CROCODILE SPECIALIST GROUP

NEWSLETTER

VOLUME 19 No. 4 ■ OCTOBER 2000 – DECEMBER 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. *Osteoleamus tetraspis*, animals at the mouth of their burrow. O. Behra 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 prossesg@flmnh.ufl.edu

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GUEST EDITORIAL

FEATURE SERIES ON CROCODILE GREATS. Something occurred to me in Brazil during a moment of quiet reflection after several cold alcoholic beverages. There are quite a few fascinating personalities in the history of crocodile work. People like K.P Schmidt, Federico Medem, Hugh Cott, Duke Campbell, Wilfred T. Neill, and Ross Allen. Additional possibilities include: Miguel Alvarez del Toro, T. Barbour, Deraniyagala, E. A. McIlhenny, Mertens, Pitman, A.M. Reese, Luis Varona and Roland Coulson. Some of the current CSG members are also quite colorful people with interesting careers. Wouldn't the newsletter be perfect venue for short biographies of these individuals?

Most of the people working in the field today know them only as names. These Crocodile Greats have all left us an enormous legacy that has never really been put together in one place- in some cases not at all. The biggest question is who could write them up?? Perhaps the chore could be split among several of the more senior members of the CSG (over an extended period of time)- do you think they could be enticed? — John Thorbjarnarson, *Wildlife Conservation Society, Jthorbjarnarson@wcs.org*

[Invitation is now made to all CSG members to submit short biographies of famous crocodile biologists for publication in the Newsletter — *Eds.*]

Views and Opinions

IS IT TIME TO RETHINK THE CONSERVATION MESSAGE AND HOW WE DELIVER IT? Despite the widespread on-going emphasis on crocodile conservation, in recent years the CSG has experienced difficulty in

maintaining its operation due to a drop in donations from the private sector and non-government organisations[1]. This may reflect changed attitudes but there has been no attempt to investigate links to the decline in public sector conservation interests. We decided to investigate the perceptions of undergraduate students to crocodiles to see if we could find clues to the drop off in financial support.

Two groups of undergraduates (science and non-science) from the University of Western Sydney (Australia) were interviewed during class time. A questionnaire was used to determine demographic information (e.g., sex and age), attitudes to crocodiles and their conservation, and where they acquired their knowledge about crocodiles.

Despite the overall negative attitude towards crocodiles, 91% of 257 students agreed that they should be conserved, primarily due to their conservation value. Most students perceived that the economic value of animals was less important than a range of other values, including environmental and educational values, but significantly more science students considered that declining wild animals should be conserved than non-science students. Despite decades of conservation effort focused on economic values, this was the least important driver for conservation. Similar attitudes have been identified among young educated Americans surveyed for their views on grizzly bear conservation[2]. Since there was no difference in attitude between younger (18-25) and older (26-45) students, it may be assumed that the current more conservation savvy generation will maintain their attitudes as they age. To capture funds for conservation it may be time to consider if the conservation message should be shifted from economic, to environmental, benefit.

The success of *Alligator mississippiensis* (American alligator) conservation efforts can be traced to decades of research[3] and public education[3,4] through various media channels, including television[4]. In recent times wildlife parks, zoos and crocodile farms/ranches have increasingly focused on the conservation message. Internet usage has also expanded greatly in recent years and it may be assumed that young educated people would now access information from these sources. However, students still relied most heavily on television for their information and live displays, the internet and other media (e.g., movies, books, radio), were less important. Our results indicate that when the focus of the conservation message is to obtain funds, it may be time to rethink the approach to selling crocodile conservation. — Vicente S. Dagangon and Shelley Burgin, *Centre for Integrated Catchment Management University of Western Sydney, Richmond Australia 2753.*

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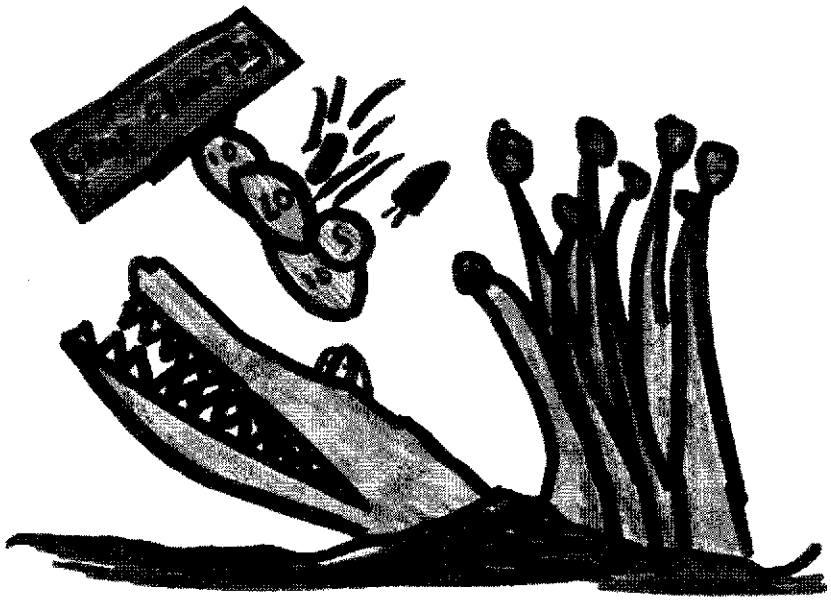


Drawing by Ms. Katy Hollands for her 'crocodile charity box' to raise money for saving crocodiles. The drawing depicts a crocodile being saved by money deflecting a bullet.

Drawing — *Submitted [independently of the Daganon & Burgin article above. Eds.] by her Dad,* Colin Stevenson, *38 Bailey St. Brightwaters, NSW 2264, Australia*

RESPONSE TO DAGANON & BURGIN. Having read with some interest, the suggestion by Dagangon and Burgin that it is time to rethink the conservation message for crocodiles and how we deliver it (VIEWS AND OPINIONS, Newsletter 19 (4), I would like to sound a note of caution in undertaking attitudinal surveys of this nature. The survey and the conclusions highlight the potential problems associated with exercises of this nature. The results may well reflect the views of the respondents, however they may also reflect the nature of the questions presented, which in turn may reflect the ideologies of the individuals who construct the questions.

During its early years the CSG employed the "accepted" conservation approach in its fund raising campaigns. Although there were some successes, effective conservation of many species of crocodilians required a more pragmatic approach. Accordingly, in the late 1980s the CSG played a pivotal role in applying the commercial value of the resource as an economic incentive for local people to conserve crocodilian resources. There is little doubt that the ability of countries to develop management systems to provide a legal supply of crocodilian skins and other parts to the international market has had a positive influence on the recovery and conservation of many species. This is now widely acknowledged and is reflected in the decisions taken under CITES to transfer various species or national populations of crocodilians from Appendix-I to Appendix-II to permit international trade.

The CSG is unlike most other conservation organizations, many of which solicit public subscriptions by highlighting conservation "problems". The CSG receives contributions for its conservation activities primarily from elements of the private sector (crocodile farming and skin industries). By contributing voluntarily to the work of the CSG, these entities practice a "user pays" approach to resource use and conservation. The fall-off in contributions to the CSG in recent years can be linked directly to the condition of the market place, which is strongly influenced by local and regional economies. The economic meltdown that East Asia, combined with a global over-production of crocodile skins resulted in reduced demand.

The authors appear to have analyzed the results of their questionnaire superficially without looking more closely at the factors involved in what is a very complex issue. Although I have not seen the individual questions presented to the recipients, the construct of a question, together with the quantity and quality of background information provided and the socio-economic profiles of the respondents will influence the types of responses obtained.

The claim by Dagangon and Burgin that the success of the American Alligator conservation program can be attributed to "decades of research and public education" conveniently does not present the complete picture and fails to acknowledge that the strategy also involves widespread commercial use of the species. It also fails to recognize that numerous other countries have developed sustainable use management systems for crocodilians that are similarly based extensive research and public awareness programs.

The most significant conclusion drawn by the authors from the survey is the indication that the respondents relied heavily on television as the source of information on which to base their beliefs and views on issues. It is regrettable that industrialized societies with ready access to television are becoming easily "programmable" and are rapidly losing the ability to think laterally and devise innovative approaches to conservation problems. — Hank Jenkins, *Creative Conservation Solutions, Canberra ACT, Australia*

CITES

16TH MEETING OF THE CITES ANIMALS COMMITTEE, SHEPARDSTOWN WV, USA. I attended the CITES Animals Committee Meeting 11-15 December 2000, and report the following:

1. The new chairman of Animals Committee, Dr. Marinus Hoogmoed (a CSG member!) took

control of the meeting, introducing new mechanisms for channeling inputs from NGO's and restricting final decisions of all matters to the Animals Committee members. This restricts NGO's ability to influence final outcomes in Animals Committee. Nevertheless, CSG and IUCN continue to be regarded highly by Parties and the Committee and were routinely requested to provide technical inputs.

2. The CITES identification guide to crocodilians, newly formatted for web use by CSG Deputy Chairman Wayne King,(see <http://www.flmnh.ufl.edu/natsci/herpetology/CITEScroc/ >) was featured during one session of the meeting as an example of new tools available to CITES.

3. The issue of modifying (relaxing) application of the exemption on personal effects to facilitate cross border transport of legally produced materials like crocodilian skin items was not put on the agenda. The AC chairman suggested that this matter must be pursued first by communication to the CITES Secretariat. Dietrich Jelden is working on a draft approach on this issue.

4. The attempt, initiated at the last COP, to simplify the process for registration of captive breeding facilities of Appendix I species was derailed and has become hopelessly complex. Conf. Res. 11.14 offered a simplified method for Parties to register captive breeding facilities, reserving rigorous scrutiny of applications only to those species considered "Critically Endangered and/or difficult to breed in captivity". Conf. Res. 11.14 suggested that Parties could submit short lists of such species. Species NOT on that list could be registered by Parties with a minimum of oversight.

Several Parties submitted very extensive lists that would in effect, remove nearly every App I species from the 'rapid registration' process (including all the App. I crocodilians.). Other Parties declined to submit lists as no criteria were available to guide which species should be listed. Animals Committee attempted to resolve this with a Working Group to define criteria by which "Critically Endangered and/or difficult to breed species" could be easily identified and listed. This process was unsuccessful. Protectionist interests and concerns about biodiversity and genetic heritage protection combined to push the proposal of extremely broad criteria (including, for example, all species listed at any level in the IUCN Red list) so that, again the effect would be to place nearly all App. I species in the category requiring rigorous scrutiny of captive breeding facilities.

