

Crocodile Specialist Group

NEWSLETTER

VOLUME 6 • JANUARY 1987 - DECEMBER 1987



International Union for the Conservation of Nature and Natural Resources

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Species Survival Commission

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Conservation of Nature and
Natural Resources

Species Survival Commission

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EDITORS' COMMENTS

The *Crocodile Specialist Group Newsletter* has a different look! Thanks to the fundraising efforts of the CSG Chairman, the cost of producing the *Newsletter* was underwritten by Jacques Lewkowicz of the Société Nouvelle France Croco, Paris. As a consequence, we have been able to contract with OMEC International, Washington, D.C., to publish this issue. The layout style was designed by Dan McQuillen of OMEC, and we hope you like it. As long as there is outside support, we will continue professional publication of the *Newsletter*.

In keeping with its professional look, we would like to upgrade the *Newsletter* and publish scientifically reviewed papers. We certainly have no intention of competing with major scientific journals, but we do want to give many of our friends and colleagues who do not have easy access to such professional publications, a chance to cite the *Newsletter* as a valid publishing source.

We often receive general reports, status reports, general observations, etc. which should be published, but by virtue of the amount of revision that is required or language editing, these frequently cannot find ready acceptance in more formal journals. These are the types of articles we would encourage for the *Newsletter*, especially from our colleagues in developing countries. Articles should be short, usually not more than five typewritten pages, and in English, if at all possible. Do not be concerned about the grammar. Our interest is in getting the information out, so we will do the necessary editing. You may include one or two photographs, preferably black and white. Maps or graphs should not be larger than a standard 8 1/2 inch by 11 inch or 218 mm X 280 mm page, and smaller if possible. There will be no charge for publication.

If anyone in the commercial sector wishes to help underwrite the cost of this publication, we would welcome the additional support. The annual cost of publishing and mailing two issues with a press run of 300 is about \$3500. Additional support would allow us to increase the number of issues, add more pages, more pictures, and to expand coverage. Checks should be made out to the University of Florida Foundation, but sent to the CSG Chairman, Prof. F. Wayne King, Florida State Museum, Gainesville, Florida 32611, USA, along with a covering letter stating the money is to be used for publication of the *CSG Newsletter*. The sole benefit any donor will receive is the best *Newsletter* we can produce.

By now, many of you have received the advance communication from the CSG Chairman announcing the 9th Working Meeting of the IUCN/CSG. The meeting is scheduled for the 17-19 of October 1988, in Lae, Papua New Guinea. The Government of PNG will host the meeting, with Mainland Holdings Ltd. acting as local host. Contact Graham S. Goudie or Greg Mitchell, Mainland Holdings Ltd., P.O. Box 196, Lae, Papua New Guinea for further information. The dates of the meeting may shift slightly to

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AREA REPORTS

AFRICA

Bophuthatswana:

Johan Marais of Kwena Gardens (P.O. Box 234, Sun City, Bophuthatswana) wrote in February 1987:

Things are going well. Fifteen females produced 700 eggs in Sept. 1986, after having only been purchased in March. Their average length was 2.35 m, and two of them were less than 2.1 m. About 500 eggs were fertile and hatched with only a 4% mortality after two months. Hatchlings gained from 100 to 300 g (some doubled that) on Cardeilhac's diet, and grew 30 cm to 50 cm.

Hatchlings are housed in a circular concrete enclosure with an insulated roof. Warm water is pumped through plastic pipes in the concrete and some of the water is used to warm the enclosure water and run off fatty material and waste with a vortex action.

A workshop was held at Kwena on 19/12/86 which was attended by 70 people from Zimbabwe, Malawi, Zambia, Botswana, the U.S.A., etc.

Ethiopia:

Abdu Mahamued (Wildlife Conservation Organisation, P.O. Box 386, Addis Ababa, Ethiopia) files this report on 4/6/87:

Ethiopia has now embarked on a crocodile ranching scheme for the commercial production of skins, with the assistance of FAO, at Arba Minch, 500 km south of Addis Ababa. The ranch is located on the shores of Lake Abaya and Chamo, and has the annual capacity of 3000 hatchlings. Eggs are to be collected on the shores of the two lakes. So far only 70% of Lake Chamo and 10% of Lake Abaya shores have been used. Data from the past four years, after increased control over human disturbance, show a great increase in the number of nests: 22 nests in 1984, 87 in 1985, 126 in 1986, and 316 in 1987.

The population over 70 km of shoreline was estimated to be about 1300 crocodiles over 1.5 m in length.

As husbandry has improved, so has hatching success. In 1986, 3176 eggs were collected and 2713 crocs were hatched. In 1987, 5521 eggs were collected from 126 nests, and 4926 animals hatched.

In 1987, 316 nests were identified. Two hundred and six contained eggs and 110 were robbed by predators.

There is a very high potential to produce commercial stocks of animals, if the population is rationally utilized. The WCO has begun to restock crocodiles in areas where there is the least human interference, and plans to collect crocodiles from areas of high human interference, for breeding stock locally or for export to approved CITES farms.

Amie Brautigam of the IUCN/SSC Trade Specialist Group, wrote that she and her husband saw Jon Hutton in October in Harare, Zimbabwe. Jon told them that the Ethiopians have a farming/ranching operation, but that all the young animals they collected for it died as a result of "a lack of dependable, inexpensive source of protein."

Kenya:

Rene D. Haller (Baobab Farm Ltd, P.O. Box 81995, Mombasa, Kenya) writes that the farm now has a stock of 660 crocodiles. Seventy-seven eggs were collected from three 12 year old females reared from hatchlings on the farm. Fifty-three hatchlings are being reared. He says there still is no change in the status of crocodiles in Kenya and he thus is uncertain of the future of their stocks.

Republic of South Africa:

J.G. Kuhlmann, Chairman of the Transvaal Crocodile Breeders' Association (P.O. Box 18100, Hercules, 0030 Pretoria, R.S.A.) sends us this report on the Association:

There are 13 member farms, 9 of which are producing eggs, and 4 should produce in the near future. Mr. Kuhlmann's farm is the largest, and seconded by Mr. Piet Schoeman at Komatipoort. Smaller producers are H.O. Penzhorn at Kroondale, G. Stewart at Nkwalini, M. Darazs at Tzaneen, E. Slogrove at Nelspruit, N. van Dyke at Ottjwarongo, Kwena Gardens at Sun City, and Crookes Brothers at Scottburgh. Those intending to be breeding in the near future are H. Seyer at George, J. Prins at Paarl, P. Watson at Tongaat, Joubert Brothers at Mafikeng. High quality skins are produced in artificial incubators and intensive growing units.

Peter Arnold (see "Florida" below) attended a privately sponsored crocodile breeding symposium in Sun City last December. David Blake, J. G. Kuhlmann and Tony Pooley, among others, were in attendance.

Zambia:

Jacques Lewkowicz (France Croco tannery, Paris, France) submitted the following proposal (loosely translated by us) to CITES in support of crocodile ranching in Zambia:

According to statistics confirmed by CITES, Lausanne, the population of crocodiles in Zambia is approximately 150,000 animals. If one were to estimate that 15 percent of this population (in any given year) is composed of nesting females, you would have 22,500 nesting females. Normally, a female lays 30 eggs in a nest. Even assuming the minimum of 25 eggs per nest, there would be 562,500 eggs produced per year. Only 1.3 percent of these reach the age of one year. Therefore you will have 7,312 yearlings.

If 15 percent of the eggs were collected by crocodile farmers, they would take 84,375 eggs. Under good incubation conditions, you can estimate that 85 percent of these eggs will hatch, which would represent 71,718 hatchlings. Even at 80 percent hatching, there would be 67,420 hatchlings (*Ed. Note: The calculated figure is 67,500.*)

Using the figure of 85 percent hatching, let us assume that the farmers return 8 percent of the hatchlings to the wild at the age of 8 months to one year, under control of the national CITES authority. This would mean that 5,737 animals would be returned to the wild.

Now, as 84,375 eggs were taken from the total of 565,500 eggs laid, there would remain 478,125 eggs in the wild. If only 1.3 percent of these eggs produced adult animals, you would have 6,215 animals *PLUS* the 5,737 animals returned to the wild by the farmers. This would yield a total of 11,952 animals. As you can see, ranching combined with nature yields an additional 76 or more percent of animals in nature than would have occurred. (*Ed. Note: 11,952 minus the original estimate of 7,312 hatchlings occurring in the wild, would yield an increase to the wild of 4,640 animals or 63 percent, still a sizeable percentage increase.*) This process does not inhibit nature.

The industry will have 71,718 hatchlings minus the 5,737 returned to the wild, yielding a total of 65,981 animals for ranch raising.

You understand that any scientific authority cannot oppose this if it receives a favorable opinion from CITES. It was the same procedure, along with a favorable opinion from CITES, that led Zimbabwe's crocodiles to be moved to CITES Appendix II.

The industry will have sufficient supplies of skin and this will prevent poaching or illegal entries of skin in the country.

Do not forget that 10 crocodile farms will create work for between 30-40 workers per farm and this will aid the country in its great need for development.

Mr. Lewkowicz added in his note to us that this will produce US\$6 million in foreign exchange for the country and will give employment for 500-600 people.

Zimbabwe:

The U.S. Fish and Wildlife Service had extended the time for public comment on the U.S. reclassification of wild populations of Nile crocodile in Zimbabwe from Endangered to Threatened to 1 November 1987. Ranches populations were reclassified from Endangered to Threatened effective 17 July 1987. The proposed rules would allow full hides to be imported into the USA.

ASIA

China:

Professor Chen Bihui of Anhui Normal University reported on the situation at the Anhui Province Alligator Breeding and Research Center. The farm completed 10 small rearing pens for young animals of different age classes. In the rearing pens containing young hatched in 1985, they placed one adult alligator. Beginning 27 October 1986, they placed three adults with the small animals. In 1986 they began to build a new artificial incubation room. The room is now

completed and was expected to be used for the 1987 breeding season. The incubation room can hold 3,000 eggs at a time. They also have adjoining young animal rearing rooms and hatching rooms. Each year the hatchlings that hatch in the artificial incubation room are maintained there for two months and then are moved to a quasi-natural rearing area. In 1986, 684 artificially incubated eggs hatched. At the time of his letter (March, 1987), more than 670 hatchlings had entered hibernation. Last year a film company from Hong Kong visited the farm and breeding center to film a movie.

