

**THE BRITISH
HERPETOLOGICAL SOCIETY**

BULLETIN

No. 16 June 1986

BRITISH HERPETOLOGICAL SOCIETY

*c/o Zoological Society of London
Regent's Park, London NW1 4RY*

Correspondence, membership applications, subscription renewals and purchase orders for the British Journal of Herpetology should be sent to the above address.

The British Herpetological Society was founded in 1947 with the broad aim of catering for all aspects of interest in reptiles and amphibians. Initiated by a small number of enthusiastic and well-known naturalists, including the first President and author of the standard textbook on British herpetofauna Dr. Malcolm Smith, the Society expanded rapidly and today enjoys national status with many international connections.

Activities of members range over a number of interrelated fields. In many cases the prime interest is in maintaining, breeding and observing various species in captivity and the Society acts as a forum for the interchange of experiences in this area. Others are concerned with the observation of animals in the wild state. There are active sub-committees which help to cater for these various tastes, notably the Captive Breeding Committee and the Conservation Committee. The former encourages the development of effective breeding techniques for captive specimens, thus providing animals for observation and study in vivaria, and for conservation purposes, while simultaneously reducing the need to take fresh stock from wild and possibly declining populations. The Conservation Committee is actively engaged in field study, conservation management and political lobbying with a view to improving the status and future prospects for our native British species. It is the accepted authority on reptile and amphibian conservation in the U.K. and has an advisory role to the Nature Conservancy Council (the statutory Government body). There are also professional scientists within the ranks of the Society engaged in increasing our understanding of all aspects of reptile and amphibian biology.

Publications

The Herpetological Journal, published each June and December, contains papers or original research in herpetology.

British Herpetological Society Bulletin, published quarterly, contains notices, news items, articles and original papers on all aspects of herpetology.

The Care and Breeding of Captive Reptiles, a book containing a collection of papers on recent developments in breeding reptiles in captivity. This publication is not included in members' subscriptions, but is available to members at a price of £4.00 + £0.50 postage. Applications to purchase should be made to the Chairman of the Captive Breeding Committee.

Conserving Sea Turtles, by Nicholas Mrosovsky. A critical review of the current problems and controversies of sea turtle conservation. Price U.K. £5.00 + £0.75 postage (surface mail) or £2.80 (air mail), U.S.A. \$10.00 + \$1.00 postage (surface mail) or £5.00 (air mail).

Meetings

About ten meetings covering a broad sphere of interests are held each year.

Subscriptions

Ordinary Members £15. Junior Members £5. (Junior Members do not receive the British Journal of Herpetology). Institution rates £25 (U.S. \$40).

All subscriptions become due on the first day of January each year.

The Society does not, as a body, hold itself responsible for statements made or opinions expressed in the Bulletin; nor does the Editorial necessarily express the official opinion of the Society.

The Bulletin is edited and produced by
John Pickett and Mike Matthewson

Contributions and correspondence arising from the Bulletin should be sent to:
John Pickett, 84 Pyrles Lane, Loughton, Essex IG10 2NW

REMAINING MEETINGS 1986

- 15 JULY Prof. Yehudah Werner (Dept. Zoology, Hebrew University of Jerusalem): Herpetofauna and herpetology in Israel. Prof. Werner particularly wants to meet members and so a good attendance is encouraged.
- 14 SEPTEMBER Joint U.K. Herpetological Societies Symposium, organised by the Captive Breeding Committee. To be held in the Zoological Society of London Meetings Room. Tickets must be purchased in advance (see programme below for details).
- 23 SEPTEMBER Care and breeding of reptiles and amphibians. An open meeting — contributions from members, with slides, live animals, etc. are invited. There will be facilities for the sale and exchange of members' private stock.
- 23 OCTOBER *Conservation and Ecology of Mediterranean Turtles*. Dr. Ian Swingland (School of Continuing Education, Univ. Kent, Canterbury and Chairman, IUCN/SSC Turtle Group) and David Stubbs (Founder, Station d'Observation et de Protection des Tortues des Maures, France): Movement patterns in *Testudo hermanni* and implications for management. David Stubbs and Dr. Ian Swingland: Conservation efforts on *T. hermanni* in S. France and Dr. M.R.K. Lambert: Natural bioclimatic range and the growth of captive-bred Mediterranean *Testudo* L. in northern Europe: implications for conservation farming.
- 18 NOVEMBER John Buckley (Member, BHS Conservation Committee): Natterjack conservation, including reintroductions, in East Anglia.

JOINT U.K. HERPETOLOGICAL SOCIETIES' SYMPOSIUM

To be held on Sunday, 14th September 1986 at the Zoological Society of London Meetings Room, Regents Park, London NW1 4RY

PROGRAMME

- 1.30-2.00 pm Arrival
Chairman: Mr J. Coote
- 2.00 pm Mr R. Bray: Husbandry and reproduction of *Bombina maxima*
- 2.25 pm Mr Paul Edgar: The amphibians and reptiles of Gregory National Park, Northern Territory, Australia
- 2.50 pm Mr C. Mattison: The amphibians and reptiles of Malaysia and Sumatra.
- 3.15 pm Mr D. Reid: The rearing of juvenile *Testudo graeca* and the problems of their disposal.
- 3.40 pm Mr R. Harper: MRCVS: Veterinary aspects of reptile husbandry
- 4.05 pm COFFEE

	Chairman: Dr S. Townson
4.45 pm	Mr D. Blatchford: Environmental lighting
5.10 pm	Mr M. Linley: Captive breeding and husbandry of amphibians
5.35 pm	Mr John Brunner (Pennsylvania, USA): Commercial Breeding of reptiles and amphibians
7.00 pm	Close

Tickets, costing £5 each, must be purchased in advance for this Symposium. Cheques should be made payable to Mr J. Coote and sent to his home address at:

195B College Street, Long Eaton, Nottingham NG10 4GF.

Ticket applications must be accompanied by a stamped self-addressed envelope.

NORTH WESTERN GROUP MEETINGS 1986/87

12/13 JULY 1986	Herptile Rally
Saturday, 12 noon-6 pm	An open weekend to present herptiles and meet the public. Volunteers wanted (with or without herptiles) to help/produce and man the displays. Please contact Mr. R. Paul, The Wildfowl Trust, Martin Mere, Burscough. Ormskirk.
Sunday, 10 am-4 pm	
23 SEPTEMBER 1986	Liverpool School of Tropical Medicine
7 pm	A lecture and visit to the poisonous snakes herpetarium. The Liverpool School of Tropical Medicine, Pembroke Place, Liverpool.
25 NOVEMBER 1986	Captive Breeding of Corn Snakes
8 pm	Mr Trevor Smith. The Wildfowl Trust, Martin Mere, Burscough, Ormskirk.

