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tortoises and turtles

Newsletter of the IUCN Tortoise and Freshwater Turtle Specialist Group, No. 4. September 1989.

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EDITORIAL

A major and long-anticipated event, the First International Congress of Herpetology, takes place this month, hosted by Co-Chairman Ian Swingland and held from September 11 to 19 at the University of Kent, Canterbury, England. We plan to have a meeting of the Group in the course of the Congress. With our worldwide list of members and correspondents, we cannot usually plan on having meetings other than of regional sub-groups, but we anticipate that we will have representatives from all continents present in Canterbury. Look for notices or make contact with either of the Co-Chairmen as soon as possible after your arrival if you will be in Canterbury. This will be a great opportunity to discuss the promulgation and execution of the Tortoise and Freshwater Turtle Action Plan, a major document to which many members of the group have contributed, and one which would not have been brought to successful completion without the efforts of the compiler, David Stubbs. We also thank Simon Stuart of IUCN for his important role in the editorial process, and Karin Nelson of the Brookfield Zoo, Chicago, for escorting the completed manuscript through the publication process.

The Herpetological Congress should also see the launching of the report of Operation Tortoise, a major initiative spearheaded by Ian Swingland and including contributions from many Group members and correspondents around the world.

I have had the good fortune to meet and travel with several far-flung members of the Group in the course of my current program of filming the tortoises and turtles of the world. In Australia

we met Arthur Georges of Queensland and travelled with him to Frazer Island and elsewhere; John Cann (author of Tortoises of Australia) met us on arrival in Sydney and took us to some excellent turtle spots; Andy Burbidge took us to the Pseudemydura reserves in Western Australia; and Colin Limpus (of the Marine Turtle Group) greatly facilitated our filming efforts in the Great Barrier Reef and on the Queensland mainland. In South Africa Bill Branch was a most gracious host and guide; he travelled throughout Cape Province with us, and showed us rare and wonderful tortoises in habitat throughout the Province. In Thailand, Wirot Nutaphand (author of Turtles of Thailand) was an entertaining and delightful host, and in Bangladesh we met Farid Ahsan and were well briefed on the status of the enigmatic softshell turtle Trionyx nigricans, whose world distribution is apparently a single rectangular temple pond in Chittagong. In India we met our old friend Rom Whitaker at the Madras Crocodile Bank, and new friends Indraneil Das (the brilliant young author of Field Guide to Indian Turtles) and R. J. Rao, a man with the enviable job of managing turtle research and conservation programs in the National Chambal Sanctuary. Our single day on the Chambal River was an unforgettable experience; this 400-km stretch of river is a complete wildlife sanctuary; even fishing is prohibited. We saw many hundreds of turtles -- Rao's report follows elsewhere in the newsletter -- and I was particularly happy to see Chitra in the wild. This was the only living turtle genus that I had not seen alive.

We had excellent response to our request for contributions to this newsletter. We always knew that our members were busy and involved, but sometimes they get too busy to write! We will try and do another newsletter in early 1990. Please send contributions to me before January 31.

We are very sorry to announce the death of Dr. Dick Smith in August 1988. Dick was a specialist in the functional morphology of turtles, and he lectured on this subject in all of the veterinary schools in the U.K. He was highly regarded by his colleagues at the University of Bristol, and was a teacher of rare ability. A Scholarship Fund has been established in his memory, to endow graduate scholarships in the field of clinical anatomy of turtles and tortoises. Contributions should be addressed to Prof. A. E. Goodship, Dept. of Anatomy, University of Bristol, Bristol BS8 1TD, U.K.

We also regret to announce that Sir Hugh Elliot, a Group member and a distinguished conservationist of international repute and encyclopediac knowledge, is seriously ill, and has been forced to resign as a member of the Group. We have asked Lady Elliot to offer him our best wishes.

NEW TURTLE JOURNAL

The Journal of Chelonian Herpetology has been established to provide an international forum for the publication of specialist papers and feature article relating to chelonians. Articles and

papers are accepted in all languages. Illustrations will be in both black and white and color. Four issues a year are planned; the first volume (1989) will include a Revision of the Testudines, genus Testudo; Future of the Galapagos tortoises; Breeding the box turtles; and New species from Africa. Subscription is ten pounds in the UK; fifteen pounds for overseas airmail. Order from: Journal of Chelonian Herpetology, c/o The Tortoise Trust, BM Tortoise, London WC1N 3XX, England.

GALAPAGOS TORTOISES: CAPTIVE BREEDING SUCCESS

Ramon Noegel, Director of the Life Fellowship endangered species captive breeding facility near Seffner, Florida, USA, gave a telephone report on the remarkable success he has had in captive breeding of Galapagos tortoises in 1989. He has hatched 75 eggs already this year, and more appear likely to hatch soon. Two females nested no fewer than five times each, at approximately monthly intervals, between November 1988 and May 1989. One of these was an old female that had already been in captivity for over thirty years, but the other was hatched in the Honolulu Zoo as recently as 1969; she first nested in 1986. Another female, hatched at the Flatts Aquarium in Bermuda in 1966 (the parents being from stock collected in Galapagos in 1928 by Charles Townsend), nested twice, but of the 13 plus 18 eggs laid, only two, from the first clutch, were fertile. PCHP

ROAD KILLED TERRAPINS; SALVAGED EGGS MAY HATCH

Gary Wood, of Avalon, New Jersey, USA (and wife of turtle paleontologist Roger Wood) has undertaken some remarkable experiments in the hatching of eggs salvaged from the carcasses of road-killed females of the diamondback terrapin, Malaclemys terrapin. This species has returned to abundance in the wetlands of southern New Jersey, but the mortality of females as they cross highways in search of a nesting site is very high. Over 300 mortalities were recorded on ten miles of highway in 1989. About 200 eggs were salvaged from these often totally smashed animals, and these were incubated on damp vermiculite in plastic shoe boxes. The hatching rate has been most encouraging -- of the order of 60%.