In March, we received a request from Dr. Dietrich Jelden of the CITES authority in West Germany, to clarify a CITES export permit issued by the authorities in People's Republic of China (PRC) for the export of 10 live *Alligator sinensis* to Peter Hoch Hauptrasse, whom Dr. Jelden identified as "one of the biggest European pet-traders specialized in herpetiles." The Chinese alligators were identified as a gift of captive-bred F_2 from the Anhui Province Chinese Alligator Breeding and Research Center. We replied that as the farm only began captive breeding in 1981, and even then, survival was poor, it would not be possible for an F_2 to have been produced by the 1986 season. We also referred him to our contacts in China. They used their influence to put a temporary stop on the CITES permit from China until there could be further investigation. Professor Wang Sung of the Endangered Species Scientific Commission, PRC, wrote to the West German CITES Scientific Authority that it had not been contacted concerning the export of F_2 generation of Chinese alligators for commercial purposes and that the farm in Anhui had not yet produced an F_2 generation. Dr. King has since heard from CITES in Switzerland telling him that the export permit cannot be stopped as what was important was not whether an F_2 was actually produced, but that, as the Anhui Farm had indicated it could produce an F_1 , it can be assumed that they have the capability of producing an F_2 . Nevertheless, it is against West German law to import any Appendix I animals that are not at least F_2 . This is still pending, but if these animals are allowed to be exported from China to West Germany, it indicates a serious flaw in the CITES procedure which will allow critically endangered species to be sent to a commercial animal dealer before an internationally acceptable breeding and rearing program can be fully implemented and tested.

India:

Sudhakar Kar, presently of the Office of the Chief Wildlife Warden, Orissa (see Personals), reports "a clutch of *Crocodylus porosus* eggs were incubated in the incubators in the Zoology Department Laboratory, Utkal University and have yielded some good results." He promises to report the results in his next letter and we will report them in the next issue of the newsletter.

While he was with the Wildlife Conservation Division Crocodile Project, Orissa, Sudhakar sent us the following report:

A decade long large scale "rear and release" program for three crocodilian species in Orissa, India has made tremendous progress in achieving its main objective by releasing a number of crocodiles into the depleted crocodile habitats/sanctuaries. The following are up-to-date release figures for the three Indian crocodilians:

1. Saltwater crocodile (*Crocodylus porosus*):

Nine hundred seventy-three young crocodiles measuring minimum of 1.2 m length (approximately) have been released into river systems of Bhitarkanika Wildlife Sanctuary.

2. Gharial (*Gavialis gangeticus*):

Three hundred sixty young gharials (1.5 m approx.), reared at the Gharial Research and Conservation Unit, Tikerpara and 110 gharials from the stock of Nandanakanan Biological Park (hatchlings hatched from the eggs laid by the captive bred gharials) have been released into the Satkosha Gorge of the River Mahanadi, which is one of the few best gharial habitats in India.

3. Mugger crocodile (*Crocodylus palustris*):

Young mugger crocodiles of minimum 1.0 m length (approx.), reared at the Ramatritha Mugger Crocodile Project were released into the suitable locations of the River Budhabalanga and West Deo Rivers within Similipal National Park. Up till now, 100 crocodiles have been released into the wild.

At present, all the projects, including the Captive Breeding Project at Nandanakanan Biological Park (a leading zoo in the country) are having a stock of crocodiles of various age groups in the rearing pools. A few more crocodiles will be released into the natural habitat early next year.

Captive Breeding Program:

Captive reared mugger crocodiles have already bred in captivity at the Ramatritha Mugger Crocodile Project since 1984 and last year, 12 mugger crocodiles laid fertile eggs within the enclosure. At the Gharial Research and Conservation Unit, Tikerpara, four mugger crocodiles are being housed separately, adjacent to the gharial pools. These include three females and one male. These females have been laying fertile eggs since 1982. This year (Feb. 1987), three females have already laid eggs. In addition, a wild female mugger crocodile has been entering the breeding pool enclosure by breaking the wire mesh during the breeding seasons since 1981. She has been staying in that enclosure from a couple of months to years (Maximum: 23 February 1983 to 16 October 1985), breeding successfully with the existing male and laying fertile eggs. In the 1986 breeding season, this wild female did not appear but during this breeding season (22 January 1987) she has again entered into the enclosure and has laid eggs. She has been guarding her nest and eggs along with other nesting muggers. No aggressive behavior of any kind has been observed either from the resident females or the new entrant (wild one).

At Nandanakanan Biological Park, the captive breeding program for three crocodilian species has been coming up very successfully. This year, four gharials and two mugger crocodiles have already laid eggs (Feb.-March

1987) and a lone female *C. porosus* is busy preparing her nest to lay eggs.

Experiment:

The experiment on environmental sex differentiation of *C. porosus* eggs has been taken up since 1985. There is a proposal to conduct a similar experiment on eggs of two other crocodilian species.

Dr. R. J. Rao of the Deori Gharial Rearing Centre, National Chambal Sanctuary, Morena, sent us the following:

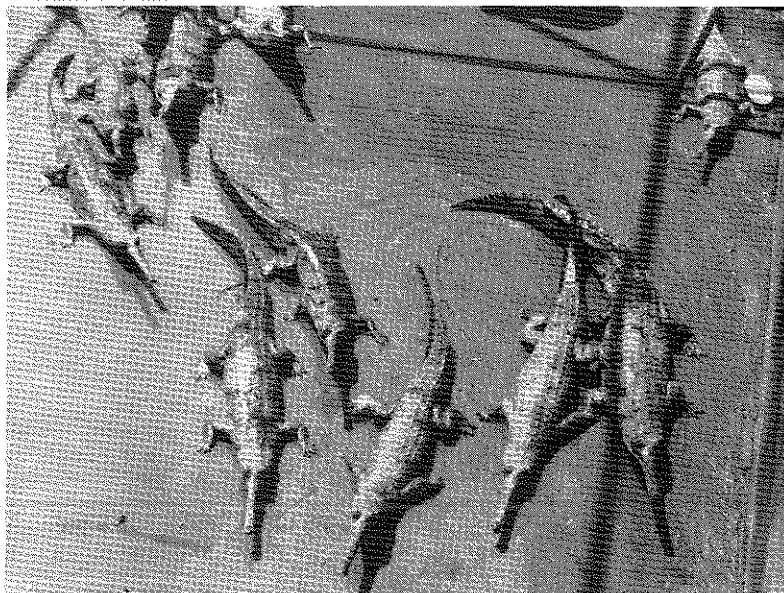
Ecological studies on crocodiles, turtles and aquatic mammals are being continued by the research team of the Crocodile Research Centre of the Wildlife Institute of India. Surveys were made in the 400 km of the Chambal River to locate new nesting sites of crocodiles. During 1987 a total number of 12 gharial nesting sites have been identified where 44 gharial have nested, an increase of two nesting sites and 8 nests over 1986. The captive rearing program is progressing and at present DGRC is holding about 150 gharial ranging in size from hatchlings to 2.4 m. The Uttar Pradesh Forest Department has, so far, released a total number of 1,147 captive reared gharial in the Chambal River.

A two year research project on the ecology of the gharial in Chambal has been started by the Wildlife Institute of India, beginning October, 1986.

The following article from Agence France-Presse was published in the 29 September 1987 edition of the *International Herald Tribune*:

India plans to release crocodiles in the Ganges River to scavenge for corpses and pollution, an official said here Monday, but the Press Trust of India reported that crocodiles have spread terror in the southern state of Kerala, where people were eaten after a similar experiment.

About 150 crocodiles from a state-owned farm in Kerala are to be dumped in the holy river near cities where pollution is worst. A senior federal official, who asked not to be identi-



Gharial at the Deori Gharial Rearing Centre, National Chambal Sanctuary, Morena, India. (Photo: Dr. R.J. Rao)

fied, said the reptiles "were supposed to be of a docile species, but it seems the breeders bungled and reared attack crocodiles."

About 100,000 corpses a year are cremated on the banks of the Ganges at the Hindu holy city of Varanasi, where pollution levels are among the worst. Millions of Hindus bathe in the river in the belief that its water will purify them.

Uttar Pradesh state authorities released 500 turtles in the Ganges near Varanasi in April and now plan to put in crocodiles to devour corpses dumped by Hindus too poor to pay for cremations, an official said.

Pakistan:

Abdul Latif Rao reported the following:

As a result of hectic efforts made by us and the protracted correspondence undertaken with the Indian authorities, we have been able to receive a gift of five pairs of young gavials and ten pairs of *Crocodylus palustris* (none young and one mature). Indian authorities did not allow us to purchase *Crocodylus palustris* from Madras Bank despite the Bank's willingness for export to Pakistan. But we are encouraged by a promise of Indian Authorities that they will try to get us crocodiles from another source. However it may take a very long time and may not even mature.

Khan Muhammad Khan wrote the following to Dr. King regarding reintroduction of the gharial in Sind:

Dr. (Brian) Groombridge visited us in January 1987, and he had the chance to visit some of our projects. We also discussed the future plans and the possibility of reintroducing the gharial (*Gavialis gangeticus*), which had gone extinct in the River Indus. This species was abundantly found in the Indus in the 1930s. But due to poaching and reduction in its habitat, the gharial in the Indus in the Province of Sind had gone completely extinct. There is no breeding population left in the wild. With the establishment of Sind Wildlife Management Board in 1972, effective steps were taken to eradicate poaching and heavy fines were imposed on the offenders. The Government of Sind is committed to reintroduce the original fauna in their habitat. A development project for reintroduction of crocodiles in its habitat is being implemented by the Government of Sind. The population of crocodiles (*Crocodylus palustris*) has increased quite successfully and now they are well out of any danger. However, the story with gharial is different. There is no chance of its revival unless they are introduced from the outside. If we get some gharial hatchlings, which are easier to carry than the mature specimen, (it) will go a long way in reestablishing the gharial population in this region, where it has gone extinct.