BHS MEETING VENUES

For few other reasons than expediency and reasonable hire charge, apart from the Society's natural history association, the Lecture Theatre of the Linnean Society of London, Burlington House, Piccadilly has habitually been used for BHS meetings during weekday evenings from 7—9.00 pm. Although very central with good access by public transport, in addition to the august, if not to say historical, surroundings provided by the long standing connection with biology in Britain, the Linnean Society venue has been criticised by members for not providing any refreshment facilities or a place to sit for informal discussion after the end of meetings. Moreover, the Lecture Theatre and building have to be vacated by 9.00 pm sharp in consideration of the caretaker's requirements. Over the last few years, members have habitually gathered at The Chequers, 16 Duke Street, London SW1 after meetings, since this about the only public house within easy vicinity of Burlington House. Even this can sometimes be crowded, however. Unfortunately the area in general around Picadilly, as a well-known place of entertainment, tends to provide only somewhat garish and often noisy alternative accommodation.

Preliminary exploration has found as possible alternatives a lecture theatre in Imperial College, London in South Kensington (London SW7), with smart, new facilities, that can be hired in the evenings (£75 — 40% off if introduced by a staff member) and a refreshment bar in the adjoining building, and the University of London Union building much frequented by students in Malet Street, London WC1, where a room taking up to 80 people in a boardroom or classroom arrangement can be hired by outside societies for £25 an evening. Coffee and drinks can be arranged, or otherwise

there is a cafeteria and bar in the building, which is open until around 11.00 pm.

Suggestions for alternative Society meeting venues in central London are requested from members, preferably in august surroundings, hopefully provided free or at low charge, and where refreshments are available or easily obtainable, and reasonably comfortable seating arrangements allow for informal discussion after the end of meetings. Perhaps some member(s) has a connection with an establishment of higher education, a professional institution or learned or natural history orientated society with club room facilities which would be willing to offer the BHS evening meeting accommodation free or at low charge. Please contact the Chairman preferably at the Society's address or telephone 01-589 3558 in the evenings (office: 01-937 8191, ext. 205) with suggestions for consideration by Council.

JOURNAL EDITOR'S REPORT FOR 1985

Editorship of the Journal changed hands during 1985 following Roger Avery's resignation after several years in the job. The transition was phased over the year, with Roger "putting to bed" Vol. 6 No. 12 (i.e. the June edition) while I took over incoming papers from the start of the year but had nothing to do with production before preparing the December issue. It is my pleasure to thank Roger, on behalf of the Society for running the Journal so smoothly up to its present standard, and on behalf of myself for all the help he gave showing me the ropes. We owe him a considerable debt.

PAPERS RECEIVED DURING 1985

A total of 30 manuscripts were submitted to the Journal during 1985, slightly fewer than in 1984. Since 1980 there have always been between 30 and 40 submissions per year, the peak being 1982 with 40. Acceptance rate since 1980 has averaged around 60%; in 1985 18 papers (60%!) were accepted, with a further 2 being sent back for revision and not yet resubmitted.

I take this opportunity of thanking those who gave their time and effort refereeing papers during 1985, notably: Prof. R. Andrew, Dr. A. Arak, Dr R. Avery, Mr B. Banks, Dr A. Cooke, Dr C. Cummins, Dr H. Fox, Dr R. Griffiths, Dr M. Lambert, Dr C. McCarthy, Dr R. Oldham, Dr C. Reading, Dr P. Smith, Dr I. Spellerberg, Dr I. Swingland and Dr D. Yalden.

THE NEW STYLE

Council agreed during 1985 to a change of title for our journal, eliminating the word "British". It was felt that this gave a parochial image and could be misunderstood by potential foreign contributors as implying a "Journal of British Herpetology", which of course it has never been. "The Herpetological Journal" was the simplest title we could think of not already in use by some other herpetological society, hence the new image of December 1985 (starting with Vol. 1 No. 1 to avoid confusion in later years). Aside from the title, other changes have been minor. I hope members are reasonably happy with the new look.

COSTS

I am attempting to reduce production costs, and changing printers has helped with this. The December issue was 33% larger than its predecessor and gave 25 free reprints to authors, but cost only £1500 compared with £2000 before. Another £100 has been recouped from authors purchasing extra reprints (production of which was included in the gross cost of £1500) so the net cost to the Society (even taking account of postage to

London) was rather less than £1500. It seems likely that this cost can be reduced further in future. Readers may have noticed a few minor mistakes however, no doubt due to changing editors and printers simultaneously. Hopefully errors will vanish in future!

The Journal can in fact now be considered as a profit maker for the Society, if we assume that institution and library subscribers are members for the sole or prime aim of receiving the journal. Income from this group in 1985 was £3725; and the journal now looks set to cost the Society £3000 per year or less.

Finally, discussions with a private publisher (Taylor & Francis) ended in 1985 when the financial implications for the Society became clear. It was hoped that this company might take over production costs and increase international sales of the Journal. In the end it turned out that the deal would require BHS to purchase 600 copies per year at a total cost of £4,200; and on top of that forego income from our current institution and library subscribers, who would then be serviced directly by the company. It doesn't take a mathematical genius to work out how bad a deal that would have been. So on with the show!

Trevor Beebee
March 1986

EDUCATION COMMITTEE REPORT - APRIL 1986

I am pleased to be able to report to the membership that during the past year membership of the Junior Section has increased so that 127 issues of the Spring Term Newsletter were dispatched. Once again a very varied postbag was received but of the 220 letters logged by myself the commonest query was from youngsters looking to herpetology as a career.

During the year members of the Committee mounted exhibits at three major public events and I am pleased to be able to announce that we have been invited back over the next year and so will be pleased to meet members at The Brent Countryside Fayre on 22nd June, The Capel Countryside Weekend on May 17/18th and the Enfield Show over the weekend of September 20/21st. Anybody interested in further details is invited to contact me direct. Once again members of the Committee gave a range of popular talks to both youth and adult organisations.

Several new activities were organised, the most exciting of which were our first J. Herps Field Trip to sites in the Lee Valley Regional Park, and assistance with a lizard rescue and relocation operation on a doomed site in Hertfordshire. Similar activities have been timetabled for the next twelve months and Committee members have also pledged their support and help for an intensive children's reptile and amphibian activity day being held at Capel Manor Environmental Centre on July 12th.

As will be seen from the copy of our audited accounts which follow this report our finances are healthy at present. Mainly by strict control of the size of our Newsletter print runs we have managed to keep the J. Herps subscription down to £3 a year but postage is one of our major expenses and we have yet to feel the full effects of having to dispatch four issues of the Bulletin a year which entails an extra send-out per member. We hope to be able to keep the subscription at its present level but will be keeping a careful watch on our financial situation.

One of the problems that I have encountered over the last year is the occasional build up of mail backlogs due to circumstances beyond my control and I am very sensitive to the fact that children in particular expect a rapid reply to any letters that they send in. In an attempt to improve the overall efficiency of our advisory service I have therefore introduced a Friday evening phone in "surgery" for an experimental period of time.

Although I cannot give a watertight guarantee that I will not be required to work on the occasional Friday evening I will endeavour to make sure that my home phone is manned every week. This system should have four advantages over the present S.A.E. system, these being as follows:

- 1) To provide a quicker and more efficient way of answering queries, some of which may indeed be of an urgent nature.
- 2) To cut down my overall letter writing load so that those who do write to me should receive a faster reply.
- 3) To cut down my postal and stationery expenses.
- 4) To provide a cheaper service for many local members.

This new system is intended to supplement rather than replace the existing S.A.E. service; one of our most valuable functions will always be that we offer our young members a source of help and advice.