Our input was restricted to technical information on the IUCN listings for 'Critically Endangered' and did not materially affect the outcome. At present, an Animals Committee Working Group recommendation for very broad criteria for inclusion of species on a list for careful scrutiny has been passed to Animals Committee for further refinement.

5. Correct labeling (source codes) on permits. Hank Jenkins presented a very thoughtful paper he prepared under consultancy to the CITES Secretariat that clarified the diversity of different ways of obtaining animal products for trade. These include wild harvest, ranches and captive breeding as defined by CITES. However there are some problematic intermediate forms of production such as collection of wild gravid females that produce young in captivity, holding animals in minimal restraint e.g. on islands, to breed, and attracting wild butterflies to lay on cultivated larval food plants. Currently, Conf. Res. 10.2 (Rev) requires that permits indicate if specimens were taken from the wild (W), originated in ranching operations (R) or born in captivity but not meeting the requirements of captive bred (F). Additionally there are two designations for specimens from closed cycle captive breeding facilities (C & D).

The correct source coding of crocodilian specimens (skins) has been a persistent problem with either misapplication of source codes (e.g. many ranched skins incorrectly coded as 'C') or skins produced in same facility by different methods (ranching and captive breeding) not being differentiated. However, the main problems in CITES are not with croc skins but with several production systems that are barely disguised extraction from the wild incorrectly labeled as ranched or captive.

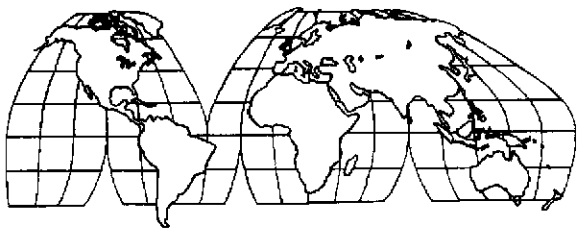
Hank's paper (see <http://www.cites.org>, Documents, Animals Committee, Doc AC 16.15) outlines the nature of the problem and proposes some solutions that will be addressed in future AC meetings.

6. Cross border transport of research samples. The need for timely and expedited CITES handling of delicate specimens such as veterinary samples (blood, tissue etc.) was introduced at COP 11. The issue is made complex by the reluctance of many Parties to

facilitate or lose control of specimens that might be used for bioprospecting and by a general reluctance to provide exemptions to the articles of the convention. Despite these problems, a very effective Working Group developed proposals to carefully limit the kinds of tissues that could be given special treatment and to limit this 'special treatment' to expedited issuance of permits, recognition of bona fide research institutions, etc., rather than to a straight 'exemption' from CITES. A number of sensible working proposals were forwarded by the Working Group for further refinement that may result in a resolution on this matter for the next COP.

7. Marking products. The Universal Tagging for Crocodilian Skins was offered as a conceptual model for other difficult-to-mark products such as caviar. The croc marking concept is to rigorously mark raw products from production source to first processing and to relax marking requirements for subsequent 'downstream' highly processed and divided items. Once again, crocs have led the way to new concepts in CITES. — Perran Ross, *Executive Officer CSG.*

Regional Reports



Africa

Madagascar

PRELIMINARY REPORT ON *CROCODYLUS NILOTICUS* IN THE LAC RAVELOBE REGION. We surveyed *Crocodylus niloticus* in Lac Ravelobe, Ankarafantsika Special Reserve, to determine the demographic structure of the population for management action. Second, we collected blood samples for genetic analysis to determine whether there is population substructuring of *C. niloticus* in western Madagascar, and to assess the degree of genetic divergence between *C. niloticus* populations in Madagascar and mainland Africa.

Crocodile populations in Madagascar have been protected by law since the 1970's but there is little detailed knowledge about the status of populations in many regions. There have been increasing reports of conflict between humans and crocodiles and there is an urgent need for a management protocol for assessing and controlling nuisance animal threats in various regions.

Lac Ravelobe is a sacred lake located in the Ankaranfanstika management area. In the past few years there have been several reported fatalities attributed to crocodiles and there appears to have been a significant increase since 1998. This site is known for its unique natural and cultural resources and, as such, requires special consideration for the resolution of human / crocodile conflicts.

Our goals were to assess the population size, structure and distribution of *C. niloticus* in Lac Ravelobe and to develop recommendations for reducing human / crocodile conflicts in the area. Additionally, we attempted to collect blood samples from this and other *C. niloticus* populations in northwestern Madagascar to determine whether populations are genetically distinct in separate river drainages. This genetic assessment is part of a larger effort to determine the genetic status of Malagasy crocodiles with respect to their mainland African counterparts.

Methods: We surveyed the population of *C. niloticus* in Lac Ravelobe using a slight modification of traditional spotlighting methods. Due to constraints imposed by local belief systems (no metal is allowed to enter the lake) we used a fiberglass boat propelled by two paddlers. Surveys of Lac Ravelobe were conducted on December 3rd and 4th, 2000. The surveys started at 1900h and followed the perimeter of the lake, approximately 30 m from the shore. We used an 800,000 CP spotlight with a portable battery to search for eye reflections of crocodiles. Size class determination was made visually by approaching an animal as closely as possibly and viewing the eye shine from both lateral and frontal positions.

In addition to surveys, we attempted to trap or hand capture individual crocodiles to collect blood samples and for possible mark-recapture analysis at a later date. Small animals (<1.5m) were approached by boat and capture was

attempted by hand or net. Large individuals were lured into snare or cage traps baited with meat. Standard morpohological measurements were made on all captured animals. Five microliter blood samples were collected from the caudal vein using a small gauge needle. Blood was stored in 5ml EDTA blood buffer at room temperature.

We interviewed the local community for information on several factors associated with human/crocodile interactions. These included location, activity, time of day, time of year, number of people in vicinity, position of individual attacked, type of wound, efforts at self defense and other relevant information. We also interviewed individuals in Malagasy (J. Paulin) to determine local knowledge of crocodile ecology, behavior and levels of exploitation. These factors were combined in collaboration with local authorities to present a set of recommendations to local communities to relieve human / crocodile conflict and promote crocodile conservation.

Sculpture of a crocodile eating a person, Zimbabwe. Fritz Huchzermayer photo.

Results: Conditions for the surveys were fair with no cloud cover and no wind. The moon was just over half full. Total survey time was 5.5 hours and total distance covered was 5.4km. The surveys resulted in observations of 22 individuals. The population was heavily skewed towards adults (>2.5m, n=9) and subadults (1-2.5m, n=8). A total population estimate of 37-66 individuals was extrapolated from our observations. It was apparent from observations and subsequent extensive surveys on foot that there has been little or no recruitment into the population for approximately 4 years. No hatchlings, or juveniles (<1m) were observed.

Intensive interviews with locals suggest that the lack of recruitment may be due to two related management actions. Water at Lac Ravelobe is retained during the rainy season for irrigation of rice fields in the dry season. Control of the lake level is determined by water resources managers at Marovoay (30km away). In recent years, the timing of the closure of the control valve has been somewhat erratic and it appears that it is frequently in advance of the hatching season for crocodiles. Observations by local guides suggest that nests are inundated and lost when the valve is closed prior to December 15th in any given year. Additional loss of hatchlings is probably a result of crowding of crocodiles during drawdown in the dry season. Mortality of hatchlings and juveniles is likely due to predation by adults in high concentrations during this period.

Crocodile attacks and fatalities have been concentrated in one small section of the lake. This area is the most accessible (100m) from the village of Ampijoroa and people frequently collect water, bathe and wash clothing at the site. One or more large crocodiles were observed on several occasions directly adjacent to this site and showed signs of habituation to humans. We captured one individual (>3.5m) at the site of two fatal attacks. Another smaller individual (2.5m) was captured and used for community education and outreach on behalf of crocodiles. Over 200

local people from Ampijoroa and the neighbouring villages of Andranofantsika and Ambodimanga, including 70 school children, participated in the outreach on one day.

Blood samples were collected from one individual at Lac Ravelobe, 4 individuals from the Mahajunga region, and an additional 28 samples were collected from hatchlings of known origin at Reptel Crocodile Farm outside of Antananarivo. Of the twenty-eight samples, 7 each were from separate river drainages in the Mahajunga provence.

Recommendations: Two areas of recommendations are important for the protection of local communities and crocodile populations in Lac Ravelobe. Firstly, in order to restore normal population recruitment for Lac Ravelobe crocodiles, the water management authorities at Marovoay must immediately be brought into the dialogue concerning the implication of water resources management actions on Lac Ravelobe crocodile populations. At minimum, we recommend that water retention at Lac Ravelobe begin no sooner that 15th December. This will allow nesting female crocodiles to adapt to water management actions over the long term and should result in successful recruitment of hatchlings into the population. The drawdown of the lake should also proceed at a moderate pace and allow retention of some refugia for juvenile and hatchling crocodiles. Long term monitoring of the population subsequent to altered water management protocols is strongly recommended.

Human fatalities attributable to crocodiles at Lac Ravelobe have been concentrated near the village of Ampijoroa. We recommend several actions intended to protect local communities while allowing them to carry out traditional cultural practices. These are as follows:

*Install wells to allow people an alternative access to water (Done)

*Provide warning signs both along the road and at lake's edge to inform visitors of the danger presented by large crocodiles (Road signs done)

*Install protective barricades at the lake's edge at least two water levels to allow bathing and washing (One complete)

*Enforce the ban on net fishing in the lake. This is a local Fady (taboo) as well as a means for poaching crocodiles and overfishing local resources.

*Encourage ecotourism associated with easily accessible crocodile watching from the spillway at Ampijoroa to bring economic benefit from live crocodiles.

*Community outreach including training crocodile guides and data collectors to gather data on human / crocodile interactions and ecological observations.

* Support locally based belief systems which view the crocodiles of Lac Ravelobe as sacred animals.

* Support locally based conservation initiatives and discussion and involve residents at all stages of decision making

* Consider removal of potentially dangerous large crocodiles from area of human activity as a last resort.