Mr. Muhammad Khan also noted that crocodiles were introduced into and have established themselves in Haleji Lake, which is one of Pakistan's Wetland Sanctuaries. In a letter to one of the CSG editors, Mr. Muhammad Khan wrote, "Efforts are under way to get the lakes and marshes, where it is available, declared as Wildlife Sanctuaries, so that the crocodiles may develop there as an integral part of the ecosystem. I hope, one day, it will also be achieved."

Singapore

The Jurong Crocodile Paradise pte. Ltd. has opened at 5001 Beach Road, #01-07 Golden Mile Complex, Singapore 0719. Mr. Liew Soo Hooi, General Manager, reports that the operation displays and farms crocodiles in a simulated natural habitat; promotes crocodile conservation through research and dissemination of information and educational materials on crocodiles. Jurong is said to have 2500 crocodiles, primarily *C. porosus*. Breeding occurs naturally in the pools. After nesting, the eggs are collected and artificially incubated, reportedly with over 80 percent hatching. However, Mr. Liew states they want to "increase the fertility rate of the eggs and we feel that artificial insemination will be suitable for this purpose." It seems improbable that artificial insemination can improve on a hatch rate of over 80 percent. Has anyone visited Jurong Crocodile Paradise? (F. Wayne King)

Thailand

Charoon Youngprapakorn of the Samutprakarn Crocodile Farm and Zoo wrote that products from their farm are utilized as follows:

Meat — There are both plenty of restaurants and Chinese visitors come to buy...everyday.

Skin — We export to European countries such as Italy, France, etc.

Bone for crocodiles up to two meters — Mostly there are some Chinese doctors and others come to buy in our farm directly, but we don't know for what purpose they are used.

Last March, they reported that they had 60 nests from *Crocodylus siamensis*, *Crocodylus porosus* and their *C. siamensis* x *C. porosus* hybrid. They expected to reach a total of 190 nests and produce 4,500 young. They noted that *C. siamensis* males mate with one pair of females and that the female lays eggs two months after the end of the mating season. They expected six nests from *Tomistoma schlegelii*.

In November 1986, Mr. Jim McKenna from Lebowa Crocodile Ranch, Pietersburg, Republic of South Africa visited Samutprakarn Farm. Mr. John J. Seaman from Okavango Swamp Crocodile Farm, (Botswana) PTY Ltd. visited them in March 1987.

AUSTRALIA

Professor Harry Messel of University of Sydney, sent the following in early 1987:

My team and I will be conducting resurveys of the Port Musgrave system on the west coast of North Queensland in August-September this year. We previously surveyed there in 1979 and the results were reported in Monograph 16. If we have time we may survey some new systems. Monograph 20 will appear within two months on the resurvey of the Kimberley region we did in 1986 and on the distribution of crocodiles

on Type 1 rivers and the upstream Roper survey. (Ed. Note: See Publications Received list for the reference to Monograph 20.)

Bill Carnell, the director of the Janamba Croc Farm in Northern Territory wrote that the "farm has recently changed hands and in the last year has undergone a complete redevelopment with the old farm being scrapped as worthless. We now have approximately 6,000 Johnston's and 1,500 *C. porosus* on the farm. Our first cull of animals will be in late 1987." By this writing, they have begun slaughtering animals, as has Crocodile Farm, N.T.

Harvey Cooper-Preston of Northern Territory told us that the Darwin group has been studying *C. porosus* nesting and also husbandry for the crocodile farms. Harvey (whom we in the U.S. know as Jane) finished her fieldwork on the ecology of freshwater crocodiles and will be writing it up soon. She also said she had a bit part in the sequel to "Crocodile Dundee."

An article, sent to us by Peter Miller of Queensland, discusses the success of the Edward River Crocodile Farm, indicating that crocodile meat is selling in Australia for Aust.\$16.00 per kilo. The article went on to state that Edward River earned Aust.\$120,000 last year.

We have just received the publication, *Wildlife Management: Crocodiles and Alligators*, resulting from the Workshop in Northern Territory. It is available from Surrey Beatty & Sons Pty Ltd, 43-45 Richard Road, Chipping Norton 2170, NSW, Australia; Fax (02) 821 1253. We will have it reviewed by the next issue of the newsletter.

The rest of the news from Australia concerned the much-publicized killings of two people, a fisherman from Jabiru and an American tourist, by *C. porosus*. We'll start with Laurie Taplin's professional report and then give you a taste of some of the more emotional press reports.

Laurie Taplin's work on Estuarine Crocodiles in Queensland is continuing. Helicopter surveys of a discrete group of the dense *Thoracostachyum* and fern swamps in the Port Musgrave area turned up what is undoubtedly the prime nesting area known in Queensland. The swampland is very similar to the Melacca swamp area near Darwin, which delegates to the Workshop on Crocodile Management had a chance to see. Forty nests were located in the Weipa area. Nineteen of them were active and 14 of these were in one patch of swamp in Port Musgrave. While nesting appears limited at this stage, the area appears to have the potential to support large numbers of nests. The chopper we were using there crashed only one month later with two fatalities!

The survey program of the last three years is winding down this year while the results are put together. The main survey thrust for this year will be to tidy up those areas of the

central and northeastern Cape which have not yet been covered.

Peter Bayliss has joined the crocodile research as a zoologist. Peter has a lot of experience in population dynamics and aerial survey and has worked on crocodiles with Grahame Webb in the Northern Territory. Peter will be looking into the experimental manipulation of crocodile populations to assess strategies for crocodile management around population centers in remote locations.

Crocodile attacks are becoming an increasing problem. In Queensland we had two more this year following two in the 1985/86 wet season. In about April a croc estimated at 2.1 m grabbed a fisherman on the hand while he was bait-netting at Gordonvale, near Cairns. In late June we had a man killed, apparently while wading off a beach at Bamaga in the far northwest of Cape York. The circumstances are unclear as there were no witnesses. A leg was found on the beach with clear tooth marks of a croc on it. Q.NPWS rangers harpooned and shot a 3.5 m male saltie with further remains in it. No other large animals were sighted in the area.

The record of attacks in Australia over recent years is as follows:

| | |
|------|---|
| 1975 | 1 |
| 1979 | 1 |
| 1980 | 1 |
| 1981 | 2 |
| 1983 | 1 |
| 1984 | 1 |
| 1985 | 3 |
| 1986 | 2 |
| 1987 | 4 |

There can be little doubt that community tolerance of crocodile attacks is wearing thin with the recent increase in frequency. Management authorities are facing increasing public pressure to extend crocodile control programs to important recreational areas as well as heavily populated areas. Queensland faces particular difficulties on the populated east coast where crocodiles occur in virtually all waterways along a coastline of about 1300 km extending from Rockhampton to Cooktown. Reports of problem crocodiles in the area, each requiring individual attention, have been coming in at a rate of 15 per month in 1987 — tying up our wildlife management resources almost completely.

Grahame Webb pointed out that "crocodiles in Northern Australia are indeed causing a few problems. The response in the Northern Territory has been fairly good, with radio talk-back shows reporting around 85 percent of people for crocs. Still, there are very real limits to the number of fatalities that the public will wear, and so we are having to be very much on our toes, and very pragmatic indeed."

An article by Dick Eussen in the May 2, 1987 edition of the *Northern Territory News* lists known croc attacks dating back to the 1800s. Mr. Eussen, who stated that he is an outdoor writer and has been and will continue to be "outspoken...about positive crocodile protection," suggests a

culling program for crocodiles, similar to that in use for the American alligator in the U.S. He states, "Our crocodiles are controlled by CITIES (sic), an international body mostly made up of Third World nations. We have no real say in the matter."

As reported in TRAFFIC Bull. 9, the Queensland Minister for Tourism, National Parks and Sport, has responded to the potential crocodile threat to people by approving a new management program for *C. porosus* on Queensland's east coast. Areas are classified as three different zone types: A, B or C. Zone A regions, which are in the immediate areas of major coastal towns and cities, will allow for removal of crocodiles of any size. Zone B regions, which include most of the rivers and streams, will allow removal of crocodiles greater than 1.2 m. Zone C regions, which include watercourses in and adjoining National Parks and nature preserves, will allow for removal of identified problem crocodiles.

Last, and definitely least, is the inexplicable popularity of the Australian movie, "Crocodile Dundee," which seems to have glorified croc poaching in the minds of many who are unacquainted with the practice. This does not constitute a movie review as the editors were too disgusted to finish watching the movie. As noted above, a sequel is in the works.

CENTRAL AMERICA

Belize:

R. Howard Hunt of the Atlanta Zoological Park filed the following:

In a March 1987 trip to Belize I identified areas suitable for releasing Zoo Atlanta's surplus Morelet's crocodiles and discussed the idea with Forestry Department officials. With the same idea in 1978, Ab Abercrombie finally concluded that Zoo Atlanta crocodiles would be killed by hunters. In his opinion, the experiment would be a failure. I thought, however, that the token release of captive conceived, captive hatched crocodiles would be an interesting experiment and that the publicity generated might benefit projects in other parts of the world involving the reintroduction of predators. Negative attitudes about predators filling vacant niches are inspired by fear that they will compete with humans. This was the fear of Forest Officer Oscar Rosado. Certainly our young crocodiles posed no threat to humanity, but he cited the 1980 death of a fisherman near Orange Walk who was killed and partially consumed by a Morelet's crocodile. He further assured me that Belize had enough Morelet's crocodiles.