Peak tourist season -- and thus peak traffic -- unfortunately coincides with the turtles' nesting season in June. In future seasons, it is hoped that it will be possible to have these county-maintained highways signposted to reduce speed limits and advise motorists about the regular turtle crossing points. PCHP

CARAPAX PROJECT

Centro Tartarughe Carapax, part of the Carapax Project aimed at the preservation of all turtle species in the Mediterranean area, was inaugurated in July in Massa Maritima, Tuscany, Italy; the official launching of the project was celebrated at the Museum of Central Africa in Tervuren (Brussels) on June 29. For more information, contact Donato Ballasina or Mark Dubrulle at CARAPAX,

c/o EVREKA s.a., 5 Rue de la Science, 1040 Brussels, Belgium. PCHP

STUDIES OF MEDITERRANEAN TORTOISES

Charles P. Blanc of the Universite Paul Valery (Montpellier, France) writes that his studies of the genetics of the Testudo hermanni population of the Massif des Maures, funded by the French Ministry of the Environment, were presented at the 3rd. European Symposium on the Chelonians, held in Marseilles in July 1988. Moreover, a preliminary study of the genetic structure of T. hermanni boettgeri from Yugoslavia, T. graeca from Morocco, and T. horsfieldi from Tajikistan SSR is in press in J. Herp. Assoc. Afr. vol. 36, 1989. PCHP

DESERT TORTOISE NEWS

The desert tortoise (Gopherus agassizii) of the western United States and northwestern Mexico is subject to many stresses -- destruction or development of the desert habitat, predation on the young by ravens, competition with grazing livestock, vandalism by off-road vehicle enthusiasts, and now a virulent respiratory virus, possibly related to the release of sick captive tortoises in areas inhabited by wild tortoises. The species was listed as "Threatened" at the June 22 1989 meeting of the California Fish and Game Commission. The vote was a close and suspenseful one, and was greeted by spontaneous applause in which the lawyers for the Southern California Builders Association, the off-road vehicle users, and the sheep and cattle ranchers did not participate. The designation will require that large projects that fall under the California Environmental Quality Act will be screened to ensure that they do not jeopardize the continued existence of the desert tortoise.

The U.S. Fish and Wildlife Service, following a lawsuit by Defenders of Wildlife, Environmental Defense Fund, and the National Resources Defence Council, has also announced its intention to list western populations of the desert tortoise in the US as "Endangered." The tortoise population in some parts of the western Mojave Desert has dropped by nearly 60% in the last four years, and the respiratory virus has spread through the tortoise's range in California, Utah, Nevada, and northwestern Arizona. The listing will make it illegal to take, harm, harass, or kill a member of the species, and it may limit construction on private land within the tortoise's habitat, and limit uses of that land. The listing is an emergency one only, valid for 240 days while the USDI decides on the question of permanent listing.

The role of the Bureau of Land Management in the whole desert tortoise question has been quite controversial. Indeed, the State Director of BLM in Sacramento, California, Ed Hastey, was roundly and appropriately criticized in a letter from Group Deputy Chairman John Behler for taking a stand against the endangered and threatened listings at both the state and federal hearings. BLM's plan instead has been to reduce the numbers of the ravens that are

a serious predator upon the young tortoises, a proposal that has, not unexpectedly, been opposed vigorously by the Humane Society and National and local Audubon groups. The Humane Society's request for a temporary restraining order was recently granted by U.S.District Court Judge Royce Lamberth, and a permanent injunction is being sought.

This is a difficult issue, and compounded by the fact that we all tend to show preference for the conservation of our own favorite species in conflicts of this kind; bird lovers will favor the ravens and tortoise lovers the tortoises. However, it is important to take a more ecological and less sentimental viewpoint, and realize that the tortoises are in a sharp and catastrophic decline, whereas the raven population of the Mojave Desert is thought to have increased 15-fold during the last two decades, as a result of trash dumps, sewage plants, highways, and other human intrusions in the desert. Some reduction in the raven population seems to be necessary, although it is important too that the ecological changes that permitted the raven population explosion to take place be corrected as far as possible.

The BLM plan was to kill the ravens by placing poisoned hard-boiled eggs on bait stations at least four feet above ground level. It was deemed impractical to try and kill the specific individual ravens that were killing the young tortoises. PCHP

MICHIGAN PROTECTS TURTLES

J. H. Harding of the M. S. U. Museum in East Lansing, Michigan, advises that, as of April 1 1989, certain rare, declining, or vulnerable species of herpetozoans in Michigan, USA, are protected by law and cannot be taken from the wild. These include the Eastern box turtle, Terrapene carolina carolina, the wood turtle, Clemmys insculpta, and the spotted turtle, Clemmys guttata. These are listed as "species of special concern" under Michigan's Endangered Species Act. In addition, the shooting of turtles with firearms is illegal. (Overseas readers may find this hard to believe, but a major problem in some areas of the United States is the recreational "plinking" at basking turtles by armed idlers in canoes). PCHP

RECOVERY PLANS FOR TWO U.S. TURTLE SPECIES

The U. S. Fish and Wildlife Service has distribuuted Agency Drafts of Recovery Plans for the Pseudemys alabamensis, and for Sternotherus depressus, the former drafted by James Dobie and Fred Bagley and the latter by John J. Pulliam. In essence, the alabamensis plan urges that steps be taken to ensure that juveniles are recruited into the population by determining the basic parameters of population biology and ecology, reduction of disturbance of the eggs, young, and adults, and protection of habitats. The depressus plan identified water pollution, collecting, disease, and hybridization as the main threats, and outlined steps for their correction.

TORTOISES IN GREECE

R.E.Willemsen, Monte Cassinostraat 35, 7002 ER Doetinchem, Netherlands.

Habitat for Testudo marginata in southern Greece was lost to wood fires in the years preceding 1986, but the species was not actually threatened. But during the last three years, wood fires have increased to such an extent that the threat has become serious. Near Sparta, an area of 20 square km of typical T. marginata habitat was burned; thousands -- perhaps over ten thousand -- tortoises were killed. It is likely that T. marginata will soon become the most threatened tortoise in Europe. To make matters worse, farmers are increasing the clearing of scrub for olive groves, herbicide use is increasing, roads -- which result in many highway deaths of tortoises -- are proliferating, and reforestation projects are threatening populations of both T. marginata and the other species. Generally speaking, detailed data on the present status and distribution of T. marginata in Greece are lacking; it is generally thought to be rare, and certainly it characteristically is found in much lower density than T. hermanni. But I believe it may be found to be less rare than thought. Studies of status and distribution are urgently needed.

Although Testudo hermanni is still very common in Greece, it seems that many populations have decreased in recent years. Loss of habitat by wood fires, land clearing, road construction, and use of herbicides has occurred almost everywhere. The dumping of garbage in the fields has caused increased rat populations in many places, resulting in increased tortoise mortality. In the small T. hermanni populations in southern Greece, agricultural activities have become a serious threat. In many places, encroachment of Rubus sp. was seen, making the habitat less suitable for T. hermanni. The encroachment also results in increased herbicide use and setting of fires by farmers trying to keep the grasslands from reforesting, again resulting in increased tortoise mortality. Studies on the changes in the status of T. hermani are urgently needed in the years to come.