Finally as Chairman of the Education Committee I must thank all of the members of the Committee for their labours over the last year. Thanks are particularly due to Janet Pracy on whose efficiency in dealing with our admin. mountain we all depend. The Committee will continue to strive towards providing an improved information resource for children and school groups and are always pleased to hear from any ordinary BHS members who are interested in helping us in this work. We would be particularly pleased to hear from any members with primary teaching experience who might be interested in filling the post of Primary Advisor on the Committee.

Vic Taylor

EDUCATION COMMITTEE

INCOME & EXPENDITURE YEAR ENDING 31.12.85

INCOME

Cash at Bank 31.12.84	325.18
Subscriptions received 1985 (including payments for Literature)	349.50
Less cash payments retained for Petty Cash	<u>24.00</u>
Cash to Bank	<u>325.50</u>
	650.68

EXPENDITURE

Printing of News Letters Nos. 14 & 15	82.40
Postage of News Letters & Bulletins	93.10
Postage & Stationery (V. Taylor)	13.41
Envelopes	50.90
Withdrawn for Petty Cash	8.00
General Expenses (V. Taylor)	<u>66.3</u>
	254.44

Cash at Bank 31.12.85	396.24
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Note: The above includes postage of, but not printing of News Letter No. 16 as invoice was not received until January 1986.

PETTY CASH

Balance as at 31.12.84	9.28	
Cash Subscriptions Retained	24.00	
Withdrawn from Bank	8.00	41.28

LESS

Administrative Expenses	30.43	
Expenses (V. Taylor)	6.00	36.43

Balance as at 31.12.85		4.85
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Total Cash in Hand as at 31.12.85.	401.09
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Signed: J.E. Pracy

Date: 2.1.86

1st NATIONAL CONGRESS OF HERPETOLOGY (SPAIN) NOVEMBER 1986

The Societat Catalana d'Ictiologia i Herpetologia — SCIH (Catalan Ichthyology and Herpetology Society) is organising a meeting with other Spanish ichthyologists and herpetologists and the opportunity has been taken by the Asociacion Herpetologia Española — AHE (Spanish Herpetologist Association) for a 1st National Congress of Herpetology to be organised in Spain. The meeting is the joint venture of the SCIH, Instituto de Acuicultura Torre de la Sal and AHE, and is the 2nd General Meeting of SCIH.

The meeting is entitled *Marine and Freshwater Ichthyology and general Herpetology* and will be held at Benicasim (on the Mediterranean Coast, ca. 70km NE of Valencia), 1-3 November 1986. Ichthyologists and herpetologists from other countries are also invited.

Registration by 31st July 1986. Enquiries and titles of contributed papers (with abstracts — up to 33 lines of 15cm length) to:— II Reunió General, Societat Catalana d'Ictiologia i Herpetologia, Apartat Correus 27405, 08080 Barcelona, Spain.

SOCIETAS EUROPAEA HERPETOLOGICA 4th ORDINARY GENERAL MEETING, 17-21 AUGUST 1987

The Faculty of Natural Sciences, Catholic University, Nijmegen, will be the host of the Societas Europaea Herpetologica.

PROGRAM

Apart from the 4th Ordinary General Meeting of the Societas Europaea Herpetologica the program will consist of oral contributions, poster presentations, social gatherings and a one-day field trip. Work-shops are planned, focusing on "the use of telemetry in herpetological studies" and "Vocalization in Anura". Special guest programs for family members will be arranged.

CONGRESS LANGUAGE

All contributions will be presented in English.

PUBLICATION

The proceedings of the congress will be published in the form of a report, including a list of participants. Posters and oral contributions will be treated equally in the proceedings.

ACCOMMODATION

The prices (for one day) are between Hfl 55.00 (DM 50.00) and Hfl 90.00 for a double room and about Hfl 25.00 more for a single one.

REGISTRATION FEE

Printing abstracts and proceedings, mailing expenses, etc. force the organisers to impose a fee of DFL 75.00 on the participants (Non members Dfl 150.00). Accompanying members Hfl 25.00.

DETAILED PROGRAM

A detailed program and CALL FOR PAPERS will be delivered during September 1986 only to those who write to the congress-organization, before 31 August, 1986. Write for details to:

Dr. Jan J. van Gelder, Catholic University Nijmegen,
Faculty of Sciences, Department of Zoology, Toernooiveld,
6525 ED Nijmegen, The Netherlands.

NEW SOCIETY: STATION D'OBSERVATION ET DE PROTECTION DES TORTUES DES MAURES (LA TUILLIÈRE DES ANGES/83340 LES MAYONS/FRANCE)

FOUNDER MEMBERS:

Jean Pierre Pouvreau : President
Bernard Devaux : Secretary and Treasurer
David Stubbs (U.K.) : Conservation Project Organiser

AIMS OF THE SOCIETY

Conservation and study of the reptiles of the Massif des Maures, Var, Southern France.

ACTIVITIES

CONSERVATION

Habitat restoration to provide greater nest site choice for Hermann's tortoise (*Testudo hermanni*). Protected incubation of eggs in natural conditions to reduce current excessive level of predation. Protected rearing of juvenile tortoises and subsequent release back into original wild populations.

PARKS AND RESERVES

Active promotion of areas in the Massif des Maures in need of official protection to safeguard vulnerable flora and fauna.

OBSERVATION AND STUDY

Survey and monitoring of important reptile sites and populations in region. Continuation of ecological research programme on *T. hermanni* and initiation of studies on conserving the pond terrapin (*Emys orbicularis*).

PUBLICITY AND PR

Posters, lectures, press articles, fair stalls, exhibitions, news sheets, leaflets.

PRODUCTIONS

Educational films/videos, especially for use in schools.

FUNDING

Membership subscriptions, sale of goods, private donations, grants from conservation organisations and other fund giving bodies. SOPTOM is a non-profit making society.

TARGET

FF 450,000 for full action programme over first 3 years.

SOPTOM was founded in 1985 by French and English conservationists concerned about the decline of *T. hermanni* and other reptile species in the Massif des Maures. The initiative has received strong support and interest from local people and the Municipal Council of Les Mayons. International support has come from the Conservation Committee of the Societas Europaea Herpetologica, the Flora and Fauna Preservation Society and the Tortoise Specialist Group of the IUCN. The conservation programme draws on the results of research carried out by the Ecology Research Group of the University of Kent and by Dr Marc Cheylan of the University of Montpellier. Ordinary Membership £5.00, Life Membership £50.00.

Further details from Bernard Evaux at the above address, or from the Flora and Fauna Preservation Society, 8-12 Camden High Street, London NW1 0JH.

RELEASE OF HEAD STARTED KEMP'S RIDLEY SEA TURTLES IN TEXAS WATERS

On April 22 and May 6, about 1,550 tagged Kemp's ridley sea turtles will be released by National Marine Fisheries Service South-east Fisheries Center Galveston Laboratory staff. About 560 turtles will be released in the western portion of Copano Bay near Corpus Christi, Texas, and the other 990 turtles will be released 6-8 nautical miles off North Padre and Mustang Islands, near Corpus Christi. These turtles represent the 1985 year-class, the eighth year-class of head started turtles at the laboratory since 1978.