Of course, Belize does have viable populations of *Crocodylus moreletii*. In searching for release sites we explored 1 km² Cox Lagoon. As water levels fell daily, both fish and crocodiles concentrated in the lagoon. On the nights of 11, 14 and 19 March we counted 29, 48 and 59 crocodiles respec-

tively. In some suitable habitat, however, crocodiles were missing and local people blamed sport hunters. (At Crooked Tree Sanctuary, three people in a canoe were shooting cormorants in the water and in the process were sending slugs past our canoe.)

After a review of potential release sites, I decided the following: 1. Crocodiles to be released should be less than 1 m in total length and should be demonstrably shy of humans. 2. Sites should not be easily accessible to sport hunters and should have no resident wild crocodiles. I theorized that released crocodiles would be easier to monitor and less likely to quickly migrate if they did not have to compete with resident crocodiles.

In my last conversation with Mr. Rosado I assured him that we would attempt to monitor the released crocodiles. I further explained that we wanted to release the crocodiles because of interest by the zoo community in seeing zoo-bred endangered species as viable candidates for release in wild areas. Mr. Rosado remained unsympathetic to our proposal.

Participants in the trip to Belize were R. Howard Hunt, Jim Tamarack of the New York Zoological Society and David Cook, Non-Game Wildlife, Florida Game and Fish Commission.

On another note, Howard reports that at Orange Walk he obtained photographs which verified a fatal attack by a seven foot long Morelet's crocodile. On 4 April 1980, Mr. George Ack was fishing in knee deep water in a small pond when the crocodile grabbed him. Later the animal was shot and killed. The stomach of the crocodile contained a human hand and the man's shirt. (*Howard has made it his business to investigate and document crocodilian attacks in and around the U.S. His accounts are factual and, whenever possible, give us insights into the attack that are most often discarded as "not newsworthy" by the media. How about giving us a note on croc and alligator attacks for the Newsletter? Anyone else? Eds.*)

Costa Rica:

Earl Junier Wade of the Ministerio de Agricultura y Ganadería, Subdirección General de Vida Silvestre, wrote, "Since 1983, we have been working really hard to establish an Experimental Farm in Costa Rica. Through these years I have noticed an ever increasing interest towards crocodiles by potential investors, wildlife students and professors. I'm aware of the fact that there is a paucity of information about aspects of the life history of the crocodiles indigenous to Costa Rica, and that the recompilation of these data should have been our first step. Unfortunately, it is very difficult to get funds from our government agencies to start such studies." He is preparing a paper on "the relative condition coefficient observed on captive caimans." He also plans to do a survey on the Atlantic Coast.

Honduras:

Dr. Dietrich Jelden of the West Germany CITES Authority requested information on the population status of *Caiman*

crocodilus fuscus in Honduras so that the European Economic Community could decide if imports of hides and products of this species would be allowed. Any information on this should be forwarded to Dr. King or directly to Dr. Jelden at Bundesamt für Ernährung und Forstwirtschaft, 6000 Frankfurt am Main 1, Postfach 18 02 03, Adickesallee 40, DFR.

Warwick J. B. Nielsen of Tegulcigalpa wrote and told us he plans to establish a crocodile ranch in southern Honduras "in the very near future."

NORTH AMERICA

Mexico:

Marco Lazcano-Barrero of Instituto Nacional de Investigaciones Sobre Recursos Bioticos, Chiapas, asked us to include the following:

From the 17th to the 28th of November 1986, I gave the First Course on Crocodilian Biology and Conservation in Mexico. The course covered six days of classroom sessions in San Cristobal de las Casas, Chiapas, two days of practice in a crocodile farm, and three days in the field, both of the latter in the State of Campeche. The practical session was involved with the capturing and surveying the population of *Crocodylus moreletii*. The main objectives of the course were:

- 1) Provide the participants with the theoretical and practical bases for the study and conservation of crocodilians in Mexico.
- 2) Train personnel in the study methods, capture and handling techniques, and management options for the utilization of these reptiles.
- 3) Elaborate a diagnosis of the problems and needs for the conservation of crocodilians in Mexico that contemplates a strategy with viable alternate solutions.

The following two hour lectures were given:

Dr. Richard C. Vogt from UNAM spoke on "Sex determination in turtles and crocodilians";

Biol. Alejandro Cabrera from UJAT spoke on "Considerations on the implementation of a farm";

M.V.Z. Ricardo Benito V., a student at INIREB, gave a lecture on his bachelor's thesis, "Capture and manipulation techniques for wild and captive crocodilians";

Biol. Olga Herrera, also a student at INIREB, who is working at CIIDIR, presented a lecture on her bachelor's thesis, "Current status of the national trade in crocodilian hides, products and live animals"; and

Biol. Eleazar Loa from SEDUE gave a lecture on the problems surrounding the legislation and administration policies on the management and conservation of this resource.

The course was directed toward professionals and technicians actually involved with crocodilian research, management, legislation and conservation within the country. A total of 20 people attended the course, among whom were biologists, veterinarians and technicians belonging to 13 governmental and non-governmental organizations from 10 states. The course was sponsored by the Instituto Nacional de Investigaciones sobre Recursos Bioticos (INIREB), The

Secretaria de Desarrollo Urbano y Ecología (SEDUE), and the Consejo Nacional de Ciencia y Tecnología (CONACYT). CONACYT participated with a grant #PCECBNA-021189.

Among the conclusions and decisions derived from the course, there is the intention of preparing a second course with the participation of IUCN/SSC/CSG members and consultants as professors. One major achievement is that people involved with some aspect of crocodilian conservation have had the opportunity to meet with each other, exchange experiences and establish permanent communication.

A document with the conclusions derived from the course is being revised by the participants and myself.

Eleazar Loa Loa, one of the lecturers in the INIREB course, contacted Rene Honegger for information for some work he is doing to demonstrate the economic value of crocodile farming.

United States:

In June, the U.S. Fish and Wildlife Service removed the American alligator from the endangered species list throughout its entire range. This effectively leaves regulation of utilization in the hands of state legislatures. A report on Florida's proposed alligator management program was sent to us by Dennis David of the Florida Game and Fresh Water Fish Commission, Gainesville, Florida 32611:

The 1987 Florida legislature authorized a new alligator license and tag framework for alligator farming and trapping in the state. The philosophical basis relied on to develop the license and tag structure for the program was to utilize part of the high economic value of alligators to fund research and management programs. License fees were set at \$250 each for alligator farming or hunting. Tag fees were set at \$5 per egg, \$15 per hatchling collected for alligator ranching and \$30 per hide for alligators taken from the wild. These new license and tag fees will enable the Florida Game and Fresh Water Fish Commission to establish a broad alligator management program expected to be phased in over the next three years. Three new alligator biologists will be hired and two biological field stations established by the Commission this year. Two additional technical staff and other support help have been budgeted for in the planning process for the following year. The entire program is expected to be supported by projected revenues of more than one-half million dollars annually once the program is fully implemented in 1990.

Numerous rules remain to be developed and adopted by the Commission over the next year or two establishing harvest procedures and criteria in order to implement a statewide management program. The program will be developed to include alligator egg and hatchling collections for ranching purposes as well as traditional hunting of alligators greater than four feet for their hides and meat.

Florida has approximately 6.7 million acres of wetlands occupied by alligators, comprising about 45 percent of all available habitat within their entire range throughout the Southeastern United States.

The two major wetland basins in the state which retain their integrity as systems and support relatively high alligator populations will receive special attention. These are the St. Johns/Oklawaha River drainage in north Florida and the

Kissimmee/Okeechobee/Everglades basin in south Florida. Full time field biologists will be assigned to the newly established field stations in each area to initiate intensive alligator inventory and monitoring programs. These investigations will support the establishment of annual collection quotas for eggs and hatchlings as well as sustainable harvest quotas for hunting larger alligators. Plans call for similar efforts to be devoted to establishing "intensive" management programs on many other suitable lakes and rivers in the state. Although these wetlands support some of the better alligator populations in the state and lend themselves to available inventory and monitoring techniques, they comprise only a portion of the total available alligator habitat in Florida.

In addition to the intensive management of these most suitable areas, a system establishing very conservative harvest levels throughout the remainder of the state is planned. Conservative harvest quotas would be established for both eggs and hatchlings as well as alligator hunting on a county-by-county basis. Harvest quotas will be based on an assessment of the quantity and quality of alligator habitat in each county. (*CSG Chairman's Note: The statute passed by the Florida legislature in 1987 indicates the quota will be set after studying each population that will be hunted, not by quantifying habitat.*)

Along with increased utilization comes a responsibility to ensure adequate regulations are enacted which prohibit the development of any possible illegal trade. A tagging and marking (clipping tail scutes) system for alligator hatchlings is being initiated along with detailed reporting requirements to insure strict regulation and control is maintained for alligator ranches and farms operated in Florida. (*CSG Chairman's Note: The GFC proposed clipping tail scutes on farm-reared hatchlings to provide additional security against illegal trade, despite the proposed system destroying the value of the hide as a hornback.*) Alligator meat is continuing to be sold for approximately \$5 per pound. The reporting and packaging requirements which include serially numbered seals around each box of meat have been successful in keeping illegal meat from entering the markets and will likely be continued in the foreseeable future.

In the past the Commission has required all alligator hides taken from the wild to be sold through a state operated sealed bid system. The state retained 30 percent of the hide sale proceeds in lieu of license and tag fees. The state "operated" sales will very likely be modified to include state "sanctioned" or supervised sales. Some thoughts being considered would require trappers to bring hides to designated locations where they could be checked and validated by the state. Additionally, trappers may be offered the opportunity to enter their hides into a cooperative sale or maintain the option of selling them to buyers individually. The specific details remain to be worked out over the next several months along with many others through the Commission's rule making process.

The phased implementation of the program anticipates hatchling collections of up to 10,000 for the fall of 1987 and the first expansion of alligator hunting to a total of about 7,500 from the wild in the late summer of 1988. Once the program is fully implemented, probably around 1990, projected harvest levels could approach 10,000-12,000 hides annually from alligator hunting and upwards of 20,000 hatchlings going to alligator ranches each year from egg and hatchling collections.