The last winter was very dry in Greece, so many pools and rivers were already dry by early spring. It seems that many freshwater turtle populations will have trouble this year. Little is known about freshwater turtles in Greece; studies are needed.

NEW THREAT TO ALYKI TORTOISES

Adrian Hailey, Dept. of Physiology, The Medical College of St. Bartholomew's Hospital, Charterhouse Square, London EC1M 6BQ, UK.

After my intensive work in Greece from 1984-1986, I revisited Alyki in May/June 1988 and in April 1989, handling 880 individual tortoise in 1988 and 960 in 1989. The marked total now stands at 4150, of which 14,000 captures and recaptures have been made.

Analysis of these results is continuing in the direction of population dynamics, especially regulation by female mortality and its effect on the sex ratio. The recent references are given below; reprints are unfortunately no longer available.

The heath was still in good condition in spring 1989, and the hawthorn bushes were regenerating. However, I was informed by Dr. V. Goutner of the University of Thessaloniki that the local villagers had regained control of the site. These villagers were responsible for burning and ploughing the site in 1980, causing the deaths of about half of the tortoises (see Biol. Conserv. 31: 125-152, 1985).

I am currently editing a short book about the site, with about equal weight being given to the tortoises and to the sea birds of the lagoon, which are also threatened and which have been studied by D. Goutner and his group from Thessaloniki. This document will be used in a campaign to save the site, mostly aimed at the European Commission in Brussels, the Greek conservation legislation being ineffective.

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BATAGUR CONSERVATION PROJECT

E. O. Moll, Zoology Dept., Eastern Illinois University, Charleston, Illinois 61920, USA.

The IUCN through WWF has funded a proposal by Dr. E. O. Moll to study the status of the river terrapin, Batagur baska throughout its range in order to design a comprehensive management plan for the species. This project is listed on the Group's Action Plan and has a highest priority (APR 1) designation.

Part of the project will entail locating and censusing major nesting sites throughout the range. To do this young biologists will be hired to conduct surveys in each country of the turtle's occurrence. Target countries for the initial year of the astudy will be India, Bangladesh, Thailand, Indonesia (Sumatra) and Malaysia. Other parts of Indonesia, and Burma will be included if possible

Another part of the project will be conducted by Moll in Malaysia, where conservation efforts for the species have been conducted by the Department of Wildlife since the last 1960's. Presently there are hatcheries and nurseries set up on three of Malaysia's larger rivers (Kedah, Perak, Terengganu). From October to February, Moll will census river terrapin populations of these rivers and look at age profiles of each to determine if the present conservation efforts have been effective.

At the conclusion of the project, Moll will prepare recovery/management plans for Batagur specific for each country and distribute these to appropriate government bodies.

NEW PROTECTION FOR MALAYSIAN TURTLES

E. O. Moll, Zoology Dept., Eastern Illinois University, Charleston, Illinois 61920, USA.

According to the Malaysian Constitution, fish and turtles are the property of the individual states and hence not subject to federal regulation. These animals are thus not protected by the otherwise comprehensive Malaysian Wildlife Act and separate laws must be passed in each state to achieve country-wide protection.

In 1987 as a first step in conservation of the rarer species, I met with representatives of the Perak State Government and recommended that the following changes in existing legislation were needed to conserve the state's turtles:

i) The Batagur nesting area around Bota Kanan on the Perak River should be made a sanctuary for the turtle and all commercial sand removal operations should be curtailed.

ii) The following species of chelonians should be given state

protection from exploitation: all sea turtles and all tortoises; Batagur baska, Callagur borneoensis, Cyclemys dentata, Heosemys spinosa, Notochelys platynota, Orlitia borneensis, Trionyx cartilagineus, Trionyx subplanus.

I have just been informed by letter that #2 of my recommendations has just been passed, but they are still considering #1. As yet I have not received a draft of the legislation and so precise details are still unavailable.

TURTLE ECOLOGY PROJECT IN CHAMBAL RIVER, INDIA

R. J. Rao, Deori Gharial Rearing Center, National Chambal Sanctuary, P. O. Box 11, Morena 476 001, M. P., India.

A study on the "Ecological Relationships among Freshwater Turtles in the National Chambal Sanctuary" has been under way since 1983, under ther auspices of the Turtle Ecology Project of the Wildlife Institute of India. I am involved in the project. The Chambal River has been under the management of the National Chambal Sanctuary since 1978. We have identified seven species of turtle in the Sanctuary: Kachuga tentoria, K. dhongoka, K. kachuga, Hardella thurjii, Trionyx gangeticus, Chitra indica, and Lissemys punctata. The turtle species receive incidental protection in the National Chambal Sanctuary, the management programmes being specifically aimed at the conservation of a highly endangered crocodilian species, the gharial (Gavialis gangeticus). Of the seven species of turtle, three (T. gangeticus, Lissemys punctata, and Kachuga kachuga) are included in Schedule I of the Indian Wildlife Protection Act, 1972 (See Newsletter T & T Specialist Group No 2, December 1987, pp. 3).

Studies at Chambal include basking, feeding, and reproductive behavior of turtles, and relationships among different species of turtles and crocodiles in utilizing territory and resources. Surveys have been conducted in the Chambal River to identify suitable habitats for each species of turtle.

Under the research project, a captive rearing program was started in 1985, in collaboration with the Madhya Pradesh Forest Department. Wild laid eggs of Kachuga tentoria, K. dhongoka, K. kachuga, and Trionyx gangeticus were collected and incubated in a specially constructed hatchery at the Deori Gharial Rearing Center, the headquarters of the National Chambal Sanctuary. Since 1988, L. punctata have bred at the Center. One L. punctata nest hatched in June 1988. The young are reared at the Center, and studies on the growth rates of the captive reared turtles are under way.

I have prepared a project proposal on the captive breeding of endangered species of turtles and tortoises, and this is under consideration by the Government of India for funding. The Project will be taken up by the Wilflife Institute of India in collaboration with the U. S. Fish and Wildlife Service.

HOW MANY SAVANNA SPECIES OF KINIXYS?

Donald G. Broadley, Dept. of Herpetology, Natural History Museum, P. O. Box 240, Bulawayo, Zimbabwe.