Kemp's ridley sea turtle is the most endangered species of sea turtle. Head starting is being tested as one of several conservation strategies for Kemp's ridley recovery. Kemp's ridley eggs are collected each year on the only known nesting beach in the world, a 20km stretch of beach near the Mexican village of Rancho Nuevo, in the State of Tamaulipas, bordering the western portion of the Gulf of Mexico. The eggs are placed in polystyrene foam boxes containing sand from the National Park Service's Padre Island National Seashore where they are incubated and hatched. The hatchlings are exposed to sand and surf at Padre Island to "imprint" them, in hopes that they will return to reproduce and lay eggs on Padre Island, thus establishing a second nesting colony in the U.S. "Imprinted" hatchlings are reared at the Galveston Laboratory for one year or less, then the survivors are tagged and released in Texas waters near Corpus Christi, with the intent of reinforcing any imprinting they may have attained as hatchlings.

The head start project, now in its ninth year, has released 9,258 tagged Kemp's ridleys so far, and about 400 have been recovered, most from sites in the Gulf of Mexico, but others on the Atlantic coast of the U.S., and two as far away as France and Morocco. Though it is not known how long it takes for Kemp's ridleys to mature, estimates range

from 6-13 years. Because the oldest of the head started ridleys released into the wild are approaching 8 years of age, National Park Service biologists will be patrolling Padre Island this spring in search of nesters.

Co-operating in the project are Mexico's Instituto Nacional de la Pesca, the U.S. Fish and Wildlife Service, National Park Service, National Marine Fisheries Service, and Texas Parks and Wildlife Department. Other participants have included the Gladys Porter Zoo, U.S. Coast Guard, U.S. Navy, Florida Department of Natural Resources, Texas A&M University, the University of Texas, and Houston Zoological Gardens.

Public awareness and support for the project have been promoted by a non-profit organization, HEART (Help Endangered Animals — Ridley Turtles), a special committee of the Piney Woods Wildlife Society, North Harris County College, Houston, Texas. Private sector contributions to HEART in support of the project have been made by EXXON Corporation, the Kempner Fund, and Pel-Tex Oil Company.

For additional information contact:

Dr. Charles W. Caillouet, Jr., Chief, Life Studies Division,
National Marine Fisheries Service, South-east Fisheries Center,
Galveston Laboratory, 4700 Avenue, Galveston, Texas 77550
409/766-3525

Ed. Note: This news item has been published late; it refers to a release during April and May 1986.

MEMBERS' ADVERTISEMENTS

The attention of members is drawn to the various Acts of Parliament and EEC regulations governing the import, possession and sale of reptiles and amphibians. Advertisements are accepted on the understanding that animals are legally obtained and offered for sale.

- * **Wanted:** any dead specimens of British (or European) reptiles and amphibians (e.g. road kills) for preparation of skeleton to compare with Pleistocene fossils, as part of a study of British Pleistocene amphibians and reptiles. Specimens can be frozen, salted or put in weak alcohol, but do not put in formalin. Do not send, but keep and contact J. Alan Holman, The Museum, Michigan State University, East Lansing, Michigan 48824-1045, USA, or the Editors of this Bulletin. Mr Lansing will be visiting England next summer (August 11-September 14) and can make arrangements to collect specimens. Alternatively they can be given to the Bulletin Editors at BHS meetings.
- * **Wanted:** If you have surplus captive bred newts/salamanders or simply unwanted specimens please write to me. I am willing to pay good prices for certain species.
P.J. Wisniewsky, Amphibian Breeding Centre, 38 Hesketh Road, Burscough, Lancs L40 0TA.
The Amphibian Breeding Centre is a non-commercial enterprise.
- * **Wanted:** Yellow Anaconda, *Eunectes notaeus*, male approx. 5 ft or pair. Carpet Python, *M. spilotes variegata*, female 6 ft+. Green Pythons, *Chondropython viridis*, pair, any size.

For sale or exchange: Carpet Python, female 4½ ft.
Saul Halpern, 11A Wallace Road, Islington, London N1 2PG. Tel: 01-359 6744.
- * **For Sale:** 2 garter snakes, species unknown, captive raised, £15 for the two.
A.J. Unsworth, 36 Fauconberg Way, Yarm. Tel. Eaglescliff 783667.
- * **For Sale:** 2 Asian Black Scorpions, £8, 2 Asian Banded Millipedes, £6, 2 Giant Land Snails, £8, 2 Trinidad chevron Tarantulas (1") £6, 1 Guatemalan Tarantula, £2 (½"); or £25 the lot.
N. Jones, Tel: 01-556 2979.
- * **Wanted:** Green Anolis (*Anolis carolinensis*), male or female.
Tel: Lee Raymond, Broxton 427 weeknights 6-9 pm.
- * **For Sale:** Captive bred hatchling Indian Pythons, *Python m. bivittatus*. £45. Also adult male Boa Constrictor and 3 Guyanan Rainbow Boas, *Epicrates cenchria cenchria*.
Simon Townson, Tel: 01-556 3373.

RECOVERING THE GALAPAGOS

DRAKE McHUGH

International Union for Conservation of Nature and Natural Resources

Far out in the Pacific Ocean off the coast of Ecuador, a battle is being fought. It is a battle to ensure that native species (under pressure by man's introduced species) will survive. The battleground is the Galapagos Archipelago. At threat are indigenous species, thousands of years old. Their only defence — isolation — an isolation that is no longer total.

Pigs and dogs hunt the tortoise and iguana; rats, cats and dogs, brought by passing ships and settlers (and now running wild) decimate rare bird populations — donkeys and goats compete for grazing and in the process starve out native species. Trees introduced by settlers quickly take-over from indigenous species. The situation poses the greatest threat to species survival yet seen in the Galapagos Islands.

One hundred and fifty years after the Galapagos Islands inspired Darwin's views on natural selection and thousands of years after they became home to some of the rarest species in the world, man is once more interfering with the process of natural selection. This time he hopes to set right the mistakes of those who came before.

Sailing ships first brought rats and domestic animals. Later, settlers abandoned their homes and turned loose their domesticated animals. Now, park rangers hunt the animals as a matter of course, to ensure native species can survive.

In fact introduced species and feral animals have become such a threat in the Galapagos that those topics took up much of the discussion time of the Charles Darwin Foundation when it met recently at the World Conservation Centre in Switzerland.

The severity of the problem is best illustrated by an example. In the mid-1960's authorities counted fewer than half-a-dozen goats on Pinta, one of the chain of Galapagos Islands. There was immediate concern. Over the years animal control officers hunted the goats but were never quite able to wipe them out. This year, authorities of the Galapagos National Park Service (GNPS) finally think they have rid the island of the goats. Over the years they have killed 40,000 of the animals; all offspring of the first half-dozen goats. Vegetation on the island is recovering and Pinta Island may soon again be safe for species previously doomed to starve in competition with the voracious appetites of goats.

On Isabela (Albermarle) Island dogs and pigs attack tortoises and last year park authorities reported two tortoises killed by poachers. Land iguanas too remain at threat. Scientists say there is little point in returning them to islands as expensive cat food. Captive-bred iguanas are now being held until they are older in the hope they can defend themselves against these predators.