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Malawi

MALAWI PLANS CROCODILE MANAGEMENT PROGRAM. Crocodiles dwelling in Malawian lakes and rivers have become a bone of contention between the government and indigenous people who live near these water bodies. Both the people and their livestock regularly fall victim to crocodiles, but the government insists that it is determined to protect the crocodiles.

Habitat and natural foods for the Nile crocodile have been reduced in the Shire River, an outlet of Malawi, Africa's third largest lake. These pressures have led to increasing numbers of crocodile attacks on cattle, goats and even humans, as well as destruction of fishing nets and other equipment vital to the prosperity of the local people.

Malawi has a government controlled crocodile harvest program, with quotas established in 1948. A national harvest quota of 250 wild crocodiles is also in place, dictated by the Convention on International Trade in Endangered Species (CITES). But the actual harvest in Lower Shire has been considerably lower. In 1997, for example, government hunters killed 162 crocodiles in the Lower Shire.

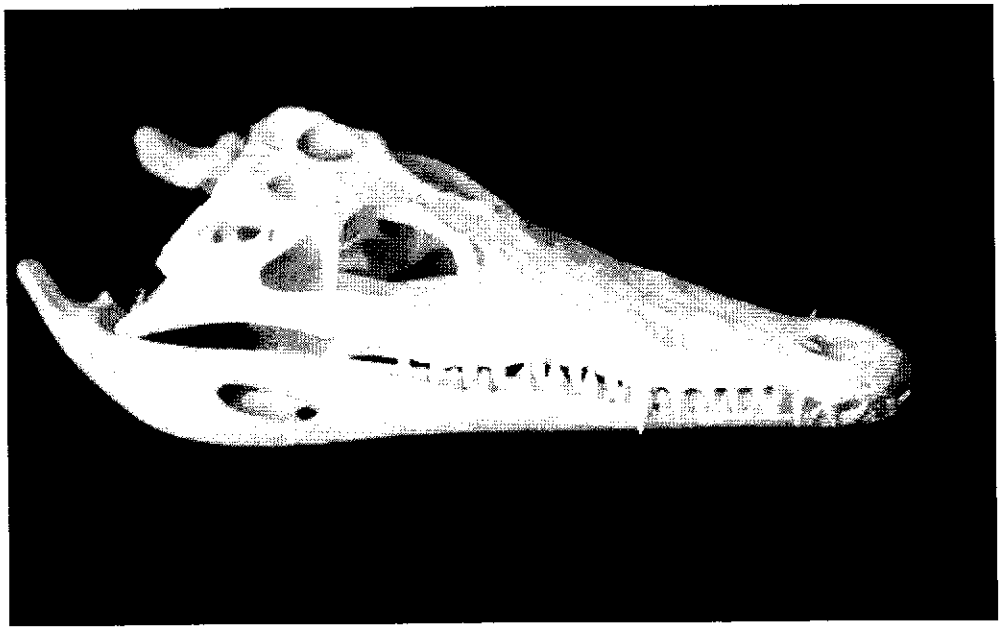
Now, the Malawi Department of National Parks and Wildlife is moving toward advocating and supporting the sustainable harvest of crocodiles, with a portion of the profits directly benefiting local communities.

dogs and other crocodiles were found. The excessive use of wetland resources by people has reduced the availability of natural crocodile food such as wild mammals and fish, contributing to the increase of crocodile attacks on people and livestock.

Besides loss of life, fishers suffer considerable destruction of equipment, particularly nets, as a result of crocodile attacks.

Wildlife managers say there is a need to address people's negative attitudes towards crocodiles. Some feel that they should not be conserved. "I don't think these animals are the type that we should conserve for the future generation," said Chief Ngabu of Chikwawa. "I don't think our children need to have such beasts around. After all, we do not benefit anything from these beasts."

While significant numbers of crocodiles are culled from the Lower Shire each year, communities currently enjoy no benefits from such activities. The plan will explore and



Skull of Nile crocodile *Crocodylus niloticus*. R. Sommerlad photo.

According to a 1998 report by a government hunter who harvested crocodiles from the Lower Shire, some parts of the river have such dense crocodile populations that he was able to shoot 15 to 25 crocodiles each night. The hunter reported that when the stomachs of larger crocodiles were opened, remains of cattle, goats,

implement better ways of involving communities in crocodile management, including the application of indigenous knowledge. The joint plan also intends to ensure that profits accruing from crocodile harvests are shared with communities in return for their participation in crocodile management.

But current efforts towards crocodile population control are being hampered largely by inadequate information on crocodile numbers. Where efforts have been made to generate adequate population figures, it is still difficult to ascertain the trends in crocodile numbers because different methodologies have been used in counting them.

The Zambezi Basin Wetlands Conservation and Resource Utilization Project (ZBWCRUP), a World Conservation Union (IUCN) project supported by the Canadian International Development Agency, is attempting to address some of the issues relating to crocodile management in Lower Shire. A formal crocodile management plan is being drawn up to the two agencies for presentation to local communities for their consideration and input.

To reduce crocodile attacks on people, the ZBWCRUP has embarked on a public awareness campaign through meetings, drama, radio and other communication methods. It has promoted the use of larger boats, which are not susceptible to crocodile attacks. Support has also been given to removing aquatic weeds that provide hiding areas for crocodiles.

To ensure that crocodile populations are maintained at sustainable levels, managers must safeguard crocodile habitats by identifying specific areas needed for various stages of the crocodile life cycle. Both nesting areas on land and water habitats of crocodiles have been reduced by agriculture and fishing.

Various issues have yet to be addressed, including crocodile population monitoring, human-crocodile interactions, habitat management and community participation. The ZBWCRUP supported the national parks department in carrying out hippopotamus and crocodile counts in the Lower Shire in 1997. Using methodologies established for the earlier counts, the project is advocating semi-annual crocodile counts. Data generated from such inventories, coupled with historic data, will help in establishing reliable trends in crocodile population levels.

The plan could be hampered, however, by actions taken recently by Malawi President. The office of the President will be responsible for all government duties, including environmental and wildlife issues, until a new government is in place. — by Brian Ligomeka *BLANTYRE, Malawi, November 2, 2000 (ENS) submitted by* Sabri Zain, *Communications Manager, TRAFFIC International 219c Huntingdon Road Cambridge CB3 0DL, UK.*

South Africa

ST. LUCIA CROCODILE CENTER NEWS. Mark Robertson's association with the Crocodile Center started 15 years ago when he worked there as a student for three years. He started here full time four years ago, taking over for CSG member David Blake, now retired. Mark reports: At the moment we are doing the annual nest survey of Lake St. Lucia. This year we have had fantastic rains and many of the crocs are laying around water pans which were not in existence before!

Recently we had three fatal crocodile attacks; all three during November and December of last year. The first was one of our own staff working with "Kwazulu-Natal Wildlife" who was presumed taken by a croc, at Lake Bhangazi here in the Greater St Lucia Wetland Park while she was fishing close to the water edge. This was extremely likely but not conclusive as her body was never recovered even after an extensive ground and air search.

The second and more publicized attack took place on 8 December while a 22-year old woman tourist was attacked at the St. Lucia Estuary/Umfolozi river mouth after going for a skinny dip with her boyfriend in the middle of the night in croc infested waters! We have intensified our education campaign and erected even more signs which often get vandalized or stolen. A third crocodile attack took place four days later when a local woman was crossing the Enseleni River. The croc held on to her body without attempting to feed and we eventually recovered it intact. The last attack before this bout of three was in December 1998 at Mapelane close to where the tourist was killed. About 85 % of the croc attacks take place from November to April as this coincides with the breeding/nesting season, the temperatures are a lot warmer and the rivers are a lot fuller and the water discolored. These incidents are highly regrettable as they do have a negative impact on our conservation endeavors. — Mark Robertson, *St Lucia Crocodile Center, Private Bag x03, St Lucia Estuary 3936, South Africa.*

NILE CROCODILE MEAT IN THE JOURNAL OF THE SCIENCE OF FOOD AND AGRICULTURE. This paper not only looks at the carcass yields but also the chemical (proximate, amino acid, fatty acid and mineral) composition of the meat. Physical attributes such as tenderness and cooking loss are also measured. The basic idea was to look at the nutritional value (from a human perspective) of crocodile meat.

If any of your readers would like a reprint, they can contact me at the address below. The full reference is Hoffman L. C., Fisher P. P. & Sales J., 2000. Carcass and meat characteristics of the Nile crocodile (*Crocodylus niloticus*). J. Sci. Food & Agric 80: 1-7. — Louw Hoffman, *Senior Lecturer, Department of Animal Science, University of Stellenbosch, PO Box 3318, Matieland 7602 South Africa (Tel) 27-21-8084747 (Fax) 27-21-8084750.*

East Asia, Australia And Oceania

Philippines

UPDATE ON PHILIPPINE CROCODILE CONSERVATION IN THE NORTHERN SIERRA MADRE NATURAL PARK. The Philippine crocodile, *Crocodylus mindorensis*, is a critically endangered species endemic to the Philippines. Recently its presence in the Sierra Madre mountains of north-eastern Luzon was confirmed (F. Pontillas, CSG Newsletter vol. 19, no. 2). This is raising new hope for the survival of this species in the wild but, as elsewhere there are many threats. In the Sierra Madre, crocodile habitats are increasingly converted to cultivated lands by upland migrating farmers, crocodiles are killed or captured and sold, rivers are being depleted of crocodile food resources because of destructive fishing and hunting methods.

The good news is that the Philippine crocodiles living in or near the Northern Sierra Madre Natural Park (NSMNP) now receive top priority attention from the authorities and conservation projects active in the area. A one year Philippine Crocodile Conservation Project for the NSMNP is now being executed by the Department of Environment and Natural Resources (DENR) and communities with assistance from the PLAN International / Northern Sierra Madre Natural Park - Conservation Project (NSMNP-CP). Efforts are underway to include this local Crocodile Conservation Project in the National Recovery Plan for the Philippine Crocodile and to extend the project to a long-term duration.

NSMNP-CP is assisting the DENR in Protected Area management and conservation of bio-diversity in the NSMNP in North-eastern Luzon. Funding of the project is provided by the Dutch government and by PLAN International, an international NGO better known for its child-focused development programs. The NSMNP-CP's major components are Alternative Livelihood Development, Information, Education and Communication (IEC), Training, Bio-diversity research and assistance to PA management and conservation.