In the last comprehensive revision of the genus Kinixys, Loveridge and Williams (1957) recognized a single savanna species, K. belliana, with a West African subspecies nogueyi. In a review of the southeast African populations (Broadley, 1981), I was able to demonstrate that K. natalensis Hewitt is a valid species, sympatric with K. belliana. The latter species was divided into two subspecies, the typical form restricted to the coastal plain and K. b. spekii Gray, a depressed form on the interior plateau, but also descending on to the coastal plain in some places.

Subsequent examination of more material from throughout the range of K. belliana (including specimens in the major United States museums) convinced me that K. spekii is a good species, which is sympatric or parapatric with K. belliana in several areas in southern Malawi (Shire Valley west of Zomba and Mangochi), eastern Zimbabwe (Mutare and Chipinge District), southern Mozambique (Maputo Elephant Reserve), and northern Zimbabwe that appear to be belliana x spekii hybrids.

The other form that appears to be a good species is K. lobatsiana Power, which has the posterior marginals moderately reverted and serrated. This species is restricted to southeastern Botswana and the Transvaal middleveld and may be isolated from K. spekii by the Drakensberg to the east and the Soutpansberg to the north. The Transvaal highveld to the south is too cold for Kinixys and the Kalahari to the west is too arid.

I am trying to assemble skeletal material of all the savanna forms of Kinixys as a basis for an osteological study similar to that carried out for Recent Gopherus by Auffenberg (1976), but probably restricted to the bones of the shell. One useful diagnostic character is the shape of the supracaudal shield and pygal bone in ventral view. In natalensis and belliana these elements are of similar thickness throughout their length, in spekii they are narrowed or proximally excavated mesially and in lobatsiana they are widened mesially.

Although I have recognized four savanna species of Kinixys in my contribution to the IUCN Operation Tortoise report, I would not be surprised if K. b. nogueyi eventually proves to be a valid species. This western race with four toes on the front foot is parapatric with typical belliana in Cameroun (Loveridge and Williams, 1957), so I am particularly anxious to examine material from this area. There is a 1700 km gap in distribution records for K. belliana between Cameroun and northeastern Zaire, but I am hoping that Jose Tello will be able to obtain some material in the north of the Central African Republic, where he is now based.

The only two species of Kinixys that might be considered

vulnerable are natalensis and lobatsiana. K. natalensis occurs in rocky areas along the eastern escarpment from the eastern Transvaal (Boycott and Jacobsen, 1988) through Swaziland to the Natal midlands. The species is threatened by habitat degradation in parts of its range and by sylviculture in others (Boycott, 1988). The status of lobatsiana has still to be investigated.

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STATUS OF RESEARCH AND CONSERVATION ON FRESHWATER TURTLES AND LAND TORTOISES IN INDIA

Romulus Whitaker and Indraneil Das, Madras Crocodile Bank Trust, Vadanemmeli, Perur Post, Mahabalipuram Road, Madras 603 104, India.

The Indian region has an extremely diverse tortoise and freshwater turtle fauna, with 26 species occurring in India alone, most being endemic to the region and poorly known. After a lull of over half a century (following the work of M. A. Smith, published in 1931), research and conservation of these groups have picked up, and there are now several biologists working on turtles and tortoises all over the country.

Governmental agencies involved in these studies include the Wildlife Institute of India and the Uttar Pradesh Forest Department, which is funding long-term studies on the ecological relationships between the various freshwater turtle species in the infamous Chambal River, conducted by R. J. Rao and D. Basu, in the states of Madhya Pradesh and Uttar Pradesh. Basu is associated with the Gharial Center at Kukrail, U. P., which has started an ambitious program of rehabilitating several species of corpse-eating turtles, to help control pollution caused by dumping tonnes

of corpses and animal carcasses in the Ganga. Large scale egg production for Trionyx gangeticus and Lissemys punctata, with an annual target of 30,000 eggs when the project becomes operational, is envisaged, as is the rearing of about 6,000 hatchlings.

At the famous Keoladeo Ghana National Park (still known to most as Bharatpur), turtles are a conspicuous part of the fauna, and S. Bhupathy, field biologist of the Bombay Natural History Society, is doing an ecological study on the turtles there (mainly Lissemys and Hardella).

Field surveys on the freshwater turtles and land tortoises in the little-known northeastern region of India have recently been conducted by I. Das, funded by the IUCN/SSC Freshwater Turtle and Tortoise Group, which resulted in range extensions of several species by hundreds of kilometers, and the collection of new data on the biology, status, and conservation of several species. Manouria emys was rediscovered in India during these surveys, after more than a century, and from a new locality.

The largest center for research and conservation of freshwater turtles and land tortoises is the Madras Crocodile Bank Trust, which has 16 species of Indian turtles and tortoises and several exotic ones. Five species (Trionyx gangeticus, Lissemys punctata, Melanochelys trijuga, Indotestudo forstenii, and Geochelone elegans) are breeding. Research under way at the MCBT includes studies on the effect of egg incubation temperature on the sexual differentiation of hatchling turtles, egg diapause, breeding biology, feeding, growth, nitrogen excretion, and other aspects. The recent grant from the Wildlife Preservation Trust International will be used in constructing large holding pens for the hatchlings and subadults of several species of freshwater turtles and for glass fronted, fully landscaped enclosures and breeding pools for hardshelled turtles and tortoises.

A million rupee joint Indian Government -- U.S. Fish and Wildlife Service project may soon get under way, to set up captive breeding facilities, protect existing populations, collect biological and status data for conservation needs and focus public attention on these groups.

TURTLE STATUS SCENARIO IN BANGLADESH

Indraneil Das, Madras Crocodile Bank Trust, Vadanemmeli, Perur Post, Mahabalipuram Road, Madras 603 104, India

Thousands of kilometers of rivers that snake southwards to meet the sea. Haors, the large yet shallow bodies of standing water, hundreds of square kilometers in area, but only a few meters in depth. A 750 km coastline, with estuaries, bays, and coral reefs. Much of Bangladesh is water. The land area is less than 144,000 sq. km., and the human density approaches 900 per sq km., making it one of the most densely populated countries on earth. Floods

wreak havok at least once a year, and many prople see sense in investing in a boat rather than property on firm land.

Approximately a tenth of the world's described turtle species, 25 in all, live in Bangladesh, an incredible diversity. In addition, populations of several freshwater turtles, now uncommon in the adjacent Indian states because of unrestrained exploitation, are still abundant. The prime reason for this high population and rich diversity seems to be the extensive wetlands present throughout Bangladesh, and a biologically rich forested area in the north-east and south-east, contiguous with forest patches in north-eastern India and northern Burma, coupled with the attitude of the followers of Islam, the religion followed by 90% of the people of Bangladesh.