Scientists say that in 1984 the Galapagos race of Petrel, *Pterodroma phaeophygia* has been threatened by rats, despite poisoning campaigns, at the breeding colony on Floreana. With the rat population controlled 72 chicks hatched from 100 eggs but in 1985, a drought severely cut back the rat population. Rejoicing proved premature. Cats, apparently deprived of their normal diet of rats and mice, invaded the petrel colony. A conservation team killed 64 cats but only 23 chicks survived and some adults were killed in the nesting area.

The future of the Galapagos Penguin and the Flightless Cormorant has also caused anxiety, firstly because of an invasion of wild dogs and secondly because of a drastic reduction of both populations by starvation during the 1982-83 El Niño, when a rise in sea temperature severely affected the food supply of all seabirds.

A dog eradication program has brought the cormorants back to their pre-Niño numbers while the penguin's recovery is proceeding more slowly. These two birds, of all those in the Galapagos, remain a cause of special concern for three reasons, they cannot fly, their habitat is very restricted, and there are so few of them. The fact that they exist after El Niño has demonstrated their capacity to survive the most severe natural disaster, but scientists say they must be given constant protection against changes induced by man and particularly against the feral animals man has introduced.

Only a few fortunate islands remain completely free of alien animals. Black rats are probably the most widespread and most intractable invaders. On tiny islets such as Mosquera, Venezia or Pitt, eradication has been possible but there is no guarantee against renewed infestation.

Charles Darwin Foundation vice-president, Ole Hamann, says the recovery of Pinta Island after the eradication of 40,000 goats is "spectacular" with vegetation recovering and erosion halted but Santiago Island, with its 100,000 goats and 20,000 pigs, is a much more serious problem. "Even if there were money available," he says, "the logistics of eradication of such numbers of animals on a large, rugged and waterless island, are alarming." Nonetheless in 1985 a program did begin concentrated on killing the pigs which prey on marine tortoises. It is a beginning, but Dr Hamann says the campaign must continue for years.

Domesticated animals turned into the wild are also a threat to indigenous vegetation and botanists are concerned about an invasion of another type. Introduced plants from farms outside the National Park's boundaries — transported by wind and straying cattle — are competing with indigenous species. The struggle against introduced trees and plants continues year by year. Some can be killed by poison, others must be dug-up with shovels. Botanists are now experimenting with arboricides.

The Charles Darwin Research Station has co-operated with the Plants Conservation Programme of the International Union for Conservation of Nature and WWF, to prepare a botanical plan with particular emphasis on forestry problems. Organizers hope to raise funds for continued research on botany, plant ecology and forestry management.

There is one other area now garnering attention from both the Galapagos National Park Service (GNPS) and the Ecuadorian government. Traditionally sperm whales and fur seals have suffered from exploitation in the region but conservationists point out that many land species too are ultimately dependent on the ocean's resources for their survival. Moreover, owing to the fact that the archipelago is situated at the conjunction of the great Eastern Pacific currents, the ecology of its waters is unique, and biologists speculate that underwater resources may prove to be even more important scientifically than terrestrial areas.

President Leon Febres Cordero, of Ecuador has proposed the creation of "a marine reserve to be incorporated in the Galapagos National Park," but whether this year sees the introduction of such a reserve or not, scientists everywhere will continue to view the area as the greatest repository of original species in the world. However, the region's major contribution to the knowledge of man may not be as nature's classroom and storehouse of natural history but rather as a reminder that the earth is a fragile place easily threatened by man and the plants and animals that sustain him.

HERPETOLOGICAL RESEARCH AT BRITISH UNIVERSITIES: THE DEPARTMENT OF ZOOLOGY, UNIVERSITY OF CAMBRIDGE

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DR. A. ARAK: SEXUAL SELECTION IN ANURAN AMPHIBIANS

Dr. Arak's research has concentrated on sexual selection, i.e. competition for and choice of mates in anuran amphibians. Past research includes work on sexual selection in the three British anuran species (a talk was given on the Natterjack at a BHS meeting on 23rd February 1983). This work involved both field observations and playback experiments, which consist of playing pre-recorded or electronically generated calls to the animals and observing their reactions. In natterjack toads, it was found that males can estimate a rival's size by the pitch of his call, which is inversely proportional to his length. Although males do not displace other males already in amplexus with a female, they do displace smaller rivals from the area of their call site. Some smaller males remain in the area as non-calling satellites, hoping to pick up any females heading towards the calling male. In this species, the relationship between male and female size does not affect the fertilisation rate of the eggs, and females do not show any preference for any particular size class of male, instead heading for the nearest calling male.

Current research is progressing along two lines: Firstly, there is a study of natural population of common toads, the aim being to investigate the lifetime reproductive success of different individuals. Using data about the animals' age, it is hoped to arrive at a model which will identify the factors responsible for the variance of life-time reproductive success between individuals. Secondly, there is work going on concerning vocal strategies in tropical frog communities in Malaysia and Sri Lanka. In the latter country, the rhacophorid frog *Philautus leucorhinus* has been investigated. Its call repertoire is fairly extensive, different combinations being used in different circumstances. If two males find themselves too close together, there is escalation, with more aggressive calls being exchanged and the two males matching each other in the number of notes in each multi-note call (which is one of the types of call exchanged in these situations). The spatial organisation of the frogs was also investigated. It was found that the males space themselves out evenly over suitable habitat, and that such an even distribution is re-established after being disrupted, e.g. by the introduction of more males.

Dr. Arak has now left Cambridge to take up a teaching post at the University of Stockholm in Sweden.

DR. J.A. CLACK: EVOLUTION AND MORPHOLOGY OF PALAEOZOIC AMPHIBIANS AND REPTILES

Dr. Clack's work is concerned with the evolution and morphology of various groups of early tetrapods, and in particular the elucidation of their relationships.

Past work has included the redescription of the embolomere genus *Pholiderpeton* (formerly *Eogyrinus*). The embolomeres were a group of Upper Carboniferous and Lower Permian amphibians which may be close to the group which gave rise to the reptiles. One of the most important discoveries resulting from this work was that of the stapes of *Pholiderpeton*. Its shape was completely different from that of the rod-like stapes seen in modern amphibians and reptiles, and was such that it would have been unsuitable for the transmission of airborne sounds via a tympanum. It most closely resembles the stapes of the unrelated temnospondyl amphibian *Greererpeton*. This resemblance indicates that the ability to perceive airborne sounds via a tympanum and a rod-like stapes did not evolve very early on in the evolution of the tetrapods, but at a

later stage and convergently in several lines of fossil amphibians, such as more advanced temnospondyls and the seymouriamorphs (which are related to the embolomeres). It also supports the theory that the middle ear arrangements found in modern amphibians and reptiles evolved separately, and that their last common ancestor did not have a tympanum and a rod-like stapes. Several anatomical features of modern amphibians and reptiles, especially the relative positions of their stapes and a nerve chord, the *chorda tympani*, had suggested that the long-held belief that their middle ear arrangements had evolved only once was incorrect. The discovery of the embolomere stapes is a very important piece of evidence in favour of the theory of a separate evolution of the middle ear in these lines of descent.