The NSMNP Crocodile Conservation Project (July 2000 - June 2001) was designed to ensure survival of this species in the municipality of San Mariano, one of nine municipalities that are partly or entirely situated in the NSMNP. Philippine crocodile presence was confirmed in several locations in this municipality and recently a crocodile nest with hatchlings was found here. The crocodile conservation project consists of several components.

Alternative livelihood development. In consultation with the communities, confirmed crocodile habitats will be protected as sanctuaries. To offer the local population alternatives for those activities that they will have to abandon in these sanctuaries, the NSMNP-CP is assisting them in establishing agro-forestry farms. The objective is to assist people in shifting from slash and burn farming, unsustainable fishery and hunting methods and timber poaching practices towards sustainable agriculture. The sanctuaries will be proclaimed by the Local Government Units and protected by local legislation or ordinances. Protection brigades are being formed and will consist of community members.

Information, Education and Communication. Awareness campaigns and community consultations have been conducted in communities close to crocodile habitats. A flyer (2000 copies) in Filipino was produced about the threatened status of Philippine crocodiles, including the fact that this species is not dangerous to people and the do's and don'ts regarding the crocodiles. The campaign's

objective is to inform people and to create a sense of pride about the unique species they are sharing the area with. A poster with that message was produced (50 copies) and distributed. People were trained in community theatre as a tool to communicate about environmental issues. Community members are updated quarterly on Philippine crocodile issues in the Filipino newsletter the project is producing and distributing. Once the crocodile sanctuary boundaries have been agreed upon, community volunteers assisted by NSMNP-CP and DENR will construct billboards to demarcate the area and to indicate the local support to crocodile conservation.

Research. Research activities are continuing to establish the status, distribution and population of Philippine crocodiles in the NSMNP and surrounding area. Land use is being mapped along rivers with confirmed crocodile presence.

A social survey is currently being conducted to determine the local people's perception of Philippine crocodiles and their conservation, recent observations and fishing and hunting activities in the area.

Based on research results, additional conservation, IEC and alternative livelihood development activities will be proposed to ensure survival of the crocodiles.

Protected Area management. Recently, the Environmental Management Plan for the NSMNP has been approved by the Regional Development Council prior to its submission to the Secretary of DENR for approval. Those areas within the park with confirmed Philippine crocodile presence have been declared Philippine crocodile habitat management zone. Special conservation measures will be taken by the Protected Area Superintendent Unit (PASU) of DENR to ensure the protection of crocodiles in these areas. The Bio-diversity Monitoring System used by the PASU staff in protected areas in the Philippines will have a specific Philippine crocodile monitoring component.

The strength of the crocodile conservation project clearly lies in its integrated approach. The first results are there already. Recently, fishermen took the initiative to turn over two hatchling crocodiles they accidentally caught to NSMNP-CP staff. The hatchlings were returned to the river where they were caught in an area that will soon be declared sanctuary. One year ago these fishermen would surely have sold the hatchlings for as much as half a months salary. The fact they turned them over and earned nothing but respect shows their concern in Philippine crocodile conservation and provides high hopes for the future. — Merlijn van Weeerd, Alfredo Alex G. & Gwen van Boven, *PLAN International / Northern Sierra Madre Natural Park-Conservation Project (NSMNP-CP), EIC, ISU, Garita Slopes, Cabagan, Isabela 3328, the Philippines.*

UPDATE ON PHILIPPINE CROCODILE OCCURRENCE IN THE NORTHERN SIERRA MADRE NATURAL PARK. As reported by Frederick Pontillas in the CSG Newsletter vol. 19, no.2, the Philippine crocodile, *Crocodylus mindorensis*, still occurs in the Northern Sierra Madre mountains of North-eastern Luzon. Surveys conducted by the PLAN International Northern Sierra Madre Natural Park-Conservation Project (NSMNP-CP) and by joint teams of the Palawan Wildlife Rescue and Conservation Centre (PWRCC formerly CFI), NSMNP-CP and the Department of Environment and Natural Resources (DENR) confirmed the presence of the crocodile in five different locations. Several other locations are suspected to harbor crocodiles but evidence is as yet lacking.

During a joint survey in August 2000 at a site known as Diwagden, Disulap river in the municipality of San Mariano, Isabela Province, the team found the nest of a Philippine crocodile. Parts of eggshells were found in the nest and eight hatchlings were observed in the river adjacent to the nest. The hatchlings were caught, measured, marked and released. Based on secondary information it is estimated that a total of twenty-four eggs hatched.

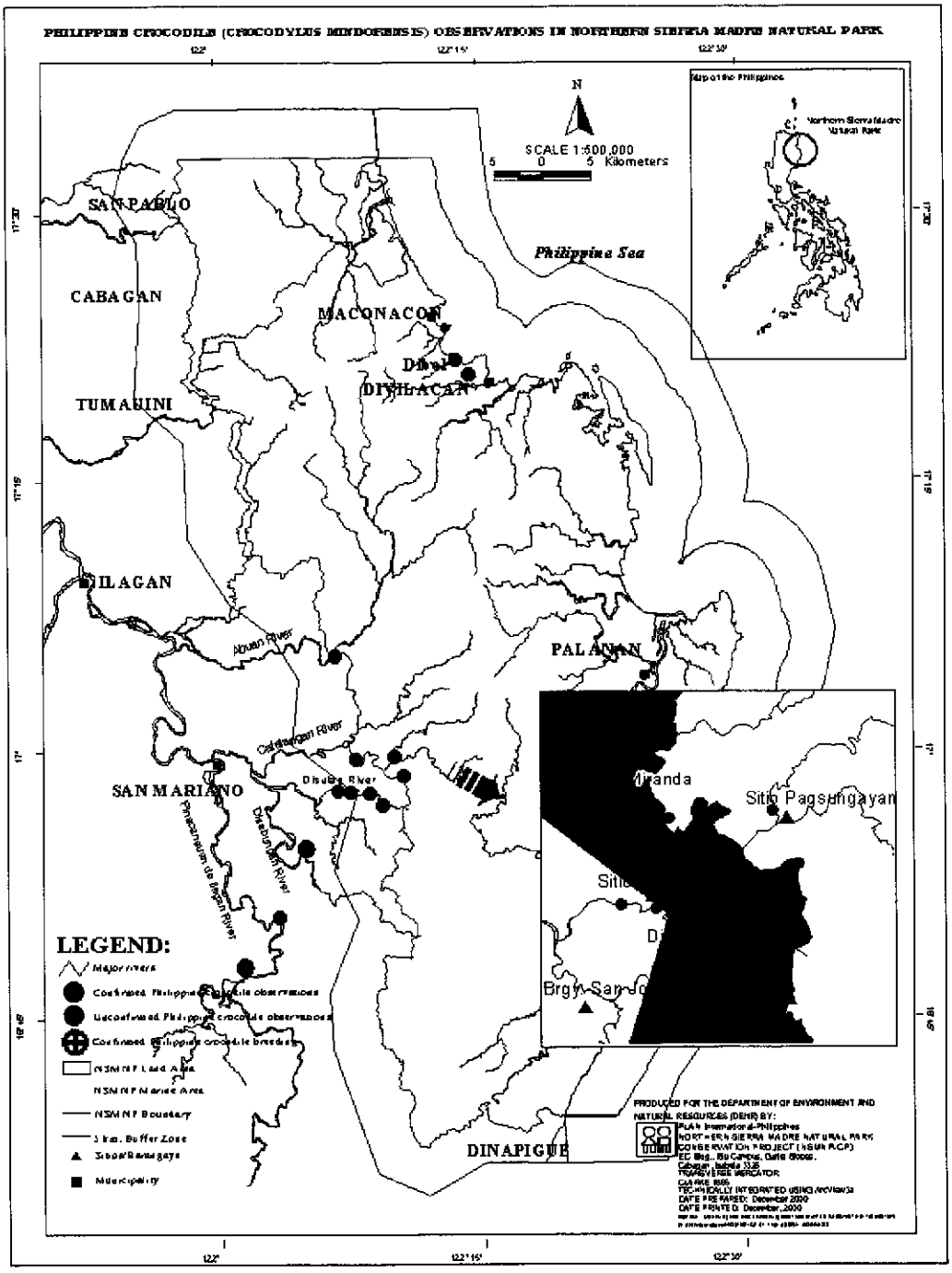
In September 2000, fishermen caught two hatchlings in their nets in the Diwagden area. One unfortunately died, the other one was turned over to Alex General, Area Manager of the NSMNP-CP in San Mariano. The marked hatchling was measured, documented and released. In October, the capture of two hatchlings by fishermen was reported about 10 km downstream from Diwagden. It was impossible to retrieve or document the hatchlings. Perhaps these were hatchlings from the Diwagden nest but that can not be concluded with certainty. Considering past experiences, these hatchlings have probably been killed or sold. During a survey in November 2000 by

NSMNP-CP, three hatchlings were observed in the Diwagden area. Two were caught, measured and released. Both were already marked. Two hatchlings were found about 100 meters downstream from the nesting site, the other one about 300 meters downstream.

Concluding, from the eight hatchlings caught and marked in August, three are still confirmed alive and present in the Diwagden area. Crocodile hatchling mortality is usually very high so this is not a bad score. NSMNP-CP will continue to monitor the Diwagden area.

Of the other locations with confirmed Philippine crocodile presence in the Northern Sierra Madre, three are also within the municipal boundaries of San Mariano and one is a coastal river in Divilacan on the other side of the Sierra Madre. They are:

Lake Dunoy, near the village of Dunoy, San Mariano is a small shallow lake with a reported population of up to ten adult crocodiles. One adult crocodile has been observed here by the NSMNP-CP researchers in the middle of the lake. No proof could be found of the presence of



more crocodiles. The forest surrounding the lake has unfortunately been logged recently and the lake is being transferred into an irrigation pond. The fate of the crocodiles of Lake Dunoy looks bleak.