Between December 1988 and February 1989, I conducted a survey of the freshwater turtles and land tortoises of Bangladesh, supported by the Fauna and Flora Preservation Society, to collect status and biological data needed for management and conservation (Das, 1989), walking, driving, sailing, or flying thousands of kilometers, from the northernmost district (Sylhet) to the southernmost (Cox's Bazaar). Close contacts with Forest Department personnel, turtlers, middlemen, exporters, academicians, and amateur naturalists made my work easier.

Fugler (1984) provided recent data on the export of freshwater turtles from Bangladesh. An official government publication, that of the Export Promotion Bureau (Anon, 1987) reveals that turtle exports have continued to increase. Between July and December 1985, turtle meat, eggs, and "fins" worth 148,000 Taka (approximately $3,900 US) were exported, while the figure for live turtles during the same period was 25,369,000 Taka. In the entire preceding fiscal year (1984-85), no export of the first category of products was officially recorded, while 23,247,000 Taka worth of live turtles were exported (Anon, 1987).

Two species of softshell turtles were found to be exported, the Indian softshell turtle (Trionyx gangeticus) and the peacock softshell turtle (T. hurum), both included in Schedule III of the Bangladesh Wildlife (Preservation) Act of 1974, which gives them legal (paper) protection from being captured, killed, or traded. Permits for export are given for three species of Trionyx, including T. leithi, the Leith's softshell turtle of peninsular India, T. cartilagineus, widely distributed in southeast Asia but not found in Bangladesh, and "T. certilsfionus," a species which, if indeed described, is not recognized in any scholarly monograph on the group. Both T. gangeticus and T. hurum are listed on Appendix I of CITES, to which Bangladesh is a party. Lack of staff in the enforcement departments and identification problems, due to paucity of literature, training, and interest seem to be the reasons behind this violation.

All turtles and turtle products seem headed for Far Eastern

markets. Turtles caught in several distant localities are transported to the holding centers in the Mirpur and Narayangunj areas of Dhaka, kept in enclosed ponds and exported in wicker baskets when sufficient turtles have accumulated. At present, twelve small business houses are involved in the live turtle export. Besides live turtles, several derivatives are also in demand from the southeast Asian markets. Oil is exported to Japan, Singapore, and Hong Kong, the cartilaginous flap (locally called badi) to Japan and Hong Kong, probably for making soup and medicines, bones to a large number of countries for conversion to fertilizers and chicken feed. Mortality during transit by air was estimated to be in the neighborhood of 5% by most exporters during the winter months, the percentage rising during the hot season.

Consumption of turtle meat is forbidden for the followers of Islam, the animal being considered haram (unclean), although eggs of both freshwater and marine turtles are eaten. But ethnic minorities, who total approximately 12 million persons, take a significant toll of freshwater turtles and land tortoises. During my surveys, the best source of information has been from the inhabitants of Hindu and (surprisingly) Buddhist viillages, who invariably had, or knew of, captive turtles, or had shells of recently consumed turtles. As in northeastern India, shells of turtles were hung over doors of human habitations, as well as over cow sheds, for the sight of a turtle is considered inauspicious, scaring away thieves! Paradoxically, local Hindus believe that the practice of hanging turtle shells brings prosperity to the house, transmitting the prolific nature of the turtles to the cows. The Hindu viewpoint appears conflicting to me, despite my own Hindu background. We consider the turtle to be an incarnation of the God Vishnu, and the vehicle of the River Goddess Yamuna, yet feel no qualms about eating the flesh of the same animal, or even watch with morbid curiosity as it dies a slow death on a blood-spattered stone.

To return to the findings of the survey, important new localities for freshwater turtles and tortoises were discovered. These include Cuora amboinensis from Salutikor, near the city of Sylhet, the second record of the species from the country, the first being from the southeastern district of Cox's Bazar (Khan, 1982), Morenia petersi from Jagganathpur, also near Sylhet City, a less dramatic range extension; Indotestudo elongata from the West Bhanugach Reserve Forest, Moulvi Bazar District, in the northeast, the species known previously only from the southeastern districts; Trionyx hurum from the Sangu River of Chittagong District, the southernmost record for the species and one which suggests its occurrence in northern Burma; and Kachuga tecta from Hael Haor, Moulvi Bazar District, the second record of the species from the Brahmaputra drainage. Moll (1987) found an example of the last-mentioned species in the collection of the Zoological Survey of India, from Cherrapunji, Meghalaya State, India.

Internal trade, as suggested earlier, involves a significant

number of turtles, for consumption by the minorities -- Hindus, Buddhists, Christians and the various ethnic groups. The Indotestudo elongata carapace found during the present survey was from a Khasia village inside a Reserve Forest, where the tortoise was eaten. At the Dhaka University Zoological Museum, there is a shell of an adult Manouria emys, collected by Prof. K. Z. Husain from a Chakma tribal settlement in the Bandarban Hill Tracts district, where the flesh was consumed. The exploitation of both these testudinids has been commented upon by Khan (1982), although neither he nor I could find any evidence of the collection of Indotestudo elongata for export, as reported by Oliver (1979). Freshwater turtles found to be locally exploited include Lissemys punctata, Morenia petersi, Hardella thurjii, Chitra indica and several of the species of the genus Kachuga. Softshells of several species are smuggled across the border to the Indian States of West Bengal, Meghalaya, and Tripura, where hardshells are not in much demand because of their low flesh-to-bone ratio.

Batagur baska, the estuarine emydid once common in the Hoogly region of West Bengal, in India, and unreported for many years from the Indian region was rediscovered in the early 1980's, from the Bangladesh Sunderbans, by Whitaker (1982), who reported that locals catch up to 200 of these turtles during the monsoons, using strings of hundreds of hooks, baited with mangrove fruits. Eggs, however, are reportedly not usually collected in large numbers in the area.

To summarize the situation in Bangladesh, there is a rich diversity of freshwater turtles and tortoises on the one hand, and heavy exploitation on the other, that is not based upon any kind of management plan. International cooperation is clearly needed, for funding, technical advice, and coordinating management programs. Training workshops for the enforcement authorities, e.g. the Forest Department, will help enforce existing legislation. While the question of total protection of the softshell turtles as Schedule III species of the Wildlife Act is debatable, a system of "closed season" may be operated, giving full protection to adults during the breeding season, perhaps allowing limited harvest of this valuable resource at other times. However, more basic biological questions on the turtle species in the country need to be answered before plans for management and utilization can be made.