Other past work includes an investigation of the genera *Anthracosaurus* and *Archeria*, which were related to *Pholiderpeton*. In particular, the braincase of *Archeria* was described in co-operation with Dr. R. Holmes.

Current work includes the investigation of some tetrapod specimens from East Greenland, especially the genus *Acanthostega*. These very important specimens, dating from the Upper Devonian and including some of the earliest tetrapods known, were discovered by chance in the Department of Earth Sciences in Cambridge where they had been lying around for several years because nobody there had realised that they were of any importance (!). In view of the importance of this material and its fine state of preservation, it is hoped to organise an expedition to East Greenland in order to collect more specimens.

Other future projects include work on the dissorophid amphibian *Amphibamus* in co-operation with Dr. A.R. Milner. This animal is thought to be closely related to the ancestors of the modern anurans, and possibly also the urodeles (the relationship between the urodeles and other amphibians is obscure and subject to debate). Secondly, there will be some work on the amphibians of a newly discovered Lower Carboniferous terrestrial fauna from Scotland.

DR. N.B. DAVIES AND DR. T.R. HALLIDAY:
MATE SELECTION IN THE COMMON TOAD (*BUFO BUFO*)

This work was carried out in the late seventies when both authors were at the Department of Zoology of the University of Oxford. The aim of the study was to investigate the strategies of mate selection in the common toad. During the short breeding season of this species, there are always more males present at the breeding ponds at any one time than females, giving rise to male-male competition for females. Males obtain females either by meeting single females on land while they are approaching their breeding pond or by displacing a male already in possession of a female in the breeding pond. It was shown that males can only displace other males smaller than themselves. The cue used by a male to assess the size of another male already in possession of a female is the pitch of the release call uttered whenever the defender is touched. The pitch of this call is inversely correlated with body size and thus fighting ability. This was demonstrated in experiments in which a single medium-sized male was pitted against either a smaller or a larger male in possession of a female, the male having been made incapable of croaking. Prerecorded calls were broadcast through a loudspeaker situated above the defender's head at appropriate times. The medium-sized males could be dissuaded from attacking smaller defenders which they could have displaced if low-pitch calls were broadcast at appropriate times, and similarly, they could be induced to start attacking a larger defender which they had no hope of displacing by broadcasting a high-pitched croak.

Another part of the study concentrated on the relationship between male and female body size in mated couples. It is in the interest of each individual to select a mate which

will maximise the number of viable offspring produced. In toads, this depends on two main factors: the number of eggs produced by the female, which is proportional to the size of the female, and the efficiency with which the male fertilises the eggs laid by the female, which depends on the relationship between male and female size, being highest for relatively very large males and small females. The male should thus maximise the product of the proportion of eggs produced by his female that he can fertilise and the number of eggs produced by the female (which is highest if the female is 10 - 20mm longer than he is), while the female should seek the most efficient fertiliser, i.e. the largest possible male. There is thus a conflict of interest between the sexes. Field data indicate that in the wild, the mean relationship lies somewhere between the optima for the two sexes, although it is rather closer to the male optimum. This may be partly due to the fact that the males are on average smaller than the females. Furthermore, a change of mates only occurs through male-male competition, the female only being able to influence what happens on her back by her ability to join or swim away from other males with the male already on her back.

Dr. N.B. Davies, now at Cambridge, has stopped working with amphibians to concentrate on his work with birds. Dr. T.R. Halliday is now at the Department of Biology at the Open University, Milton Keynes.

MS. S. GAY: EAST AFRICAN DICYNODONTS (Ph.D. THESIS RESEARCH)

Ms. Gay is at present investigating the taxonomy, functional morphology and ecology of a collection of dicynodonts from the Late Permian of the Ruhuhu Valley in Tanzania. The dicynodonts were a group of fossil synapsid herbivorous reptiles which lived in the Late Permian and most of the Triassic. The present study involves the preparation and description of the Ruhuhu specimens and the preparation of a faunal list, which will require a revision of all the taxa that have been described from that area by other workers, often on the basis of poor material.

Since some of the material is very well preserved and complete, it is hoped to study jaw function in as many of the specimens as possible. The results of this study will be compared with those of similar studies undertaken by other workers on other dicynodont taxa. From these comparisons, a picture should emerge of the ecology of the dicynodont community, since studies of jaw function together with other morphological data should give a very good idea of the different species' modes of life, food preferences etc. Finally, the Ruhuhu fauna will be compared with other known faunas from the Late Permian of East and South Africa to study geographical variation in climate, vegetation and other ecological aspects of the subcontinent in the Late Permian.

DR. A. LAURIE: ECOLOGY OF THE GALAPAGOS MARINE IGUANA

The original aim of this study was to investigate the behaviour and population dynamics of the marine iguana, with special reference to the effect of introduced predator species (dogs, cats, rats and pigs). However, the arrival of El Niño and the warming of the waters in that part of the Pacific disrupted this aspect of the study to some extent but also gave a unique opportunity to study the effects of a natural catastrophe on a wild reptile population. A talk on this latter subject was given at a BHS meeting on 8th October 1985.

In order to assess the effect of introduced predators, population sizes and structures, islands with and without these aliens were compared. A camp was set up on the predator-free island of Santa Fé, and the results obtained there used as baseline values with which data from other islands could be compared. It was found that on predator-infested islands, the populations were smaller and with far fewer young specimens than

on islands without predators. Hatchling survival on some of the former islands was almost nil, the populations thus being in serious danger of becoming extinct.

On Santa Fé, the basic ecology of the species was investigated, especially its reproductive biology. The males defend territories during the breeding season if they are able to defend them. Only territory holders get the opportunity to mate. The females only seem to nest every two or three years. Normally, two eggs are laid by each female. Under normal conditions, females reach sexual maturity at 6 years, males at 7 or 8.

El Niño in 1982/3 proved disastrous for the iguanas. Due to the high water temperatures, the highly digestible algae that form the usual diet of the iguanas were replaced by other, less digestible species. The result was mass mortality, up to 70% on some islands, the young being worst affected. Breeding ceased almost completely during El Niño.

After the end of El Niño in the autumn of 1983, conditions rapidly returned to normal, with the food algae growing again. Due to the reduced numbers of iguanas, competition for food among the survivors was very low, and their growth rates were and still are much higher than under normal conditions. The young grew at double the normal rate and the adults were on average 30% heavier than before El Niño. Females are reaching sexual maturity at a much earlier age, and some are even laying three eggs in one clutch. The iguana population is thus exhibiting a good ability to recover from this type of natural disaster, much better than expected.

Dr. Laurie has been working on this project since 1981 and is returning to the Galapagos Islands again in 1985 to gather more data.

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TRAVEL NOTES OF A HERPETOLOGIST'S JOURNEY TO CHINA

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During August and September of 1985 I travelled to mainland China and visited several sites of possible interest to fellow BHS members. My journey was sponsored by the USA National Academy of Sciences and the Chinese Association of Science and Technology. During this period I presented lectures in five different cities, participated in two meetings, conducted field studies, and consulted with Chinese colleagues.