The Commission is committed to developing Florida's alligator management program in a manner which encourages

"value added conservation" — that is to utilize the economic value of alligators to enhance the value of natural wetlands. The Commission feels this can be accomplished through the development of a broad constituency group of individuals which benefit from alligator utilization and therefore have an economic incentive or vested interest in conserving wetlands in a natural and productive state for alligators and ultimately all wetlands wildlife.

Articles in Gainesville, Florida newspapers reported the death in July of a 29 year old man who was snorkeling in Wakulla Springs State Park. As a result of this, officials of the Florida Game and Fresh Water Fish Commission destroyed four alligators: one six feet long, two 7 feet long and one 11 feet long.

Despite the alligator's notoriety, it was designated the State Reptile by the Florida State Legislature.

The American Alligator Farmers Association is organized and running strong. In fact, members of this organization are now on the *CSG Newsletter* mailing list. The AAFA meets quarterly and has already sponsored research at the University of Florida into standards of meat preparation and production of new meat products. Research also is underway on finding new uses for gator fat and oil, and on a variety of veterinary problems of captive gators. An advisory board includes the CSG chairman, and CSG members, Brazaitis and Brisbin, UF professors of animal science and veterinary science, and the head of the Florida Game and Fish Commission law enforcement office in charge of the alligator program.

Peter Arnold, formerly of South Africa, is now working for Babcock Florida Co. in Fort Myers, Florida. According to Peter, Babcock is "the only private landowners in Florida to have an experimental gator ranching permit from the State ..." His report continues:

... this year we were able to pick up close to 1000 eggs of which we set 781 and hatched 646 — an 82.7 percent success.

Of course, nothing was really prepared for the arrival of so many gators, so I have been frantically designing and building a rearing facility which is now (Oct. 5) about two weeks from completion. In the meantime, I have been battling with the hatchlings in plastic tubs which all have to be cleaned by hand as they have no drains and this involves catching every gator every day.

I am very encouraged that despite all this unnecessary stress they are doing better than I would have expected and so far we have only lost four percent. Of these, nearly all the deaths were attributable to piling, which I have since stopped, and we haven't lost any for the past two weeks.

A non-native species, the South American caiman, *Caiman crocodilus*, is making its way into the newspapers in Florida. Caiman apparently were introduced into the wild in Southern Florida a good many years ago as a result of the pet

trade. The newspaper articles indicate that the species is well established there and that caiman-human encounters are occurring. We would appreciate some accurate information on this from our friends in Florida for inclusion in the next newsletter.

The U.S. Fish and Wildlife Service, the arm of the U. S. Department of Interior that is responsible for enforcement of national and international endangered species regulations, is establishing a wildlife forensic laboratory in Ashland, Oregon, on the campus of Southern Oregon State College.

SOUTH AMERICA

The first phase of the CITES central South America Caiman Study roared to a close in 1987. The Bolivian team, led by Wayne King (CSG Chairman) and Dante H. Videz Roca (Bolivian Vida Silvestre) completed the survey work in Bolivia, and wound it up with an audit of the finished tanned 109,000 skins in the six ASICUSA tanneries by an international team which included King, Videz, Juan Villalba-Macias (Director of TRAFFIC South America) and Peter Brazaitis (CSG).

The Paraguayan team under the leadership of Dr. Norman Scott (U.S. Fish and Wildlife Service), Lucy Aquino



CSG Chairman, Dr. F. Wayne King, inspecting Caiman flanks at tannery in Bolivia. (Photo: P. Brazaitis)



Prototype captive rearing facilities for Caiman crocodilus yacare at Fazenda São Vicente, State of Mato Grosso, Brazil. (Photo: Roberto Stoll)

(Paraguay Biological Survey and National Museum) and Lee Fitzgerald (University of New Mexico, USA), completed the work there as well, culminating over three months of field investigations.

Lastly, the Brazilian team, led by Peter Brazaitis, Carlos Yamashita (IBDF — Carlos is a new CSG member) and George Rebelo (INPA and CSG), entered the field on 17 June 1987. Members continued work in the field nearly continuously until 18 November when Carlos and George wound up the surveys with the advent of the rainy season.

The teams surveyed the entire range of *Caiman c. yacare* in those three countries, and collected biological samples for gross morphological and biochemical systematics comparisons. Species distributions were defined and areas of special interest were identified for Phase II research. Much was learned about the hide trade, levels of hunting, relative population levels, and the potential for crocodilian conservation and management programs. The study was developed in 1983 as a result of a meeting by the governments of Brazil, Bolivia and Paraguay, the U.S. exotic leather industry, the U.S. Fish and Wildlife Service, the Office of the CITES Secretariat, WWF/Traffic U.S.A., and representatives of the IUCN Crocodile Specialist Group. They pointed out the lack of comprehensive information on the status, systematics, biology, and ecology of South American crocodilians and the need for a major study to develop the data needed to base regulation, conservation and management programs.

Now that the field work of the first phase is complete, the biochemical assay work will begin in New York. Team leaders will meet at the Florida State Museum in January 1988 to review the gross morphological data. Phase I surveys will move into northern South America this year, while Phase II (ecology, focused demographic studies, and development of management programs) will continue in the southern areas already surveyed.



Prototype captive rearing facilities for *Caiman crocodilus yacare* at Fazenda São Vicente, State of Mato Grosso, Brazil. (Photo: Roberto Stoll)

Argentina:

Juan Carlos Troiano, Buenos Aires, Argentina is doing research on hematological values from *Caiman latirostris*, as well as caiman reproduction in captivity.

Claudia Mercolli and Angel Alberto Yanosky report that they are "managing a private reserve of Alparamis S. A. and a wildlife sanctuary in the Humid Chaco Region in Formosa, Argentina." They are interested "in breeding in captivity caimans within the preserved area." The two species that are native to that area are *Caiman latirostris* and *Caiman crocodilus*, which is less common. They are working with Dr. Schuerholz of Canada, and are interested in breeding the species with the greater commercial value, while at the same time, restoring the animals to normal population levels in the natural habitat, which they say is and has been under "a great commercial pressure."

Lic. Esteban Astort is no longer at the Zoo in Buenos Aires, but is now working in an experimental hatchery for teiids. He and the owners of the hatchery are interested in setting up a farm to breed *Caiman latirostris*.

Brazil:

Augusto Shinya Abe of the Universidade Estadual Paulista, "Julio de Mesquita Filho", Rio Claro, plans to breed *Caiman latirostris* in captivity in order to release young "in damp areas formed around hydroelectric reservoirs." (See "South America" above for additional reports.)

Colombia:

Carlos G. Herrera of Barranquilla planned to start a breeding farm for *Caiman crocodilus fuscus* and *Crocodylus acutus* by the end of 1987 or beginning of 1988.

Jorge Enrique Valencia P., a fisheries biologist in Bogota, wrote that he would like to establish a breeding farm for *Caiman crocodilus fuscus* in northern Colombia, which is the species' natural habitat. He plans to begin with 400 adults (3 females/1 male ratio), allowing 20 m² for each animal (15 m² land and 5 m² water.) He wrote that

he expected 5,000 young/year from these. He plans to put the hatchlings in concrete ponds (6 m x 2 m x 0.6 m), at a density of three animals/m², until they are 60 cm in length. At that time, he would "move them to earth ponds at a density of 3 m² each (2 m² water and 1 m² earth)." He plans to feed them a diet consisting mainly of *Sarotherodon niloticus*, which he plans to raise at the same farm, supplementing the diet with offal from slaughterhouses. He expects that "with a food conversion of 1 to 4, to obtain a 12 kg crocodile in 15 months, with an average of 1.2 m in length and 5 pounds of meat to be sold."

Jorge Enrique further reported that there presently are four companies engaged in rearing *Caiman crocodilus fuscus* and *Crocodylus acutus* in northern Colombia. He stated that in order to rear crocodilians, the companies need two licenses from INDERENA, the government arm responsible for such activities. The first is an experimental license for the initial two years of operation. The second is a commercial license. The farms currently are in the experimental period and do not have commercial licenses to trade in crocodilians. The animals, however, are being traded illegally. INDERENA has authorized the taking of 4,000 breeding animals from the natural habitat for these operations. These animals are to be returned to the natural habitat.

Ecuador:

Dr. John C. Jahoda of Bridgewater State College, Bridgewater, Massachusetts, USA, submitted a report to World Wildlife Fund on his July 1987 study on the population of *Melanosuchus niger* in Zancudo Cocha. He noted that the population was "in very good shape" in that lake, probably due to the lake's remoteness, however, he cautioned that increased hunting activity in the area could threaten the population. He recommended that Zancudo Cocha and the area surrounding it be made into a preserve for the species.

Dr. Jahoda noted that he saw one *Paleosuchus* at the edge of Zancudo Cocha.

Guyana:

Rabindra Singh of the Institute of Applied Science and Technology, Greater Georgetown, wrote in response to questions regarding export of crocodilian skins from Guyana:

Presently there is an official ban on the export of all forms of wildlife products. This ban was implemented with effect from December 15, 1986. "This action became necessary because of a significant increase in the number of irregularities identified with the trade, including violations of the agreement with CITES." During the closure, attempts are being made to strengthen and improve the systems employed in all aspects of the trade of wildlife and its products.

Thus, legally, no specimen of *Caiman c. crocodilus* should be leaving the country. (CSG Chairman's Note: The ban was lifted in late 1987 and thousands of hides presently are being exported or transshipped through Guyana.) As is so far known, no *Caiman crocodilus* of the subspecies *yacare* have been identified here in Guyana.

Word from the Ministry of Agriculture (Wild-Life Division) states that *Caiman c. crocodilus* is not an endangered species. The Ministry is presently putting together information on the potential for a commercial hunting industry and on the actual harvest of *Caiman c. crocodilus* in the future.

However, as far as I know, no study has ever been done of the population of the *Caiman* of Guyana. As to how common is the species, I would say fairly common. Indeed, many can be seen in the Abary Area of Guyana where presently there is a large agricultural project going on.