My field surveys of the freshwater turtles and land tortoises of Bangladesh were supported by the Oryx 100% Funds of the Fauna and Flora Preservation Society, and conducted with the permission and assistance of the Bangladesh Forest Department. I thank Mr. Syed Abdul Rahaman, Conservator of Forests, and Mr. Waham Akonda, Senior Research Officer, of the Forest Department for the logistical help and advice received. Numerous individuals helped in collecting data, and I have attempted to thank each of them in my larger reports.

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NEW HOPE FOR RECOVERY FROM THE BRINK OF EXTINCTION: PSEUDEMYDURA UMBRINA, THE RAREST TURTLE ON EARTH, BREEDS AGAIN.

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It is a long time since there hasa been good news about the survival prospects of Pseudemydura umbrina, a taxon which represents a monotypic genus and subfamily of the Chelidae. Despite the fact that all known habitat (in the northern environs of Perth, Western Australia) has been protected since 1962, the wild populations dropped from 200-300 animals in the 1960s to 340-90 in 1979 (Burbidge, 1981), and 15-25 at present. In captivity the species has fared little better. A captive colony was established in the early 1960's, but breeding was sporadic and only very few (five or six) of the 29 hatchlings produced between 1966 and 1980 survived to maturity. From 1981 to 1986 captive breeding came to a complete standstill, with no eggs produced. In 1987 the number of captive animals was 17, only three of which were mature females, and these had been caught thirty years ago -- presumably as adults. The concern was that they were too old to reproduce.

In 1987 I arrived in Perth and developed a method, using ultra-sound scanning, to assess the ovarian activity and the reproductive state of female turtles and tortoises (Kuchling, 1987; 1988; 1989). This non-invasive method is especially applicable to endangered species and has the prospect of revolutionizing the monitoring of female reproduction in captive breeding projects as well as in field studies of chelonians. Noting the ovarian activity of the old female P. umbrina, I immediately proposed changes in the captive conditions (Kuchling, 1987). But the

embryos died during incubation, at an early stage of development (Kuchling et al., 1988).

During 1988 Dr. A. A. Burbidge (of the Western Australian Department of Conservation and Land Management) and I initiated and established a new rescue program and captive breeding project for P. umbrina. It is funded by WWF-Australia, the Australian National Parks and Wildlife Service, the Western Australian Department of Conservation and Land Management, and Perth Zoo.

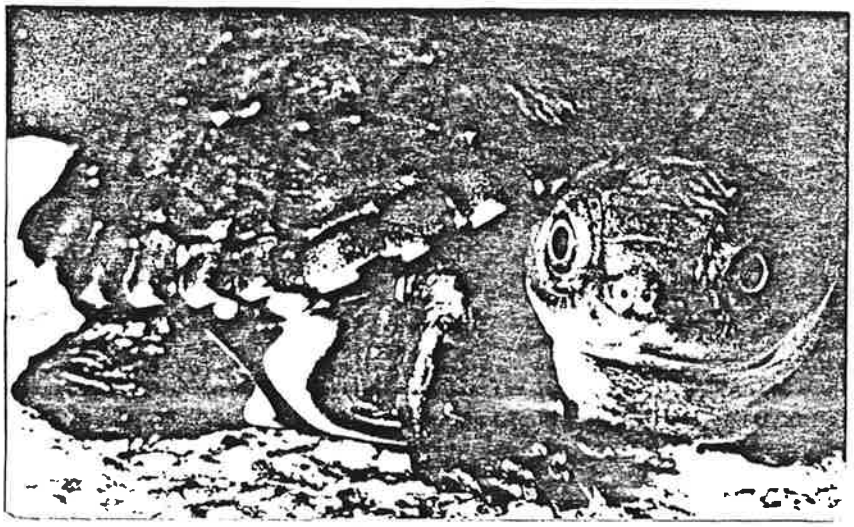
In September 1988 I found a mature female P. umbrina (the first female found in the wild in seven years) in a shallow, ephemeral pool on a privately owned cattle paddock south of the Ellen Brook Reserve where the last wild animals occur. It was added to the captive group, and this animal and two females from the old captive stock produced clutches of three, four, and five eggs respectively between late October and early December 1988. The changes in captive conditions and management have been described by Kuchling and DeJose (1989).

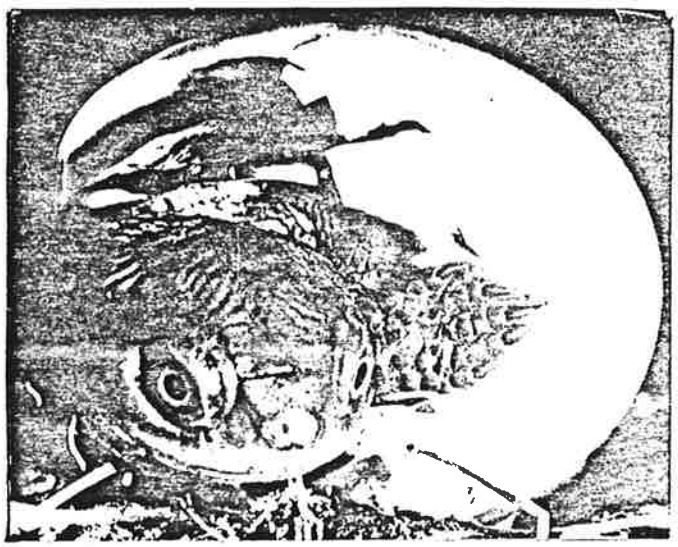
Three eggs were left outside, to develop in the natural nest, but the other nine were incubated at various temperatures (25, 27, 28, 29 degrees) on moist vermiculite. The different temperatures were chosen to assure that both sexes are produced, in the case P. umbrina proves to have temperature-dependent sex determination. Between February and April 1989, eleven young hatched; only one egg (which had been left in the nest) died during development. All eleven young started to feed and grow.

The next goal is to build up a viable, increasing captive population, able to achieve a regular output of offspring. The species is clearly in a bottleneck, with only a few reproducing animals. During the coming year, the genetic variability of the group will be assessed by plasma enzyme electrophoresis, chromosomal studies, and DNA fingerprinting. Then a husbandry plan can be developed to minimize loss of genetic diversity. It is important to get all existing animals to reproduce.