Kamalaglagan Creek, near the Agta (the indigenous people of the NSMNP) settlement of Pagsungayan, San Mariano. One adult crocodile was observed here in July 1999. Agta mention they observe crocodiles here regularly as well as in another creek nearby. As yet, no evidence has been found of crocodile presence in the other creek. Pagsungayan and the surrounding creeks are situated within the Northern Sierra Madre Natural Park. The conservation prospects of this area look good.

Pinacanuan de Ilagan river, village of Ibuyan, San Mariano. Two juvenile crocodiles were caught here in 2000 by fishermen. The crocodiles have been retrieved by NSMNP-CP. Field surveys in this area are ongoing. Local informants mention the presence of crocodiles in several creeks feeding the Pinacanuan de Ilagan river.

Dibol river, municipality of Divilacan. At the mouth of the small coastal Dibol river, an adult Philippine crocodile was caught by fishermen in 2000. It was caught in the sea but clearly was a *C. mindorensis* and not a *C. porosus* which also occurs in the coastal waters of the NSMNP. The authorities were not able to retrieve it and it died later. It could be documented well however. Local informants mention the presence of several crocodiles in the coastal rivers in this area and in a lake nearby. So far, the captured crocodile is the only evidence of the occurrence of crocodiles in this area.

In the map, areas with confirmed and suspected crocodile presence in the NSMNP are indicated. Studies are presently ongoing to determine the distribution, population and habitat preference of the Philippine crocodile in the NSMNP. — Merlijn van Weerd, *Wildlife Biologist, PLAN International / Northern Sierra Madre Natural Park-Conservation Project (NSMNP-CP), EIC, ISU, Garita Slopes, Cabagan, Isabela 3328, the Philippines*

INCREASED PRODUCTION OF CROCODILES. The Philippine government recently embarked on a massive breeding program to ensure that crocodile numbers remain high. Spearheading this initiative is the Department of Environment and Natural Resources (DENR). They have set out a captive breeding program that calls for production of 35,000 reptiles by the year 2005. The government has entered into an agreement with six private companies to enhance breeding and dispersal of primarily saltwater crocodiles.

The Crocodile Farming Institute (CFI), now called Palawan Wildlife Rescue and Conservation Center, was established in 1987 to prevent further decline of the crocodile population. Established through cooperation with the Japan International Co-operative Agency, CFI's major objectives were to conserve the two endangered species, *C. porosus* and *C mindorensis*, and to develop and introduce suitable farming technology to uplift the socio-economic well being of the Philippines. CFI's eight acre facility has limited space and can accommodate only about 4,000 specimens. However the stock was reduced in 1998 when a typhoon and flooding allowed some crocodiles to escape into a nearby river.

CFI was established with a founder stock of just 50 adult *C. mindorensis* and 153 adult *C. porosus*. Successful breeding was accomplished in 1989-1990 and by 1995, stocks included 820 *C. mindorensis* and nearly 2,500 *C. porosus*. Production in 1995 was 143 Philippine crocodiles and 819 saltwater crocodiles.

Table. Crocodile stock at CFI as of September 1995.

Age class	*C. mindorensis*	*C. porosus*
hatchling	263	1,152
Juvenile	340	1,007
Subadult F	108	141
Subadult M	59	44
Breeder F	21	106
Breeder M	29	47
Total	820	2,497

DENR officials selected just six highly qualified companies with the ability and know-how to breed crocodiles from 79 applicants. Initially, the government approved the distribution of 110 crocodiles from CFI to the private breeders and the program is expected to generate huge revenues for the government and provide employment to many rural farmers. The principal income will be from skins and from meat which is becoming a delicacy because of its high protein content and supposed aphrodisiac

qualities. Farmers raise stock provided from CFI by the government under contract and will receive 60% of revenues and offspring from their breeding activities. Forty percent will go to the government. An additional part of the strategy is to survey potential sanctuaries where, eventually, crocodiles will be released and conserved. — From LEATHER, *November 2000:52-54.*

Solomons

SOLOMONS UPDATE. Mike McCoy has produced a CD-ROM updated version of his book, McCoy, M. 2000. REPTILES OF THE SOLOMON ISLANDS (CD-ROM) ZooGraphics, Kuranda, Australia. The account is an update of the 1980 book of the same title. It comprises detailed accounts of all 88 species of reptiles - terrestrial and marine - currently known to occur in the Solomon Islands (including Bougainville and the Santa Cruz Group).

Mike includes the following comments on crocodiles, *C. porosus:*

'A 1988 survey estimated the total crocodile population of the Solomons to be less than 1,000 animals, with the largest breeding population (about 700 animals) occurring in Lauri Lagoon on the southern coast of Guadalcanal. The species inhabits mangrove areas and tidal estuaries, also creeks and rivers, swamps and on occasion, the open sea.

During the day the crocodiles are often actively swimming but rarely leave the water. Larger individuals occasionally come ashore to sun themselves, mostly in the early morning or late afternoon; young crocodiles spend most of their time in the water and shelter in shore vegetation. At night larger crocodiles often move around on land, up to 100m or more away from the water. They feed, largely depending on size, on a variety of vertebrates and invertebrates such as crabs, fish, frogs, birds, other reptiles including smaller crocodiles, mammals such as rats, flying foxes and very occasionally pigs and calves. There have been human fatalities attributed to this crocodile in the Solomons. A large nest of leaves, sticks and grass is constructed by the female crocodile. About 60 eggs are laid and guarded by the female until they hatch. No information is available on times of nesting in the Solomons; it is not known if crocodiles have defined nesting season in these islands.

I have had some opportunity to observe wild crocodiles on the island of Aliiti in the Olu Malau group off Makira in the eastern Solomons. On Aliiti, a large colony of flying foxes *Pteropus* sp. live in the trees surrounding the small lake inhabited by the crocodiles. During heavy rain the bats move low in the trees and the crocodiles wait in the water below and grab any bat that comes within reach. On Malaupaina Island in the Olu Malau group I have seen evidence of crocodiles digging in the sand above the high water line, presumably for crabs.

The situation in the Solomons still hasn't changed much as far as the crocodile populations are concerned - there are very few areas where *C. porosus* occurs in any numbers, and individual animals in the vicinity of villages are invariably killed sooner or latter.' — M. McCoy, *in litt. to* Gahame Webb. *Submitted by* Grahame Webb, *Wildlife Management International, Sanderson, NT. Australia.*

Vietnam

THREATENED CROCODILE SPECIES GETS HELP. Vietnam is set to reintroduce crocodiles to the wild later this year for the first time since the animal disappeared from the country's rivers and estuaries a decade ago, the official VNA news agency reported on Monday. An initial batch of 25 is to be released in Cat Tien National Park, in Dong Nai province northeast of the commercial capital of Ho Chi Minh City, and will be joined by a further 15 before the end of the year, the news agency said.

The animals have been bred in captivity by the Ca Sau Hoa Ca Crocodile Company and will first undergo DNA testing by scientists from Australia's Queensland University to ensure they are Siamese crocodiles, the freshwater species formerly native to Vietnam. Both the Siamese crocodile and its saltwater cousin, the Estuarine crocodile, have gone unsighted in the wild here for the past decade.

Hoa Ca Crocodile Company transferred 25 adult *Crocodylus siamensis* to Nam Cat Tien National Park yesterday in the hope the species will multiply in the wild. Later they will be released into Bau Sau, a small lake covering 2,500 hectares in the wet season.

Tran Van Mui, director of the park, said this was part of a project to revive the threatened species. The Ministry of Agriculture and Rural Development had provided financial support for the program, he said. The HCMC Tropical Biology Institute had joined in a study of Bau Sau over 18 months starting in May this year to determine the lake's suitability, he added. The chosen crocodiles are all to be given a crash course on survival in the wild, the news agency said, although it gave no details on how the training would be provided. Ironically Mother Nature may already have preempted the government's reintroduction scheme. Earlier this month an amazed fisherman in the flood-stricken Mekong Delta caught a 25 kilogramme (55 pound) crocodile in his net and villagers elsewhere in An Giang province have also reported sightings.

Officials said they believed the opportunistic animals had taken advantage of the region's worst floods in nearly 40 years to escape from one of the province's growing number of crocodile farms. *From Saigon Times Daily. October 26, 2000, submitted by* Jon Hutton, *Africa Resources Trust, 219 Huntingdon Road, Cambridge CB3 ODL, UK.*

Western Asia

India

BEHAVIORAL AND ECOLOGICAL STUDIES OF MUGGER IN THE KACHCHH DISTRICT, GUDJARAT. The Kachchh (Kutch) District in the western part of Gudjarat State has an area of 45,652 km^2 and is the largest district in Gudjatrat and second largest in India. It falls entirely in the arid region with an average annual rainfall of 326 mm. Rainfall is scanty and erratic and droughts are a recurring phenomenon. There are no perrenial rivers in Kachchh, although there are temporary monsoon torrents. High temperatures (42°-47°C March-June) and high evaporation result in poor surface water availability and many lakes, dams and tanks dry up in summer. There is also severe pressure on water sources from the high human population (1.2 million) and livestock (1.5 million head) and from agricultural and industrial sectors.

Surprisingly, under such conditions Kachchh supports a good population of endangered freshwater mugger crocodiles (*C. palustris*) with the second largest population of muggers in the State. As muggers are dependent on fresh water, the harsh environmental conditions affect their survival. Muggers in Kachchh have a developed special behavioral adapations of burrowing and overland migration between water bodies that are different from muggers living in other parts of the country. In addition this population is isolated from other crocodiles in Gudjarat and the rest of India by the Arabian sea on the south and western boundaries and by the greater and lesser Ranns, which are barren highly saline marshes that occupy over 23,000 km^2 of unsuitable habitat north and east of Kuchchh.

Except for the distribution and status there is little information on muggers living in the region. A new project, 'Ecological and behavioral Studies of *C. palustris* in the arid region of Kachchh' is being proposed to assist formulation of monitoring, management and conservation guidelines for this population. A study of distribution and status of muggers in Gudjarat (including Kachchh) was carried out in 1996-96 and it is important to monitor changes in the population status after an interval of five years. Therefore a survey of muggers in Gudjarat has also been planned as part of the project. The following report is a preliminary result of the project. — V. Vijay Kumar, *Gudjarat Institute of Desert Ecology, Patwadi Naka, Bhuj, Gudjarat Pin 370 001, India.* [Eds/ This and the following report were received prior to the recent disaster in Gudjarat, we are pleased to report that Vijay and his family have survived - see personals.]