Beginning August 25 I attended the Sino-Japanese Herpetological Symposium in Guangzhou (formerly called Canton), a short distance northwest of Hong Kong. In attendance were 15 Japanese, 7 Americans, 1 Swiss and about 55 mainland Chinese. This meeting was sponsored jointly by the Chinese Society of Herpetologists and the Herpetological Society of Japan. The host institution was the South China Normal University. All local arrangements were handled by the energetic university president, Pan Jionghua, a well-known ichthyologist who occasionally publishes in herpetology, and the program was skilfully planned by Zhao Ermi, China's leading herpetologist. The scientific sessions consisted of four days of papers covering all aspects of amphibian and reptile biology (systematics, faunistics, venoms, ecology, behavior, physiology, development, reproduction and conservation). Most papers were presented in English, and if they were in Chinese there was sequential translation into English. A total of 68 papers was presented. Those by Chinese participants were concurrently published in *Acta Herpetologica Sinica* (volume 4, pages 81-356, 1985), except for seven papers yet to be issued. The quality of the papers presented was very good and time was set aside for substantive discussions after each one.

During the evenings there were congenial banquets — fabulous gourmet delights, one with 18 different courses — as well as technical videotape and motion picture presentations and a cruise on the Pearl River. All non-Chinese participants ate and slept in the Foreign Guest House, a very comfortable on-campus hotel overlooking a beautiful lotus-covered pond that was complete with water snakes (*Enhydryis*). Two days of local tours followed, including one to the Dinghu Lake Mountain Forest Reserve and to Sevenstar Crags, in a karst region in Zhaoqing.

Following these activities on the mainland, a field trip was taken to Hainan Island, a survey tour to see the fauna and flora of this remote tropical isle that had been planned to take five days. We were the first foreign herpetologists to be permitted to visit the island in many decades. Hainan is at the southernmost part of China, located only 250km off the Vietnamese coast and having the highest mean annual temperatures of any region in China (25°C). The north end of the island is an open plain whereas the south is primarily covered in rugged mountains. The first extensive series of amphibians and reptiles to be collected in Hainan were those taken by the American Clifford H. Pope in 1922-23 and by Malcolm A. Smith, the first president of BHS, in 1922. Our group followed or crossed the Pope and Smith trails on several occasions.

We arrived by jet aircraft on September 1 in the capital city of Haikou, on the north end of the island. We travelled in two large buses but later had to transfer to smaller ones in order to fit the very narrow mountain roads in the interior. We first visited the South China Institute of Tropical Crops; it is located near Nadoa which had been Pope's island headquarters. The plantation was teeming with lizards (e.g. *Calotes*, *Hemidactylus*, *Takydromus*). Later that day we moved up into the highlands in the southwest part of the island, to the Ba Wangning Mountain Range. We stayed at a training camp for forestry personnel, located at about 1100m. It was a rather spartan place but even with the warm beer and cold showers we felt very comfortable given the

remoteness of this tropical site. At night we were successful in finding many frogs, lizards and snakes including *Bungarus*. The next day we went to higher elevations nearby, to a lush forest covered with epiphytes. There were large portions of the forest that had been reforested with pines which were being tapped for resin. It was in these southern mountain ranges that Malcolm Smith did most of his collecting.

Our large group was subdivided into smaller parties of more effective size and specialized by individual interest. Of course, the "snake group" got the best lizards, the "turtle group" the best frogs, etc. Among the most interesting taxa we found were *Eublepharis lichtenfelderi*, *Trimeresurus stejnegeri*, *Ptyas korros*, *Calotes*, and several kinds of anurans (*Amolops*, *Bufo*). After a strenuous day in the field we had a wonderful banquet at the forestry station which included whole frog and also turtle soup; the turtle was probably local *Trionyx steindachneri*, based on a foot in my bowl!

We next travelled to the southernmost tip of the island, to the "Border of the Earth" historic site west of San-ya and, after a short night's rest, drove up the east side of the island back to Haikou, thus encircling the entire island, in order to catch our return flight to Guangzhou. Unfortunately a typhoon intervened and all transportation to the mainland was cancelled. Thus stranded at a hotel in Haikou, we borrowed projectors from Hainan University and held an impromptu meeting and continued to do so for two days until our flight was eventually re-scheduled and we returned to Guangzhou on September 7.

Following the meeting and field trip I travelled alone throughout China and among other places I visited were two herpetological research centres. Fujian Teachers University is located in Fuzhou, a coastal city located midway between Shanghai and Hong Kong, and directly opposite Taiwan. I spent a week here, at a meeting hosted by Ding Han-po, the titular head of the Laboratory of Developmental Biology. Although officially emeritus, Prof. Ding remains active in supervising students and research projects. This group, consisting of ten staff plus five Masters students, also includes Zhang Zing, who, like Ding, specializes in herpetology. This group is very active in research and publication, often publishing in their university's own science journal. Among their projects there are many of herpetological interest such as mechanisms of fertilization in frogs, amphibian hybridization, karyotyping of frogs, and snake embryology. On the same campus there is a museum of natural history which includes a preserved collection of 3500 amphibians and reptiles curated by Cheng Ji. Most specimens are from the home province, Fujian.

The other herpetological research centre that I visited is in Chengdu, the capital of Sichuan Province. The Sichuan basin of central China is a rich agricultural region, surrounded on all sides by picturesque mountains. The Chengdu Institute of Biology is a division of Academia Sinica, the Chinese Academy of Sciences. I spent five days in Chengdu, hosted by Zhao Ermi and his staff at the institute. Prof. Zhao is deputy director of the institute and head of the herpetology unit. This unit consists of Jiang Yao-ming, the deputy head, and several principal staff members (Tian Wan-shu, Huang Qing-yun, and Hu Qi-xiong) plus 17 others of whom three are Masters students. The herpetology program at the institute was initiated by the late Liu Chengchao the herpetologist justly renowned for his book "Amphibians of Western China", published in 1950. Prof. Liu's widow, Hu Shuqin, is herself a well-known specialist on frogs but is now retired from the institute. Together, they published the standard work on the frogs and toads of China, issued in 1961, a book now being revised for publication by Prof. Zhao.

Herpetology is the only area of basic research at the institute in Chengdu and, though it is one of the smallest units, its research interests are very broad, encompassing systematics, distribution, and faunistics of the entire country. Most staff work on

specific taxonomic groups, especially frogs, salamandrids, and poisonous snakes, using classical as well as the most modern techniques such as karyology, electrophoresis, and venom electrophoretograms. In addition to well-equipped laboratories, the unit curates a collection of 80,000 amphibians and reptiles collected throughout China. The quality of herpetological research being conducted at the institute is outstanding and, given the size of the staff, the Chengdu group can justly be called the leading centre of its kind in China and one of the largest anywhere in the world. Adding to the leadership of the Chengdu group is the fact that the quarterly journal *Acta Herpetologica Sinica* is edited and published there. This is a journal of high standard which has provided a crucial medium forum for publication by herpetologists throughout China and, from the standpoint of the world scientific community, it is the single most important product of the Chinese herpetological community.