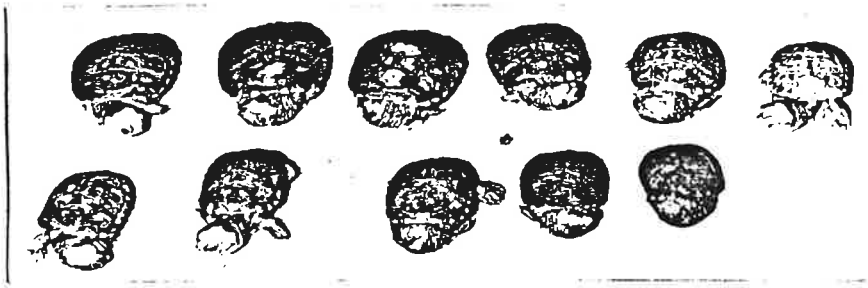
At the same time, the small surviving wild population in Ellen Brook Reserve has to be secured from the depredations of feral foxes, cats, and dogs, and the effects of the reduction in the water table. Applications are now being put forward to the Australian government for funds to build a fox-proof fence around the turtle habitat, but part of the expense will have to be raised by public appeal. The area south of Ellen Brook Reserve, where I found the lone female last year, would be suitable for restoring or re-creating lost P. umbrina habitat and for increasing the size of the reserve. This would increase the carrying capacity of this last remnant wild population to a more secure figure.

In the long term, captive bred animals should be re-introduced to the Twin Swamps Reserve where P. umbrina was extirpated in the early 1980s. This will only be feasible after captive animals have been breeding for a second generation, and after the situation in

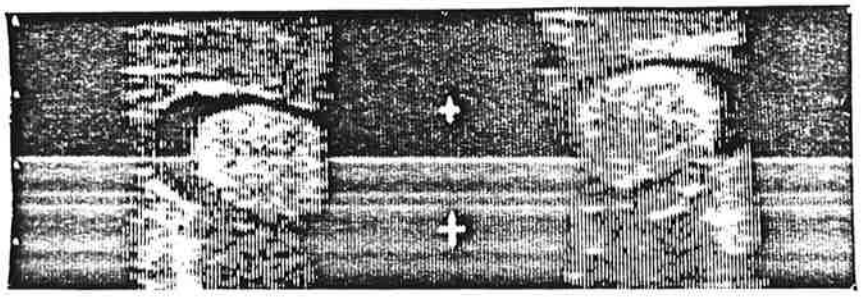




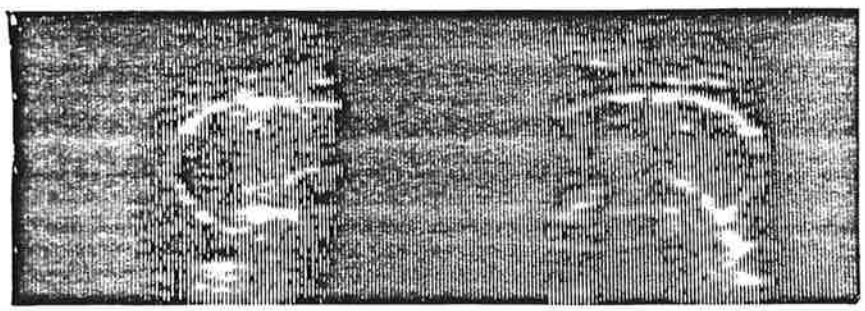
Hatchling Pseudemydura umbrina



Hatchlings from 1989, representing about 20-25% of the world population of P. umbrina



Ultra-sound tomographic picture of ova in the oviduct of P. umbrina during the secretion of the shell membranes



Ultra-sound tomographic picture of hard-shelled oviductal eggs of P. umbrina

this reserve has been substantially improved.

The captive breeding success received good media covcerage in Australia (press, TV, radio) and public interest to save this species seems to be high. A few weeks after a single appeal to the public in 1988, WWF-Australia raised more money by earmarked donations for the Pseudemydura project that I had asked WWF to provide for the project for three project years. The high profile of the rescue program of P. umbrina in Australia is also reflected by the interest of politicians to associate themselves with it: the successful production of eleven hatchlings this year was announced at a special press conference by the Deputy Premier of Western Australia, assisted by two Ministers. My hope is that the demonstrated committment of the Australian people will back up the rescue program for Pseudemydura umbrina until complete success -- the re-establishment of a viable population in the wild -- is reached.

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CHELONIAN STUDIES IN SOUTHERN AFRICA

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Accounts for southern African tortoises of the genera Chersina, Homopus, and Psammobates have been prepared (either by myself or local colleagues) for inclusion in this IUCN publication due for release at the World Herpetological Congress. In most cases, these proved relatively easy to prepare as much of the diverse information had already been reviewed in a number of recent publications, including:

1. A Field Guide to the Snakes and Other Reptiles of Southern Africa (W. R. Branch, Struik Publ., Cape Town, 1988; 326 pp).

2. The South African Tortoise Book (R. C. Boycott and O. Bourquin, Southern Book Publ., Johannesburg, 1988; 148 pp).

3. The South African Red Data Book -- Reptiles and Amphibians (W. R. Branch, Ed., Nat. Sci. Prog. Rpt. 151; Pretoria, 241 pp.)

The last of these lists a number of chelonian species, namely:

Endangered:	Psammobates geometricus
Threatened:	Dermochelys coriacea
	Caretta caretta
	Chelonia mydas
	Eretmochelys imbricata
	Lepidochelys olivacea
Rare:	Kinixys natalensis
Restricted:	Homopus signatus cafer
Peripheral:	Pelusios castanoides castanoides
	Pelusios rhodesianus

The Status of Homopus bergeri

For a species known from so few specimens (still under thirty), H. "bergeri" has had a confused and complicated taxonomic history, aspects of which still have to be satisfactorily resolved (Branch, et al., in prep). Homopus bergeri was described by Lindholm (1906) on the basis of a fragmented Bushman artifact, that he noted could have originated "deeper in South Africa." Soon after its description, Siebenrock (1909) synonymized H. bergeri with H. boulengeri, but later the same year he transfered it to the tentorius group of "Testudo." Perhaps he was influenced by Duerden's (1907) footnote that considered H. bergeri to be only doubtfully referable to Homopus. Until the present, Siebenrock's decision has been followed in principle by all subsequent workers, although as the generic status and interrelationships of the tentorius group have evolved, the synonymy of bergeri has proliferated.