MUGGER BURROWS, AN ADAPTATION TO A HARSH ENVIRONMENT. Burrows are used by muggers (*C. palustris*) under various circumstances as a refuge for resting, thermoregulation, aestivation during prolonged drought, protection from natural predators and humans, and for nesting. A total of 144 mugger burrows were recorded in Gudhjarat State. Muggers were present in 5 burrows and 22 were also used for nesting. Many of the burrows indicated recent use by muggers by the presence of spoor (track) marks. During the summer in the Gir Forest, burrows were observed at three different heights above water level; 5-10 m up the bank, at the water level and at the middle of the bank between water level and the top. It was

assumed that the upper burrows are used during monsoon at highest water levels, the middle levels during the winter as the water recedes, and the lowest levels during summer and lowest water levels. Temperatures 3m within a burrow at Hiran dam in the Gir Forest fluctuated between 19.2°C and 19.8°C over 24 hours while the outside air temperature ranged from 12°C to 43° C. The low and stable temperature within the burrow allows the mugger to reduce body temperature and metabolic rate, reduce energy expenditure and live for longer periods without food.

The area of Hiran dam during the monsoon is 3.35 km ^{2} and supports around 200 muggers. In summer the same number of animals occupy just 0.83 km ^{2} as water is withdrawn for irrigation and by evaporation. The density is high even during the monsoon and during the summer reduced habitat availability and competition for food are intense. We recorded 58 burrows at Hiran dam. It seems that muggers will group together in a single tunnel, as reported for Nile crocodiles. — V. Vijay Kumar, *Gudjarat Institute of Desert Ecology, Patwadi Naka, Bhuj, Gudjarat Pin 370 001, India.*

Latin America

Brazil

BLACK CAIMAN WORKSHOP. Between 17 and 20 October 2000, a workshop on Conservation, Monitoring and Management of Black Caiman was developed at Manaus, capital of the Amazonas State. The meeting, organized by the Instituto de Protección Ambiental de Amazonas, (IPAAM) began with presentations from local, national and international specialists who shared their experiences with a group specially invited for their activities in different aspects of the conservation and actual and potential use of caiman in the Amazon.

Presentations began with an explanation of the origin and activities of the CSG (Alexandro Larriera), followed by a summary of the situation of Brazilian caimans (Luciano Verdade), the Venezuelan experience (Alvaro Velasco), a proposal for caiman (*C. yacare*) management in the Pantanal (Guillherme Mourao), legislation in Brazil (Fernando Dal 'Ava) and problems in applying current legislation (Bill Magnusson). These presentations were enriched by the additional inputs of Sonia Wiedmann, legal counsel of the Instituto Brasilero del Media Ambiente (IBAMA). The meeting continued with presentations on the more specific questions of illegal trade (Marcelo Gordo), the advantages of exotic skins (Leandro Scur), accidents (human attacks) from caiman (Jaydione Marcon), financing and economics in Amazonas State (José Barroso), and the conservation of Amazon caimans (Ronis Da Silveira), that gave a very appropriate closure to the first days discussion.

The second and third days were spent in working groups in which the designated groups animatedly discussed themes of legislation, education, priority areas for research, commercial exploitation and monitoring and tourist development. On the fourth day (20 October) the meeting was opened to the general public and general scrutiny of the responsibilities of federal, sand state authorities and the meeting sponsors, IPAAM.

From the meeting and exchange of opinions there emerged a clear analysis of the situation that is seen in several places in Brazil and in Amazonas State, and specifically in the Mamairaua Sustainable Use Reserve, where there is current use of *Caiman crocodilus* and *Melanosuchus niger* that is illegal. This exploitation, that is completely uncontrolled, is nevertheless believed to be occurring at a sustainable level due to the particular biology of these caiman species in each area. The limited fraction of the population accessible to hunters are displaced males that do not participate in reproduction. These occupy the more navigable waterways (in much the way described for American alligators in Louisiana). The reproductive population remains in more inaccessible areas and is usually not subject to hunting. By the same token, the illegal use produces the lowest benefits to local people and absolutely none to the State. Another element recognized to be important is that current Brazilian law impeding the use of wild fauna limits the development of coherent sustainable use projects.

The workshop generated many and varied recommendations. I believe that due to the emphasis of the new Brazilian laws on conservation areas, it will be possible to incorporate the Mamiraua reserve into a legal program for caiman exploitation. The Brasilian investigators and authorities present also

indicated their desire to present a proposal to the next Conference of the Parties to CITES to transfer *M. niger* to Appendix II.

Finally, we wish to express our great thanks to Mr. Marcio Ayres who graciously invited a group including Alvaro Velasco, John Thorbjarnarson and Luciano Verdade to visit the Mamiarua Reserve with our friend Ronis Da Silveira as guide and host. This occasion filled us with wonder at the incredible passage through the Amazon, the rich avian fauna, the fish, fresh water dolphins and, obviously, the unimaginable number of *Melanosuchus* that were constantly with us for four fantastic days. — Alejandro Larriera, *CSG Vice Chairman for Latin America, Blvd Pelligrini, 3100, Santa Fe 3000, Argentina.*

BLACK CAIMAN DENSITY. Today Bill Magnusson and I read more carefully the excellent article entitled *Black Caiman Population in Kaw Swamps* by our friend Paul Ouboter and his colleagues from French Guiana, published in the CSG Newsletter 19(2):13-15. We are very pleased to know that Kaw Swamps have "a good black caiman population" and that the species is more abundant than other caiman species that occur in the area. However, I need to make a correction. The authors cited that the densities of the species in the Mamirauá Ecological Station (now classified as a Sustainable Development Reserve) in Brazil is >30 individuals per km of shoreline. In reality, recently surveys showed that the population in the area is much higher in the dry season. In the last survey in the Mamirauá Reserve in September 1998, I found densities in the six water bodies that varied from 76.8 to 450 caimans / km. Of these, 76.8 – 83.3% were Black Caiman. In some parts of the Mamirauá lake the black caiman density was around 2000/km in the dry season (Da Silveira, in review).

I agree with the authors about the importance of swamps for the black caiman populations, these being important sources and more open water bodies are sinks when the species is hunted. Complex systems, with unhunted refuges could be the "key" to sustainability (Da Silveira and Thorbjarnarson, 1999).

Da Silveira, R., In review. Conservação e Manejo do jacaré-açu (*Melanosuchus niger*) na Amazônia Brasileira. Em Revisão. En: Larriera, A. & Verdade, L. M. (Eds.) La Conservasión y el Manejo de Caimanes e Cocodrilos de América Latina. Volume II.

Da Silveira, R., and J. Thorbjarnarson. 1999. Conservation Implications of Commercial Hunting of Black and Spectacled Caiman in The Mamirauá Sustainable Development Reserve, Brazil. Biological Conservation, 88:103-109. — Ronis Da Silveira, *Sociedade Civil Mamirauá & Coordenação de Pesquisas em Ecologia-Instituto Nacional de Pesquisas da Amazônia,, CP 478, 69011-970, Manaus-AM, Brasil.* <ronis@inpa.gov.br>

BLACK CAIMAN SEIZURE. A press report from Em Tempo (Amazonas, Brazil 12 January 2001) indicates that around 15 tonnes of dried salted meat of caimans and piracu (the endangered giant fish) was seized from a freighter on the Purus river. Personnel of the Brazilian Institute of Natural Resources (IBAMA) intercepted the vessel 'Deus Jugara' at the mouth of the Igarape river near Coari, about 370 km from Manaus. On board were salted dry meat of two endangered amazon species estimated to represent around 1,050 individuals of caiman (*Caiman jacare* and *Melanosuchus niger*) as well as the giant fish (*Arapaima gigas*), with an estimated value of 155,000 Brazilian Reals (about $75,000 US). The vessel had been under investigation for over two weeks as it moved along the Purus river buying dried and salted meat from riverside communities. This is the first major confiscation of illegal wild meat this year in Brazil where illegal trade in protected forest species for food has increased in recent years. Last year more than 730 tonnes of illegal fish was seized. The vessel's owner and captain will be fined 60,000 Reals ($30,000 US) for violation of the environmental and species protection laws. The confiscated meat has been donated to public charities and hospitals. — Ronis da Silveira, *Sociedade Civil Mamirauá & Coordenação de Pesquisas em Ecologia-Instituto Nacional de Pesquisas da Amazônia,, CP 478, 69011-970, Manaus-AM, Brasil.* <ronis@inpa.gov.br>

Colombia

PHOTOGRAPHIC DOCUMENTATION OF ORINOCO CROCODILES IN ARUACA DEPARTMENT. Following on the reports presented in CSG Newsletter, Vol. 18 (3):10-11 & Vol. 19 (2) 12-13, the following photograph is submitted of a specimen of *C. intermedius*. — Olga Patricia Bonilla Centeno, *Museo Nacional de Historia Natural, Universidad Nacional de Colombia, A.A. 7495, Santa Fe de Bogota, Colombia.*

Boy with a foot of *Crocodilus intermedius*, male 420 cm TL killed at Rio Cravo Norte, Arauca, Colombia 1995. O.P. Bonilla photo.

Central America the Caribbean and Mexico

Mexico

SECOCOM MEETING. On 22- 23 September over 80 participants from all of the crocodilian regions of Mexico met in Mexico City. Twenty five papers about farming, conservation, human-crocodile interactions and legislation were presented. SECOCOM has established a working group to address several problems of crocodilian conservation in Mexico. To date, no additional action has been taken on the proposal to move *Crocodylus moreletii* to Appendix II of CITES. — Manuel Muniz, *President SECOCOM, A.P. 41-601, Lomas de Chapultepec, Mexico DF. CP 11000, Mexico.*

Panama

AMICRO MEETING. On 8 September 2000 a general assembly of the Asociación MesoAmericana de Investigadores de Crocodylia (AMICRO) A.C. was held in conjunction with the Meso American Congress of Biology and Conservation in Panama City.

The meeting opened with a welcome from Fabio Buitrago, President of AMICRO, who welcomed participants from seven countries in Mesoamerica and an additional 12 interested scientists. Present were Fabio Buitrago (Nicaragua), Juan Sanchez (Costa Rica), Francisco Castañeda (Guatemala), Norwing Torres (Nicaragua), Liliana Piedra (Costa Rica), Gladis Vallarino (Panama), Miriam Anaya (Panama) and Beatriz Figueroa (Mexico). Current research in these countries was presented.