Our study, when completed, will give some idea of the geographical distribution of crocodilians along Guyana's coastal environment. (CSG Chairman's Note: Much of the information is available in Vol. 2 of Prof. Medem's 1983 *Crocodylia de Sur America*.)

The lack of information on the crocodilians of Guyana is perhaps due to the absence of any specialists in this area (herpetology) and perhaps it is time that some people here get interested and begin studying Guyana's reptiles before it's too late.

Suriname:

Paul E. Ouboter, Curator of the National Zoological Collection, Paramaribo, reported:

In August, 1986, I started a research project on sympatry and competition of Suriname caimans. The project will last for four to five years and is carried out with the cooperation of the State Forest Service (Suriname) and the Rijksmuseum van Natuurlijke Historie (Netherlands). Since commercial hunting has occurred only for a very short period (In 1978 and 1979 about 2,000 *Caiman crocodilus* were killed.), most populations are in an almost pristine state. *C. crocodilus* is numerous in the coastal plain with densities up to 80 caimans/km of creek. (Three to 20/km is the usual.) In the oligotrophic waters of the savanna belt and the interior, caiman numbers are smaller; *Paleosuchus palpebrosus* occurs there in numbers up to 3/km of creek; *Paleosuchus trigonatus* up to 5/km of creek.

In August, 1986, the Suriname government established four new reserves in the coastal plain. At least two of them, Boven Coesewijne and Copi, contain good populations of caiman. In 1983, the Coesewijne population was estimated at 4,700 *C. crocodilus*. Caiman numbers in the other two reserves, Peruvia and Wanekreek, are unknown. In addition, the establishment of two other reserves is planned, both of which contain good caiman numbers.

Venezuela:

Stefan Gorzula, Puerto Ordaz, Venezuela briefly reports that the Yuri Lake created by the hydroelectric dam on the Caroni River reached its maximum level on 8 November 1986. This was commemorated with a special publication.

John Thorbjarnarson is temporarily back from Hato Masaguaral, Venezuela, and is at the Florida State Museum working up his Orinoco Crocodile and caiman data. He continued aerial surveys on the crocs in April 1987 as well as the study of caiman populations on the ranch.

Tomas Blohm, Caracas, Venezuela, also wrote in April 1987 that they were getting *Crocodylus intermedius* hatchlings from eggs resulting from breeding on Hato Masaguaral, as well as from eggs they collected from the Cojedes river. They have more under incubation and will keep us informed. So far, they have 72 Orinoco crocodile hatchlings, of which 7 died. They suspect a pesticide problem with 99 eggs taken from the Cojedes river. Embryos had their heads bent over backwards. The subtotal of hatchlings was 65 up to 28 April. The old Camatagua pair laid 47 eggs, of which 21 were left in the nest, 21 were incubated artificially, and 5 were cracked.

The *Crocodylus acutus* breeding pair produced 31 eggs (smashed 9). While the eggs contained mostly dead embryos, 6 were being incubated at the time. The adults had been kept at the home of Dr. Inga Goetz. She had been sick for a number of years and the crocs were acquired after she died. Tomas suspects the diet of the adults was very poor for a number of years.

They also acquired a 2.9 m long *Crocodylus intermedius* which was caught in a snare in the Orituco River near Calabozo. The people did not shoot it after it ate some of

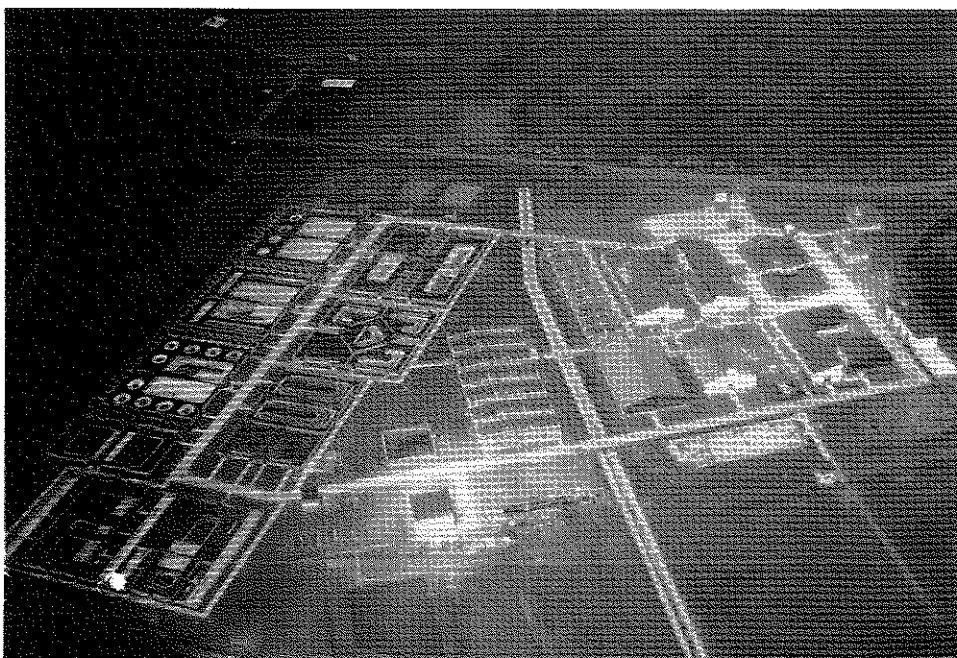
their pigs, and another larger animal was seen. They also got a yearling from the Portuguesa River near Camaguan. They now have a total of 104 specimens of this rare and highly endangered species, and two American crocodiles. (Ed. Note: Tomas is one of our longest standing and dearest CSG members and a good friend. Once, when these editors visited him in Caracas, we noted he was sharing his shower with a 1 m long Orinoco croc that was injured. Tomas commented, "It's O.K. He goes to one end of the tub when I get in!")

OCEANIA

Indonesia:

Jack Cox, FAO in Irian Jaya, enclosed a snazzy business card, with a gold and black crocodile printed on it, and wrote the following:

Field activities are at last underway for FAO Project GCP/INS/060/JPN: "Development of the Crocodile Industry in Irian Jaya on a Sustainable Basis." Headquarters has been set up in Jayapura. At least two commercial farms will be developed: one financed by the government in Sorong, and another, a private venture in Jayapura. Initial field work will focus around the establishment of a village network of crocodile pens and "midi-ranches," and monitoring surveys to establish harvest quotas of young crocodiles. Both *Crocodylus porosus* and *Crocodylus novaeguineae* will be utilized, but particular caution will be applied to the former, given its apparent depleted status over much of its range in Irian Jaya. Captive breeding, restocking and protection of the wild breeding stock will be encouraged. Obtaining baseline data from night counts and aerial nest counts will be an initial priority of project fieldwork.



Aerial view: RP-Japan Crocodile Farming Institute, Irawan, Puerto Princessa, Palawan, Philippines. (Photo: Jose L. Diaz)

Philippines:

Prof. A. C. Alcala, director of the Marine Laboratory, Silliman University, wrote the following description of their project:

The Silliman University Marine Laboratory has bred *Crocodylus mindorensis* for several years. Initially, our captive propagation project was funded through two grants from the World Wildlife Fund, International, with assistance from Charles A. Ross while he was involved with the Smithsonian Institution/World Wildlife Fund Philippine Crocodile Project from 1980 to 1983. Our project is solely conservation oriented and although the Marine Laboratory does have captive *C. porosus*, our intent is to concentrate our efforts on preserving *C. mindorensis*. We now have ca. 20 *C. mindorensis* at the Marine Laboratory, distributed in four pens, and recently donated four animals to the Calauit Animal Sanctuary, in the Busuanga Island group, for eventual release on the island. At this time, the Marine Laboratory has one breeding pair of *C. mindorensis* and several excess adult females for which we are actively searching for mates. Our breeding female is at this time (March, 1987) gravid again, and we expect an additional 15 to 20 young in several months.

The Silliman University Marine Laboratory crocodile breeding program is in desperate need of expanding our rearing areas for young crocodiles. It is likely that the deaths of several of our 3 to 5 foot long animals through fighting is a direct result of overcrowding and, when we locate one or more adult male *C. mindorensis* to mate with our excess females, we will require additional breeding pens. Daily maintenance costs for this program (security guard, food and caretaker) are offset by charging a minimal fee (=US\$ 0.025) for students, etc. to view the two crocodile species we maintain. We provide conservation oriented information to the viewers. However, funds needed for expansion of our facilities cannot be generated in this way.

The Marine Laboratory has suitable land adjacent to the existing crocodile pens to permanently fence in an area of roughly 0.5 hectare. This area will then be subdivided with moveable fence sections as our space requirements change. I estimate fencing for this expansion will cost US \$ 3,000.

Prof. Alcala is offering a pair of captive propagated *C. mindorensis* for sale to a zoological society to cover the costs of fencing the area they need for expansion.

Professor Alcala reported to us in 1986 that they donated four 3-4 year old *C. mindorensis* to be released "on the protected island of Calauit, Calamianes, southwest Philippines. Two 3 year old juveniles were donated by the Facility to

a conservationist for release in his wilderness area in Zambales Province, Luzon Island. Meanwhile, 13 out of 25 eggs of the breeding pair hatched in mid-June."

Dr. Jose L. Diaz, of the Foreign-Assisted Projects Management Office, Ministry of Natural Resources, reported on the joint Republic of the Philippines-Japan Crocodile Farming Institute:

As background, the Crocodile Farming Institute is a grant-aid from the Japanese government, which aims to conserve and eventually farm both *C. porosus* and *C. mindorensis*. It is located on a 10 hectare lot, 12 km from Puerto Princesa City, the capital of Palawan Island, some 600 km south of Manila. It has facilities for maintaining 200 breeders, with incubators and nursery facilities for hatchlings. Juveniles can also be accommodated in different pens. Research facilities include laboratories for farming, ecology, nutrition, physiology and pathology. So far, we have just finished the physical structure and facilities of the CFI and tentative date of operations is mid-March (1987). It will be operated by Filipino personnel with some Japanese experts. Breeding stocks will come from different parts of the country, taking in as many *C. mindorensis* as we can capture. The bulk of breeders will be *C. porosus*. Breeding and studies will commence at once and when hatchlings are produced successfully, they will be released into sanctuaries — (still to be established) and the rest to be raised in rural farms.