Mertens (1955) recorded Homopus boulengeri from Namibia, but this was questioned by Greig and Burdett (1976) in their survey of the tortoises of southern Africa. Fresh material of Homopus obtained by J. C. Greig in 1981-82 from the vicinity of Aus led to further speculation. Differences in the color pattern and morphology of this population, compared with typical H. boulengeri from Cape Province, led to speculation that a new species of

Homopus was involved, and to the revival, perhaps prematurely, of H. bergeri (Newbery and Jacobsen, 1986; Branch, 1988a; Branch et al. 1988). However, the problem is not settled. It remains to be determined whether the Aus Homopus is conspecific with H. boulengeri (either identical with Cape boulengeri, or a new subspecies), or if it is referable to H. bergeri Lindholm, 1906. These problems are now being investigated by the author. All material in southern African collections has been studied, and opportunity will be taken to inspect the type and additional material whilst in Europe for the WHC.

The Namibia Homopus is restricted to barren, granite mountains, with sparse succulent vegetation in the Namib Desert and with grassland on the Aus Escarpment. Populations on the Koweisberg, in the Namib Desert near Luderitz, are subject to extreme aridity (often < 10 mm rainfall p.a.) and the tortoises must obtain most of their water from their food and/or from advective fog caused by the offshore cold Benguela Current. It is normally rock-living, although it may forage in sand gullies. It has been reported to shelter under rock slabs and to be particularly active during and after winter rains. At Aus it is sympatric with Psammobates tentorius verroxi, although the latter does not climb on to the bedrock outcrops favored by H. bergeri. In this respect, the situation is similar to that in the Central Karoo, where Homopus boulengeri and Psammobates tentorius tentorius occupy comparable habitats.

The Ecology of the Angulate Tortoise, Chersina angulata

A Ph.D. Thesis, entitled "Ecophysiological Studies on the Tortoise Chersina angulata" has recently been completed by Shaleen Els (University of Port Elizabeth). It extends, and in some cases revises, the findings of Branch (1984, Amphibia-Reptilia 5: 43-55), made earlier on the same study site. A comparative study of the angulate tortoise population on Dassen island, off the SW Cape Coast, has also been made, the results of which have been submitted for publication. Densities on the island are very high (10-250 tortoises/hectare for the different habitats), and the island, which is only 222 ha in area, probably contains about 25,000 tortoises. The biomass, corrected both for sex ratio and sexual dimorphism in adult weight, ranges from 67.6-107.4 kg/ha. Among testudines, this figure is only surpassed by that for the giant tortoise on Aldabra. Tortoises are not indigenous to the island. They appear to have been introduced around the turn of the century. A separate note on the high level of predation on the tortoises by the Kelp Gull (Larus dominicanus) has also been submitted for publication.

Geochelone radiata

A number of these beautiful but endangered tortoises has recently been confiscated by the Natal Parks Board, and a number of others have been located in private collections in Natal and the Transvaal. It is still not certain where these specimens

originated, but they appear to have been illegally imported from wild stock from southern Madagascar. They have been handed over to the Transvaal Snake Park Halfway House, who plan to initiate a captive breeding program. This has the support of the Natal Parks Board, and it is hoped to work in conjunction with a number of other local facilities, including the Port Elizabeth Museum and Snake Park. The other captive breeding colonies of Geochelone radiata are mostly in the northern hemisphere (Texas and Georgia), and the South African colony will have the advantage of a southern latitude comparable to that to which the species is native. Researchers interested in the project should contact: Mr. T. Morgan, Transvaal Snake Park, P.O.Box 97, Halfway House, 1685, South Africa.

(References not supplied)

TURTLE NEWS FROM ALABAMA

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1. Most of Alabama's native turtles now receive some degree of protection from taking and/or possession. Fully protected species, either under federal law, state regulation, or both, include: Alabama Map Turtle (Graptemys pulchra); Mississippi diamondback terrapin (Malaclemys terrapin pileata); Alabama red-bellied turtle (Pseudemys alabamensis); alligator snapping turtle (Macroclemys temminckii); Barbour's Map Turtle (Graptemys barbouri); box turtle (Terrapene carolina); Gopher tortoise (Gopherus polyphemus); and flattened musk turtle (Sternotherus depressus).

All other non-exempted species are protected to the extent that no more than four individuals may be in possession. Exempted are: common snapping turtle (Chelydra serpentina) and softshells (Apalone sp.) having carapaces eight inches or greater in length; and "nuisance" turtles taken with live traps in private ponds and lakes.

2. Attempts are being made (so far without success) to persuade the Coastal Land Trust, of Mobile, to permit state and federal officials to deny public access to its land on Gravine Island, in the Tensaw River, during the nesting and hatching seasons of the Alabama Red-bellied Turtle. Most of the beach area of the island is owned by C.L.T. and receives heavy recreational use during the summer months. The beach area on the island is believed to be the major nesting area for the turtle, and observations made by turtle researchers indicate that recreational use is adversely affecting the reproductive success of the Alabama red-bellied turtle and other species that attempt to use the site.

3. A status survey of the gopher tortoise on Camp Shelby, Mississippi has been completed and submitted to the Mississippi National Guard. The survey,. by Bob Mount and Ed Wester of Auburn

University and Kelly Swing of Louisiana State University, was conducted to provide a basis for "Section 7" consultation between the National Guard and the U.S. Fish and Wildlife Service under the Endangered Species Act.

4. Ty Bryan and Craig Guyer of Auburn University are working under contract with the U.S. Forest Service to study the impact on the gopher tortoise (Gopherus polyphemus) of establishing a seed orchard on an area in DeSoto National Forest inhabited by tortoises.

5. James Dobie of Auburn University reports that an undescribed species of Pseudemys belonging to the rubriventris group in Mississippi is apparently exceedingly scarce and warrants investigation.

6. A bill to outlaw use of commercial fishing nets in fresh waters of Alabama was introduced in the legislature but did not pass. These nets are believed to result in substantial mortality to turtles, including Alabama red-bellied turtles.

POSTSCRIPT

The SUN newspaper of New York and Florida reported on April 11 1989 that a young boy in England, three year old Timmy Morton of Essex, accidentally swallowed his pet turtle, a hatchling Trachemys scripta elegans. It appears that young Timmy was in the habit of carrying the turtle in his mouth to keep it warm and because he liked the way it tickled his tongue; he swallowed the turtle during an attack of hiccoughs.

After two days of moaning and discomfort, Timmy was taken to the hospital and X-rayed, confirming that he had indeed swallowed the turtle. He was given a saltwater solution to induce vomiting, and when the upchucking was over, "there sat the turtle blinking his eyes and pulling his head in and out of his shell."

"Clarence, you're okay!" shouted Timmy, as a nurse wiped his mouth. "I was so worried about you."