A summary of AMICRO activity at the CSG meeting in Cuba was presented then a detailed discussion of a suitable logo was held. Final decision on the logo was deferred to an electronic discussion after the meeting. Fabio is preparing a directory of AMICRO members and a similar directory of crocodilian farms in the region was proposed. Fabio is also preparing a

web page for AMICRO. Miriam Anaya of Panama was delegated to be in charge of the AMICRO bulletin.

Annual membership dues for the organization were set at $50 for founder members, $10 for students and $25 for other members. Juan Sanchez of Panama is investigating the legal registration for AMICRO and a rotation of the AMICRO office among the countries in the region was proposed.

The meeting agreed to initiate a global project to evaluate the status of crocodilian populations in the Mesoamerican region. Experiences from different countries will be gathered in one document with the goal of standardizing sampling methods and coordinating data to accurately assess crocodile status. From these country accounts overall status of each species will be assembled and responsibility for this work was assigned to several members.

Miriam Anaya proposed a genetic project including a technical workshop and offered her experiences at the Smithsonian Institution (USA). This would permit the creation of a genetic data bank for crocodilian species of the region. The costs and timing of this project will be evaluated and reported back to AMICRO.

A workshop on management of wild populations was proposed. A probable date of February 2001 in Guatemala prior to the Mesoamerican Congress on Biology and Conservation was accepted. An extensive bibliographic data bank of crocodile literature prepared by the crocodile program of the Universidad Juarez Autonoma de Tabasco and funded by the Spanish Economic Cooperation, Friends of the Earth and Amicro was demonstrated. Copies were made available to each member and additional CD copies and access to this material on a web page was announced. Corrections and additions to this bibliography from the region are requested.

Finally, during session presentations on population monitoring of *C. acutus* in Nicaragua (Buitrago), investigations of illegal traffic in Nicaragua (Torres), genetic models to differentiate races of *C. acutus* in Panama (Anaya), the population status of *C. moreletii* in Mexico (Figeroa) and Guatemala (Castañeda), and models for intensive production in farms (Figeroa) were made. — *Summarized and translated by the Editors from minutes of the meeting*, Beatriz Figeroa Ocaña, *Secretary, AMICRO, Universidad Juarez Autonoma de Tabasco, Tabasco, Mexico.*

Zoos

PHILIPPINE CROCS GO HOME. Three captive bred Philippine crocodiles were repatriated to the Philippines from Gladys Porter Zoo on 3 October 2000. The subadults, 1 male and 2 females, were captive hatched from the zoos captive breeding stock in 1991. The animals are under a 45 day quarantine at the DENR Wildlife Rescue and Rehabilitation Center. After quarantine, they will be transported to the Palawan Wildlife Rescue and Conservation Center, where they will be permanently deposited.

In still other news, this year we hatched 25 baby *C. mindorensis*. A memorandum of understanding (MOA) between Gladys Porter Zoo and DENR-Philippines is in development to clearly define the agreement concerning this international cooperative program. This will allow distribution of these crocodiles to other North American Zoos as facilities at Gladys Porter are becoming limited. But DENR have asked us to keep the hatchlings here until this is resolved. — Collete Hairston Adams, *Gladys Porter Zoo, 500 Ringold St. Brownsville TX, 78520, USA.*

LONDON ZOO ASSISTS CHINESE ALLIGATOR CONSERVATION INITIATIVE. London Zoo is one of the few UK zoos with Chinese alligators on public display. Part of a European captive-breeding program, the alligators can be seen in the Reptile House.

A recent article for the childrens magazine Animals Animals authored by Ron Toft, features the Chinese alligator and includes an appeal to support the CSG Chinese Alligator Fund and also offers adopt an alligator program. London Zoo has over 600 animal species, all of which can be adopted for one year at a time, including the

Chinese alligator. 'Whole animal' adoption fees range from £25 to £6,000, a Chinese alligator costing £750! Usually only businesses adopt the more expensive creatures. What many children do is adopt part of an animal under a special pocket money scheme. Adoption raises much-needed cash for conservation work. For further details, contact the zoo.

Friends of London Zoo has over 20,000 members. Benefits include free admission to London Zoo for a year, a free subscription to Lifewatch magazine and special invitations to see animals in areas not normally open to members of the public. — *from correspondence,* Ron Toft, *Lifewatch, London Zoo, London UK <Ron.Toft@btinternet.com>.*

Publications

PROCEEDINGS OF THE 15TH WORKING MEETING. Proceedings of the CSG Meeting held in Varadero, Cuba, in January 2000, were distributed to registered participants and authors by surface mail in mid-December. Additional copies are available for purchase directly from Zoo Book Sales. This is the result of a cooperative venture between CSG and Eric Thiss and Zoo Book Sales. Zoo Book Sales is one of the largest distributors of natural history books in the USA with a well developed system for selling and mailing books. By arrangement with CSG, Zoo Book Sales mailed out the Proceedings to meeting participants from lists provided by CSG and also purchased a number of copies at wholesale price for resale. We hope that prompter service, more efficient distribution and credit card facilities will make the Proceedings more readily available. After holding the price of CSG proceedings at $40 US for the last 10 years, increased production and mailing costs force us to increase the price and by agreement with CSG the Proceedings will be sold by Zoo Book Sales for $49.95 US plus shipping and handling. Zoo Book Sales also has limited quantities of the Singapore Proceedings (1998) and the Gainesville Proceedings (1990) for sale at original prices. Inquiries from meeting participants and authors about Proceedings can be directed to the CSG Executive Officer. **All inquiries about purchase of Proceedings should be addressed directly to** — *Zoo Book Sales, 403 Parkway Ave. N., P.O. Box 405, Lanesboro MN 55949-0405, Phone 1 507 467 8733, Fax 507 467 8735 E-mail <zoobooks@means.net>.*

Meetings

SECOND INTERNATIONAL WORKSHOP ON DNA IN CROCODILIANS. PRELIMINARY ANNOUNCEMENT. A workshop to bring together global workers in crocodilian DNA is planned for 7 – 10 November 2001, in San Diego, CA, USA. The meeting is organized by Valentine A. Lance, Llewellyn D. Densmore, and Travis C. Glenn and hosted by San Diego Zoological Society.

The goals of the Workshop are: 1) to bring together the world's leading experts in crocodilian genetics research; 2) to provide a forum for discussions of research attempted and completed in the 5 years since the first workshop in 1996; 3) to discuss the genetic techniques that are now available to address long-standing problems in crocodilian research; and 4) to discuss and determine priorities for multi-institutional collaborative research that will lead to quantum leaps in information known about crocodilian genetics.

Sessions are planned for discussions focusing on:

- Major Classes of DNA Markers
- Use of DNA Markers in Research and Management of Wild Crocodilians
- The Crocodilian Genome
- DNA Markers for Research and Management of Captive Crocodilians

Internet links to the latest information about the workshop can be found at <http://BadDNA.srel.edu/>. Questions regarding the workshop can be addressed to — Valentine A. Lance, *San Diego Zoo, P.O. Box 551, San Diego, CA 92112, USA. Tel: (1) 619 557 3944 Fax: (1) 619 557 3959<lvalenti@sunstroke.sdsu.edu>,* Travis Glenn *<Travis.Glenn@sc.edu> or* Llewellyn D. Densmore *<y41ds@ttaca.ttu.edu>.*

Veterinary Science

Wanted- LOGO for this section
2.5cm x 7.5 cm Electronic format GIF image files no larger than 10 KB preferred.
Please submit entries to the editors.

A CASE OF STRESS SEPTICAEMIA IN FARMED NILE CROCODILES. Under normal circumstances pathogenic bacteria are transported through the intestinal mucosa either at the sites of gut-associated lymphatic tissue and presented as antigen for the production of local antibodies, or by macrophages into the blood circulation and presented as antigen for the production of humoral antibodies (Vasquez-Torres *et al.*, 1999).

As a separate phenomenon under conditions of severe stress intestinal bacteria apparently enter the bloodstream more easily, although the exact mechanism still is unclear (to me at least). When the animal recovers from the stress, normal immune functions eliminate these bacteria again. However, if the immune functions remain suppressed, either by continuing or repeated stress or by cold, the bacteria can carry on multiplying and eventually will settle in various organs and tissues.

Crocodiles are highly sensitive to stress and under farming conditions are easily exposed to stress septicaemia. The present case happened recently on a South African crocodile farm where the young crocodiles were reared indoors at a constant temperature of 32°C.

The farmer received an order for a certain number of skins and wanting to supply top grade skins only, he caught every day for 10 days a small number of crocodiles from one pen and examined their bellies before taking the chosen crocodiles to be slaughtered. Ten days after the last crocodiles had been slaughtered one of the survivors became "paralyzed", unable to move. The next day there were three more cases and the following days a large number. Two live "paralytic" crocodiles were submitted to a laboratory and were found to suffer from polyarthritis. *Morganella morganii*, a normal gut inhabitant, was isolated from joints and internal organs. A few days later some of the crocodiles in the adjacent pen also developed arthritis.

Since it is not possible to treat a bacterial arthritis by oral administration of antibiotics and to prevent further losses the farmer was advised to slaughter as soon as possible all the affected crocodiles without causing further stress by shooting them in the pen and to discard the meat.

Not only the crocodiles which were caught but also those which witnessed the capture suffered from severe stress (fear, fright), even in the adjacent pen, and many of them repeatedly developed a stress septicaemia, while the daily repetition of the stressful event prevented a recovery. Consequently the bacteria could successfully establish themselves, in this case in the joints. Some bacteria have certain tissue preferences and the synovial cavities (joints) also are less accessible to immune cells and humoral antibodies.

Stress septicaemia in conjunction with temporary immune suppression probably is the most important mechanism for bacterial infections in crocodiles. The mechanisms involved in this phenomenon need to be investigated further.