Once farming is economically feasible and the sanctuaries can maintain a sustainable yield of crocodile products, skins and meat will be traded.

TECHNICAL NOTE

Franklin D. Ross and Gregory C. Mayer, Museum of Comparative Zoology, Harvard University, sent the following note on scale counting methods based on their paper, "On the dorsal armor of the Crocodylia," in Rhodin and Miyata (ed.) 1983, *Advances in Herpetology and Evolutionary Biology*, Museum of Comparative Zoology, Harvard:

In Ross and Mayer, 1983, we employ an alternative to traditional scale counting methods in crocs. This method is based on the one-to-one correspondence of transverse scale rows and vertebrae, and enables comparisons of animals from different species and genera. Because it starts from an evolutionarily conservative spot, the resulting scale counts are considerably more reliable than the alternative, traditional way.

Because the greatest variation occurs on the crocodile neck and tail, we begin our counts at the pelvis. We count toward the neck through the dorsal trunk scales in a precaudal series (PC 1-26) where PC 1 and PC 2 are the two transverse rows corresponding to the two sacral vertebrae, and PC 3 to PC 26 correspond to the dorsal and cervical vertebrae, including the atlas and axis. Posterior to the two sacral scale rows is the caudal series (C 1 to however many transverse rows there are on the tail). C 1 is adjacent to PC 1. Finding the location of PC 1 and C 1 can sometimes be tricky, and we

strongly recommend that people pay close attention to our "Methodology" section (pp. 308-313), in which we detail the one-to-one relationship between transverse rows of dorsal osteoderms and the slightly anterior underlying vertebrae, and techniques for feeling the pelvis and femurs to judge which is scale row PC 1.

Permanent record of variation in natural populations can be made using photographs from directly above specimens showing the dorsal armor including the pelvic region. Close-ups of the neck can be made by placing a piece of tape on PC 12 as a marker from which anterior scale counts can be made. Great care must be made to correctly identify PC 1, and to place the PC 12 marker accurately so that PC 13 to the back of the head are in a picture (like the tracings in Ross and Mayer, 1983: figs. 5-10), and not some unidentified or misidentified scale rows.

Because it is important that people taking and publishing crocodilian dorsal armor data in PC and C counts do it accurately, and because our paper appeared in a large and expensive book, please feel free to request a copy or copies of our paper from Franklin Ross and/or Gregory Mayer, Department of Herpetology, Museum of Comparative Zoology, Harvard University, Cambridge, MA 02138, USA.

PERSONALS

It is with great sadness that we report the passing of three people who made significant contributions to the study of crocodilians.

Dr. Hugh Cott died at the age of 86. Dr. Angus d'A Bellairs wrote to Prof. Harry Messel, "I was one of his students in Cambridge just before the war, and he has always been a very good friend. I guess he was one of the last all-round zoologists in the Darwinian tradition, and I reckon that his big paper on the Nile crocodile was the starting point of modern crocodile ecology. I think he was a great animal artist, perhaps the best ever in his chosen black and white medium... But he had a pretty good innings, and was in fairly good health until a few months ago."

Prof. Archie Carr, who is, perhaps, best known for his work with sea turtles, and his beautifully written popular books, died in May at the age of 77. Stories of the female alligator who nested year after year in view of his dining room window, are legion among the many alligator researchers in the USA. His former student, Dr. David Ehrenfeld, wrote in an obituary that appeared in *Conservation Biology* (Vol. 1, August, 1987), "Archie Carr, noble spirit and greatest conservation biologist of these troubled times, died at his home on Wewa Pond near the town of Micanopy, Florida, on May 21, 1987. At the time of his death, he was the world's leading authority on sea turtles, a tropical field ecologist of exceptional skill and experience, a brilliant writer for audiences of both scientific and popular literature, a distinguished taxonomist and evolutionary biologist, and an internationally acclaimed advocate of conservation."

Dr. Luis Varona, Cuba's foremost crocodilian researcher and one of the founding members of the CSG, died several months ago after a long illness. Although incapacitated to a large degree by a stroke he suffered some time ago, he continued to write and actively contributed to the *CSG Newsletter*. On one occasion, we received a note written in a large wavering hand, a few words of greeting to ask how we were and to send his regards, apologizing for being too weak to write more. He continued to publish on the crocodilians of Cuba, with two articles appearing in *Poeyana* (Instit. Zool. Acad. Ciencias Cuba) in 1986. He was a greatly respected herpetologist, and a warm and good friend.

Prof. Chen Bihui of Anhui Normal University, Wuhu, Anhui Province, People's Republic of China, was promoted to the rank of Professor at the end of last year. Congratulations!

Lou Densmore (Dr. L. D. Densmore III) visited with us last March. He has been collecting blood samples from crocodilians at zoos around the USA for his work on mitochondrial DNA. Lou is now Assistant Professor at the Department of Biological Sciences, Texas Tech University, Lubbock, Texas, USA.

Prof. Huang Chu-chien, Institute of Zoology, Academia Sinica, Beijing, People's Republic of China, is doing research on the sea turtle. In March, 1987 he attended a meeting about the Chinese South Sea turtle in Hainan Island. His eldest son, Huang Dawei, is a student at the Institute of Languages, Sydney, Australia. Any of our Australian friends who wish to contact Dawei may do so at P.O. Box 274, Strawberry Hills, N.S.W. 2012.

Dr. Sudhakar Kar was transferred from Chandabali to the Office of the Chief Wildlife Warden, Orissa, where he has been supervising the captive crocodile breeding project at Nandankanan Biological Park, the sea turtle project at Puri and the Bhitarkanika *C. porosus* project.

Dr. Mark W. J. Ferguson, Chairman of the Department of Cell and Structural Biology, University of Manchester, Manchester, Great Britain, reported that Jeff Lang recently spent a six month sabbatical there and they have "done some more studies on crocodilian eggshell state and sex determination." (*At least I think that's what Mark scrawled. MEW*)

Tony Pooley left Crookes Brothers and is now living outside of Durban, South Africa, where he plans to spend his time writing books and articles. (See "Requests" below for his new address.)

Dr. R. J. Rao, of the Deori Gharial Rearing Centre, National Chambal Sanctuary, Morena, India, is working as a

Research Fellow of the Wildlife Institute of India on the turtle ecology project.

Franklin D. Ross and Gregory C. Mayer, Museum of Comparative Zoology, Harvard University, wrote that they "have recently fathered healthy young women named Norna and Caroline, respectively."

John Thorbjarnarson of the Florida State Museum, Gainesville, Florida, USA, wrote, "Just turned 30! It's all downhill from here (??)" The editors, neither of whom will admit to remembering being 30, send their sympathies.

REQUESTS

Jorge Enrique Valencia P., Calle 100 No. 13-26, Apto 402, Bogota, Colombia, would like to hear from researchers dealing with crocodilian farming in the tropics. He also is interested in visiting a commercial alligator farm in the USA.

Juan Carlos Troiano, Araoz 2230 - 9no "A" - (1425)+, Buenos Aires, Argentina, would like to receive scientific papers on crocodilian pathology, especially in blood samples, and infectious diseases.

If you would like to receive a special volume of *INTER-CIENCIA* on the ecology off the Caroni River Basin in Venezuela, contact, Departamento de Relaciones Institucionales, C.V.G. Electrificación del Caroni C.A., Apartado 62413, Caracas, Venezuela.

Tony Pooley has asked us to publish the following:

Re: The Ecology of the Nile Crocodile *Crocodylus niloticus* in Zululand. Over the years there have been a number of requests for copies of my Masters Degree thesis (as above). It was registered with Natal University in 1982 and comprises 350 pages.

I can have copies xeroxed and bound in board at the following prices. Should you be wanting a copy, please let me know as soon as possible as I will only produce as many as are requested. Please enclose payment with your order.

South Africa and neighboring countries:

R50 plus R3 postage (surface).

All other countries:

\$ 30 (which includes bank exchange charges)

PLUS

Overseas postage to be included as follows:

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| India | \$31 |

Please send your orders to: A. C. Pooley, P.O. Box 295, Scottburgh, 4180, South Africa.

Yehuda L. Werner, Professor of Zoology and Curator of Amphibians and Reptiles, Department of Zoology, Sturman Bldg., The Hebrew University of Jerusalem, 91904 Jerusalem, Israel, wrote, "I urgently yearn to hear from anyone who has knowledge of croc specimens originating from Israel, then Palestine. We seem to have only two specimens in Israel, and I would like to confirm that the population belonged to *C. n. niloticus sensu* Fuchs, Mertens and Wermuth."

Dr. L. A. K. Singh, Officer In-charge, Crocodile Research Centre of the Wildlife Institute of India, 19-4-319 Lake Dale, Bahadurpura P.O., Hyderabad-500 264. (A.P.), India, would like to hear from anyone who has knowledge of any dealings between any zoos and the animal dealer, International Zoo-Forss, Denmark. (See "Zoos" below).

Dr. George Zug, Curator, Division of Amphibiaps and Reptiles, National Museum of Natural History, Smithsonian Institution, Washington, D. C. 20560, USA, would appreciate papers, reprints, newsletters, etc. for the Division Library.

ZOOS

Estaban Damian Astort, Buenos Aires, Argentina, tells us that *Caiman latirostris* bred on exhibit at the Buenos Aires Zoological gardens. After incubation, 13 young were hatched. They are expecting reproduction in their *Alligator mississippiensis* in March.

Rene Honegger of Zoo Zurich, keeps us well informed of crocodilian happenings in European Zoos. Here is a selection of material he has sent to us:

The Copenhagen Zoo announced the hatching of five *Osteolaemus tetraspis* out of a total of 10 eggs that were maintained in incubation. The hatchlings were 20 cm long and weighed approximately 30 g at hatching. Incubation was for two and a half months. An additional eight eggs remained unhatched in the nest. In 1986, the Copenhagen Zoo reported the hatching of two *Crocodylus niloticus*.

