil.com.br. -- Zilca Campos *CPAP / EMBRAPA, Rua 21 de Setembro, 1880 Corumbá MS 79300-900 BRASIL. E-mail: zilca@cpap.embrapa.br.*

VETERINARY NOTES FROM UGANDA. The recent workshop held in Uganda (see separate report) provided an opportunity to examine a substantial number of captive Nile crocodiles (*Crocodylus niloticus*), some of which showed clinical signs of disease or pathological lesions. Despite

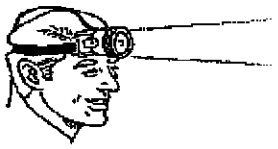
pioneering studies in Uganda in the past on this species such as Cott's work published in 1961, little has appeared from the region in recent years and there is a particular dearth of information about the health and diseases of Ugandan crocodiles. This brief note is a preliminary step towards redressing that situation.

The majority of crocodiles that were presented with signs of ill-health during the workshop in Uganda were 'farmed' (ranched) specimens that had been in captivity for varying periods of time. Substantial numbers of animals had bite wounds, truncated tails and missing digits. Often these lesions had become infected, normally with Gram-negative bacteria from the environment. Other animals showed skeletal abnormalities, mainly scoliosis but also brachygnathia (undershot jaw) and there was one crocodile with malocclusions. In addition, a sizeable population of young crocodiles had ulcerative skin lesions (some infected) associated with weight loss and probable malnutrition.

No infectious diseases with a specific aetiology were seen, but a young Nile crocodile housed elsewhere showed skin lesions that resembled pox and laboratory investigations on samples are in progress.

As a result of the workshop interest in Nile crocodiles has been re-awakened in Uganda and a number of ventures, aimed primarily at improving collaboration between biologists, veterinarians and those involved commercially, are planned. Further, more detailed, reports of veterinary cases will be submitted to the CSG in due course. -- Professor John E. Cooper *Wildlife Health Services, P O Box 153, Wellingborough NN8 2ZA, UK, NGAGI@compuserve.com.*

PERSONALS



M. Marcellin Agnagna, *BP 98 Brazzaville, Congo. Fax 242 814136,* has regained contact with CSG after a long silence and is now Director of Wildlife and Protected Areas Management. Marcellin continues his interest and work on dwarf crocodiles and is in contact with Fritz Huchzermayer from South Africa. Difficulties in Congo over the last two years have prevented him communicating with CSG, but now he hopes to continue his crocodile work.

Ana María Trelancia has a new address and contact at <alcatre@blockbuster.com.pe > *Las Laderas 502, Urbanización Casuarinas, Lima 33, Perú Tele/: 511- 3441114 fax 511 - 3440936.*

We record with great sadness that CSG member Mario Orjuela was killed in tragic circumstances in Costa Rica last December. Mario was a Colombian whose family is active in crocodile farming. He attended a training course with Grahame Webb in Australia and had established himself in Costa Rica where he was effectively combining ecotourism and crocodile conservation and public education in the Tarcoles River area. Mario is survived by his wife, children and his brother Leonardo, who hopes to continue Mario's crocodile conservation activities. The participants of the 15th Working Meeting in Cuba observed a moment's silence in recognition of Mario's contributions to crocodile conservation. CSG Chairman Professor Harry Messel joins us and all the CSG in expressing our great sympathy to Mario's family. -- *Editors.*

EDITORIAL POLICY - The newsletter must contain interesting and timely information. 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. The information in the newsletter should be accurate, but time constraints prevent independent verification of every item. 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 not unless so indicated, the opinions of CSG, the SSC, or the IUCN-World Conservation Union.

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