References, Vasquez-Torres, A., J. Jones-Carson, A. J. Bäumler, S. Falkow, R. Valdivias, W. Brown, M. Le, R. Berggren, W. A. Parks & F. .C Fang 1999. Extraintestinal dissemination of *Salmonella* by CD18-expressing phagocytes. Nature, 401, 804-808 — F. W. Huchzermeyer, *P O Box 12499 Onderstepoort 0110 South Africa. <crocvet@mweb.co.za>*

PRIVATE VETERINARY RESEARCH IN VENEZUELA. The veterinary clinic "Centro Veterinario Los Colorados C.A." in Valencia and the veterinary laboratory "Veagrip" in Maracay, Venezuela, recently published a complete report of diseases and veterinary results in Boede Ernesto O. & Sogbe Elias, 2000. Diseases in Orinoco crocodile *Crocodylus intermedius* and American crocodile *C. acutus* kept in Venezuelan Farms". Revista Cientifica, Facultad de Ciencias Veterinarias, Universidad del Zulia, Maracaibo, Venezuela. Vol. X, No 4, julio-agosto, 2000 Pp 328-338.

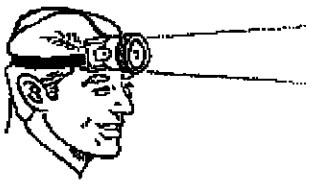
The first author is a member of the "Venezuelan Crocodile Specialist Group" (GECV). The data was collected between 1985 and 1998 from the Venezuelan Captive Breeding Program, in three Orinoco crocodile and one American crocodile farms. Compiling the results of physical clinical evaluations and laboratory

findings from 80 neonates, 130 hatchlings, 60 juveniles and 17 adults.

The diseases observed in the farms were: NEONATES: omphalitis, congenital anomalies and intoxications. HATCHLINGS and JUVENILES: nutritional deficiencies such as vitamins A, E and B1 deficiencies, scoliosis, osteodystrophia, bacterial, viral and mycotic diseases, hatchling alligator syndrome. Parasitary casuistic of protozoa, nematodes and trematodes, trauma and shock. ADULTS: nutritional deficiencies such as xiphosis, osteodystrophia, nutritional secondary hyperparatyroidism, trauma, wounds and shock. A complete description is given of necropsy and histopatological examinations in hatchlings and juveniles also of clinical, radiological, hematological and histopatological results of an adult crocodile with osteodystrophia. Bacteria and fungus isolated from omphalitis in neonates, hatchling alligator syndrome, dermatomycosis in hatchlings and juveniles and endoparasites are also described. The incidence of the casuistic was 20 % in neonates and 69 % in hatchlings and juveniles. The most frequent problems in hatchlings and juveniles were the hatchling alligator syndrome, nutritional deficiencies, complicated with secondary bacterial, viral and microtic infections. Diseases in adults contributed with 11 % of the total cases, being the shock related mortality of 50 %. In juveniles and adults wounds produced by hierarchy fighting reached a significant morbidity. The object of this research, was to obtain data of the diseases and the causes of mortality and morbidity in these two species, kept in farms of the Venezuelan Orinoco and American crocodile Captive Breeding Program. Copies can be obtained from — Ernesto O. Boede, *Apartado Postal 1595, Valencia 2001, Venezuela. E mail <ernestoboede@latinmail.com>*

AEROBIC INTESTINAL FLORA OF AFRICAN DWARF CROCODILES. Intestinal contents were collected from wild-caught African dwarf crocodiles (*Osteoleamus tetraspis*) in 1993 and 1995 which were slaughtered at urban markets in the Congo Republic. The samples were kept frozen and brought back to Onderstepoort, South Africa, for aerobic culture. Out of 29 specimens, 33 species of bacteria and 20 species of fungi were isolated. The bacteria included three isolates of *Salmonella* and eight isolates of *Escherichia coli*, most of the latter being rough strains. The flora of individual crocodile specimens contained 1-5 bacterial and 0-5 fungal species. Neither *Aeromonas hydrophili* nor *Edwardsia tarda* were isolated from any samples. — *from* Huchzermayer F. W., M. M. Henton J. Riley & M. Agnanagna. *2000. Onderstepport Journal of Veterinary Research 67: 201-204.*

Personals



V. Vijay Kumar, *Gujarat Institute of Desert Ecology, Patwadi Naka, Bhuj, Kachchh, Gujarat 370 001 India <vijay_mugger@hotmail.com>*, responded to our recent e-mail to report that he and all his family and most friends escaped the recent earthquake in Gujarat, although their home was destroyed and belongings lost. The earthquake destroyed Bhuj and devastated surrounding areas with much loss of life. Crocodile research takes a back seat while Vijay re-establishes his family and home.

Rom Whitaker, *CSG Vice Chairman for Western Asia, P.O. Box 21, Chengalpattu, India 603001*, (New Address) announced that after 25 years, he has stepped down as Director of the Madras Crocodile Bank to pursue other interests, particularly wildlife film production. His involvement and commitment to crocodile conservation remains the same. He can also be reached at <draco@vsnl.com>.

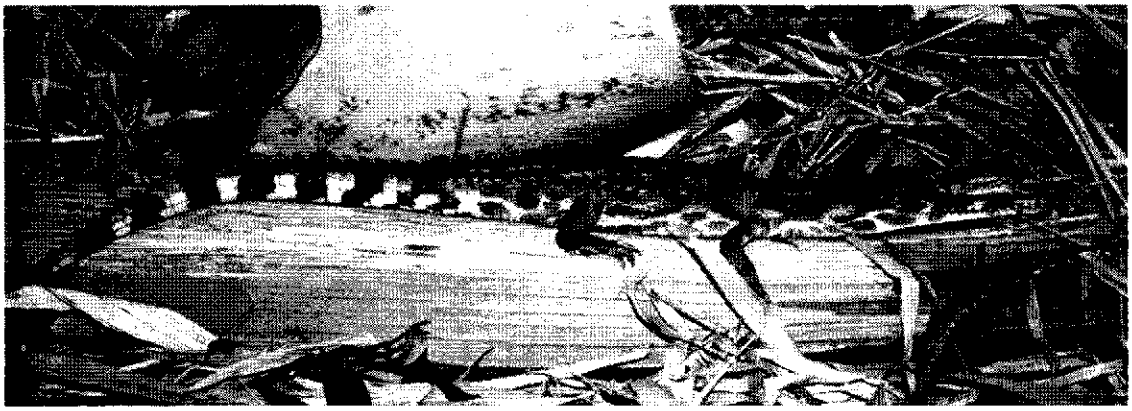
Lorraine Collins, *<IB-Collins@t-online.de>, Ravensburg, Germany*, has been out of contact for some time but recently made contact to report a new husband, Frank, and a life of recreational paragliding in Alps of S.E. Germany near the Bodensee. Lorrie left the CITES Secretariat and now does consulting work for EU CITES, Brussels TRAFFIC office, teaches English, does

scientific editing, and is surveyors field assistant. She likes the variety but misses the CSG guys and the other great people she met through the CITES network.

Interesting story and quote: "A man walking by the banks of the Nile with his child. A crocodile jumps out of the river, seizes the child, then says, "I will return the child if you guess correctly whether or not I will return the child". The father replies: "You will not return the child." No one recorded the crocodile's reply."

The article is about Kurt Godel, who evidently formulated a bunch of such mind-twisters. — *From New Scientist 25 November 2000 page 54. Submitted by* Grahame J.W. Webb, *Director, Wildlife Management International Pty. Ltd, P.O. Box 530, Sanderson, NT 0812, Australia.*

DITORIAL 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.



Tomistoma schlegelii, Juvenile 13 mos. TL 21 inches. Hatched Cypress Gardens FL Oct 1999. B. Shwedick photo.

How Scientists can affect the Crocodile's Love life. — a poem by Zai Whitaker

The laid back croc he swung his tail
Slowly, from side to side
And cruised the waters of Armavel
Enjoying the lazy ride.

He thought of this, he thought of that
He pondered death and life
He thought of friend, both thin and fat
And some who'd taken a wife.

Ah! There thought the croc, is a thought
That I really should pursue
Ime a teenager now, it's time I sought
The love of a sweetheart true.

This croc of ours was the sort of beast
Who, once a thought had struck
Liked to act at once, or at least
Make up a plan of attack.

So he hauled his scales upon the bank
And waited for the ladies to come
How lovely he looked!- all sleek and dank
While his heart did loudly drum.

An hour he lay, in a debonair pose
Making sure that his tail was straight
His head held high, well aligned with his toes
And- oh he could hardly wait.

Would she? Wouldn't she? Where were those girls?
This posing was really a pain
Then suddenly, in the watery swirls
He detected a scaly mane.

What a beautiful reptile, every scale in place
And a sparkle in her eye
Our man was mesmerized by her face
She was perfect as bandicoot pie

She knew the young batchelor was watching
And did a splashy turn
Every scale and scute on her body tingling
With delight from hull to stern.

Our man he slid into the lake
And followed her with devotion
After some moments of intense heartache
He started a conversation.

Quite honestly lady I never did see
An epidermis quite so fine!
Your dorsal scutes so dazzle me
And how your occiptals shine!

He saw she was pleased as mongoose pie
And began to plan a wedding
When- oh just when bliss was nigh
Fate dealt him a horrible drubbing.

Her smile was quickly and suddenly gone
When she saw his silver tag
'So your one of THOSE!" she said in a tone
That made our friends heart sag.

'Er' he said, 'It's a survey tag-
The crocodile census you know.
Its actually an honour and no great drag
And really it hardly does show.'

She hurried away with a snub-nosed scowl
Eyebrows arched in scorn
'Let me explain,' our man did howl
Oh, he wished he had never been born.

This unrequited love kept the croc in pain
Nor food nor drink enhappied him
Until finally Bliss came again
And filled him to the brim.

Another lady swam by and with a sniff
Said, 'Oh, are you one those?
What an honour to get even a whiff
Of the wonders that Science knows

Ive heard of this project to study our ways
By the aliens who live on land
I can hardly avert my avid gaze
From lovely tag on your hand.

Now quickly he struck an attractive pose
And- Well it worked out fine
The wedding guests ate buffalo toes
And pate of porcupine.

Ten months later or maybe six
Nine eggs did noisily hatch
From a nest constructed with leaves and sticks
And as a parent no could match
Our ecstatic friend
For he ferried the youngsters in his jaws
And found them crawly food
And sometimes he cuffed them, mainly because
They were just a little bit rude.

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

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