Last February, an *Alligator mississippiensis* maintained at Zweedse Gotenburg, reached the age of 65. Rene remarked that he believes the oldest *A. mississippiensis* in a zoo is one maintained at the Pretoria Zoo. When Rene last saw the animal in November 1985, it was 69 years old.

Alligator sinensis young hatched at the St. Augustine Alligator Farm, St. Augustine, Florida, USA. The young are from a pair on breeding loan from the New York Zoological Park. The New York Zoological Park's *A. sinensis* that are maintained at Rockefeller Wildlife Refuge in Grand Chenier, Louisiana, USA, produced 28 eggs, of which 26 were fertile and 13 hatched.

An article in the Jan./Feb. issue of *The Animal's Agenda* stated that *Alligator mississippiensis* maintained at Gatorland Zoo in Orange County, Florida, USA, are being harvested. Some animals are being maintained for show purposes at this tourist attraction.

International Zoo-Forss, an animal trading company in Copenhagen, Denmark, is offering "zoo-bred" *Crocodylus rhombifer* for sale. Does anyone know the source of these animals?

TRADE

Louisiana skins were the talk of the trade in 1987. The three day sale which usually brings prices for American alligator skins of between \$28 to \$30 U.S. per foot, reportedly began the first day of bidding at \$37 per foot and ended at \$39. The highest price came on the second day with raw skins selling for \$48.65 per foot (or about \$14 per belly cm). The effect of such high prices on the classic skin market is speculated to mean major increases in the price of the manufactured product, perhaps pricing it out of the market.

Contrary to the hype generated by some members of the industry, that sales are great and a lot of people are paying up to \$2,600 for an envelope clutch crocodile handbag, \$200 for a men's belt or men's lace-up shoes for \$795, we have not seen nor spoken to anyone candid in or out of the industry who tells us the hype is real. If it is, it is not in the USA.

We continue to find the majority of imported croc products to be made of South American caiman skin. Many are very poorly processed, but some are excellent. We also note some very expensive classic croc and alligator products that are manufactured from parts of skins that have been poorly tanned, perhaps indicating that people that have less processing and manufacturing expertise are getting in on the market.

We are informed that soft leathers are in, and that the fashion has run its course and will go dormant for awhile, at normal levels. This is reported to be largely because of the high price of the raw material, lack of skins, the world economic situation, especially after the recent USA stock market earthquake and the caution of the consumer in spending for such a luxury item.



Beginning in late 1987, thousands of raw Caiman skins entered international trade

We are told that tanneries in France and Italy are closing down parts of their operations for lack of skins (*Or buyers? Eds.*). Their situation may not improve with the latest presidential decree in Bolivia in November 1987. As of that time, only manufactured finished products may be exported from Bolivia. This precludes the legal export of raw or even tanned and finished skins.

On the other side of the coin, countries like Brazil are under tremendous pressure by the European and Japanese industry interests. There is great pressure to open up the export of caiman skins with a wild harvest of the population, in spite of the fact that some government agencies as well as local biologists and many members of the private sector want to proceed slowly, develop the necessary caiman population data, and initiate a conservation, management and captive breeding program first.

It will not be an easy choice to make. The Brazilian economy is very poor, and the wild caiman appear to represent immediate revenues of \$5 to \$10 a skin to land-owners and local dealers. In some regions of the Pantanal, people promoting a wild harvest report the animals to be extremely abundant. Tourists are shown hundreds of animals in small ponds, largely at the height of the dry season when caimans are forced to congregate from many square kilometers into the only remaining sources of permanent water. At the present time, population and demographic studies have only begun in a few regions of southern Brazil.

The decline in the value of the U.S. dollar is reflected in a slight but growing shift in imports from manufactured products to tanned and finished skins, particularly caiman. Large numbers of these skins are of *Caiman c. yacare*, which, although it is on Appendix II of CITES, is prohibited from entry into the USA under the U.S. Endangered Species Act. Skins are still being routed from Paraguay through other northern countries in Latin America to Europe and the USA, and as far as southeast Asia and then back to the USA. In Brazil, greatly increased poaching is reported for 1986 and was compared to increased poaching in 1980 and 1981, following major fashion promotions that came on the heels of the infusion of American alligator skins into the market in 1979 and 1980, and large numbers of caiman skins from Venezuela in 1985/86. While the control of classic skins has tightened around the world as legitimate ranches and farms have organized into associations, and tagging of skins is now required, the caiman skin industry remains riddled with abuse and irregularities, and in many instances a pervasive disregard for national and international wildlife regulations. Some French tanners have voiced their concerns, in that all too often they purchase caiman skins with CITES export documents from sources in Asia and northern South America that are not the species they have requested or are listed on the documents.

Malaysia, Singapore, Taiwan, El Salvador, Guatemala, and Honduras were singled out by TRAFFIC (Japan) for allowing major trade in illegal crocodilians including large numbers of caiman skins. Irregularities in Venezuela's management program are currently being addressed and hopefully will soon be corrected. Yacare skins from Colombia, Guyana, and French Guiana are increasingly being funnelled through Singapore and other Asian countries.

What is our guess for 1988 and beyond? No guess is needed. The fashion magazines and promotions are not showing the quantities of crocodilian skin ads seen in 1986 - 1987. Actually, they show few reptile skins in general. When they do, they continue to show caiman skin as well as classic croc at comparable astronomical prices. Although the department stores in the USA kept longer hours earlier in the 1987 Christmas buying season (much of the annual gross income from sales is determined by the Christmas buying season), the stock market crash and the fear of an often predicted recession by 1990, seriously curtailed sales of all goods. We don't know what the effect was on crocodilian product sales. We do know that those products were not prominently featured in the stores before Christmas, and many were drastically discounted even during the height of consumer buying.

A shortage of legal inexpensive raw material, high prices of finished products, limited buying ability on the part of the consumer, and a fearful and poor economy, all cannot bode well for an industry based on a commodity that is strictly luxury and out of reach of the average consumer. As the strength of the Yen increases and Japanese industry becomes more interested in wildlife products around the

world, great competition is being levied on the traditional European based crocodilian leather industry. For certain, there will always be a consumer segment that can and will buy a \$3000 handbag. But I wonder if their numbers are not going to be just a bit thinner or less cavalier in 1988. The answer for the welfare of the industry is to infuse it with cheap raw material out of Brazil as fast as possible. But what is the best answer for the conservation of the animals, and ultimately for the people of Brazil? Do they want a fast dollar now, or perhaps a more comprehensive view for utilizing their national wildlife resource for generations to come? What Brazilians need to better understand, is that they hold the major portion of the key to the future of the crocodilian leather industry. They have the needed animals. No one else does.

On another note, increasing numbers of offerings of live endangered crocodilian species (as well as other endangered species in general) by commercial animal dealers, that are listed as bred under captive programs (see "Asia" section above), raise a number of ethical as well as legal questions. While offspring resulting from captive propagation programs may be considered to be Appendix II animals under CITES, we wonder about the high prices being offered for the acquisition of such endangered species by institutions and private collectors. Are such animals being offered for sale because of their monetary value because they are endangered species, rather than the lesser lucrative option of making them available to other captive breeding or reintroduction programs? We know of one instance where we and CITES were asked to assist one country in acquiring animals from another country for a captive propagation and reintroduction program. The animals were being offered at the same time by an international animal dealer on the open market. To date we have seen such offerings for *Crocodylus rhombifer*, *C. siamensis*, *C. palustris*, *Alligator sinensis*, and *Gavialis gangeticus*. We would like to hear your views on this issue for the next issue of the CSG Newsletter.

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Tagged Caiman crocodilus yacare at Fazenda São Vicente, State of Mato Grosso, Brazil, during 1985 populational studies (Photo: Roberto Stoll)



Beginning in late 1987, thousands of raw Caiman skins entered international trade.

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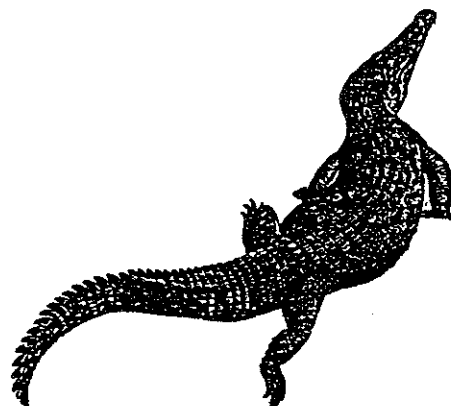
Editors' Comments, continued from page 2

accommodate flight schedules between Australia and PNG, and to allow interested participants to visit the Queensland *C. porosus* population at Port Musgrave with Laurie Taplin, and the Edward River Crocodile Farm with Victor Onions. The CSG Chairman will send out more information and a call for papers in the near future.

Many of you have asked about the publication of the proceedings of the 8th CSG meeting in Quito, Ecuador. Our hosts in Quito originally planned to publish the Proceedings, but difficulties arose that prevented it. The Proceedings will be published in Gainesville, Florida, and will be forthcoming before the 9th meeting.

We receive many requests for copies of articles we have received. When we can, we like to fulfill these requests, however, as we have no secretarial assistance or other support, it is often difficult to do so. We will continue to do the best we can under our current constraints. This also holds true for requests for back issues of the newsletter. We began editing the newsletter in 1982 and we do not have a complete set of newsletters prior to that date. In fact, in moving we seem to have misplaced everything but volumes 4 and 5. (The other volumes will probably turn up at some point.) Again, if you need back copies, your best bet would be to contact the CSG Chairman.

Frequently we receive requests for the CSG mailing list. Rather than needlessly increase the load of unwanted mail received by its specialist group members, the SSC does not release the list of members. The editors are following that policy. If there is a genuine need for the list, contact the CSG Chairman.



TEAR SHEET

PLEASE RETURN TO:

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