In addition to my time in Chengdu, I spent three days on a delightful field trip to Mt. Emei, about 150km southwest of the capital city. Travel is still slow and difficult in this part of China, so we did not reach Emei until late on the first day and we slept in cabins at the base of the mountain. The next day we travelled a rugged road to an elevation of about 1300m where, in still, clear pools, we collected the hynobiid salamander *Batrachuperus longdongensis*, taking a clue from the local children who catch them on fishing line baited with pieces of earthworm. Apparently this species is not hunted for food, but does have reputed medicinal value in relieving constipation! Professor Zhao and I were accompanied on this trip by one of the Chengdu staff, Wu Guan-fu, a most accomplished field collector who first began working for Professor Liu in 1953. Here we also collected the anurans *Amolops mantzorum*, *Bufo wrighti* and some other frogs. Elsewhere, at a site somewhat lower on the slopes of Mt. Emei, Mr. Wu showed us a pool in which he had collected *Andrias davidianus*, the famous giant salamander. Surprisingly, the site was not the shallow stream filled with flat rocks that I had expected but a very deep, clear pool with the most beautiful turquoise blue water rushing swiftly off the side of the mountain. Reportedly, giant salamanders are being bred and raised for commercial purposes in Hubei Province; in 1984 alone, 2200kg of salamanders were produced in one farm consisting of only eight fish ponds located alongside a natural stream.

The impression one gets, even from such a brief visit, is that herpetological activity in mainland China is very great, both in terms of quality and quantity. The Guangzhou symposium was the first international herpetological meeting ever held in China. Not only was it conducted in a highly professional manner, but the scope of the papers presented by the Chinese participants makes it clear that the study of amphibians and reptiles is progressing very rapidly in that country.

Ed. note: Prof. Adler is co-founder of the Society for the Study of Amphibians and Reptiles in USA and visited China on a special study fellowship. As Secretary-General of the first World Congress on Herpetology (WCH), he also met with leading herpetologists at the Sino-Japanese Herpetological Symposium at Guangzhou (Canton). The meeting followed-on from one with other WCH Committee members at the 1985 European Herpetological Meeting in Prague, Czechoslovakia, during the week before. Prof. Zhao Ermi, the leading herpetologist in China, was entertained by Prof. Adler the year before at the joint SSAR/Herpetologists' League/American Society of Ichthyologists and Herpetologists 1984 meeting in Norman, Oklahoma, USA, where he gave a special invited lecture on the Chinese herpetofauna. Prof. Adler has been a BHS member since 1956.

THE ISLAND, THE RATTLESNAKE, AND THE SPECIES SURVIVAL PLAN

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Though many varieties of animals occur in limited or restricted habitats, few are as vulnerable as those occupying a niche on an oceanic island. Most island faunas have suffered to a greater or lesser degree throughout recorded scientific history, some to the point of extinction, and mostly due to the activities of Man. Islands, particularly those located in warm tropical climates, have always been exciting ports of call for sailors, naturalists and other travellers, and in general, the degree of vulnerability and persecution of animal populations has been directly proportional to the popularity (for whatever reason) of the specific island.

Insular animal populations, because of their isolation from the mainland, are of great interest to zoologists. Because in most cases gene flow between these populations has long ceased, relationships over time can be assessed through studies of the degree of differentiation exhibited between populations. To the herpetologist, the number of examples are almost endless, ranging from the geckos of Madagascar and elsewhere within the Indian Ocean, to the Aldabra in the Indian Ocean and those of the Galapagos in the Pacific, off the coast of Ecuador. All of these animals have evolved over the centuries in these specific island habitats, and once habitats are destroyed, then so are their animal populations ... probably forever.

Certainly one case displaying a tremendous degree of insular differentiation occurring within a single group involves the rattlesnakes of the genus *Crotalus*. A great wealth of varieties can be located on a total of 27 islands on either side of the Baja California peninsula, 22 in the Gulf of California and five in the Pacific Ocean. Though the majority of cases of rattlesnake inhabitation involve mainland forms, six are endemics currently classified as distinct subspecies of *C. enyo*, *C. mitchelli*, *C. molossus*, *C. ruber* and *C. viridis*. Three other forms are unique enough to have been afforded specific status, and these are *C. catalinensis*, *C. exsul* and *C. tortugensis*. Two mainland varieties, *C. e. enyo* and *C. m. mitchelli*, are apparently the most ubiquitous, being found on seven and six islands, respectively. In addition to the above, there is one other island, somewhat removed from the others, that is inhabited by its own endemic rattlesnake.

The case in point, and the topic of this article, is the tiny island of Aruba, located in the southern Caribbean Sea. It is one of the Netherland Antilles, a group of several small islands located not far from the country of Venezuela in northern South America. It is said that during Pre-Columbian times, Aruba was heavily forested, but most of the trees were removed for making charcoal. Subsequently, sparse rainfall and erosion have prevented reforestation, thus leaving the island as it is today, mostly arid and somewhat rocky ... quite unlike the tropical paradise so often alluded to in travel advertisements.

But Aruba does have its beaches, and because of this, tourism and the local population have boomed in the last 15 to 20 years with the introduction of resort hotels and gambling casinos. With an estimated population of 65,000 people, combined with the island's size, a clash between Man and the indigenous fauna was inevitable.

Perhaps the most seriously threatened animal on the island is *Crotalus unicolor*, the Aruba Island rattlesnake, and a number of factors are responsible. First, the primary habitat of this species is a dry, rocky and generally inhospitable portion of the centre of

the island. With continued population growth, much of the original habitat has been altered for use by Man, thus reducing the area available for this species. Second, Aruba is overpopulated with feral goats that were either released or escaped many years ago. As is usually the case, the introduction or non-control of feral animals can, and often does, wreak havoc with indigenous animal populations, particularly in fragile environments such as that occupied by this rattlesnake. And finally, let's face it, *C. unicolor* is a snake, and a venomous one at that. Until very recently, the Dutch government of Aruba hesitated to admit that there was an endemic rattlesnake inhabiting their island for fear of driving off tourists and trade. Since a permit for export of animals from the Aruba government is required prior to allowing import into the United States by the US Fish and Wildlife Service (*C. unicolor* is listed as "Threatened" by the Service), this attitude made it virtually impossible to obtain specimens for captive-breeding programs.

Very little is actually known about *C. unicolor*, and as is the case with many varieties of truly rare animals, much more is known of this animal's biology from work with captive specimens than from observations in nature. It was first collected in the 1880's by Dutch naturalist van Lidth de Jeude and described to science as a variety of *Crotalus horridus* (the Timber rattlesnake) in a publication of the Leyden Museum appearing in 1887. A number of taxonomic changes occurred until 1936, when herpetologist and rattlesnake expert Howard K. Gloyd elevated *C. unicolor* to specific status, again owing to its differentiation from mainland counterparts. Since the original description and until concerted efforts were made in more recent years to locate specimens, only a handful have been available for study. One such was a gravid female acquired by the Staten Island Zoo which died prior to giving birth, but the description of this snake and her brood of twelve dead and slightly premature young by Kauffeld and Gloyd in 1939 presented the first basic information on reproduction in this form. Gloyd published his monograph on rattlesnakes in 1940, and at that time, a total of 17 specimens (including the above female and young) were available.

Though a few of these rattlesnakes have been exhibited in United States zoos over the years, it wasn't until the late 1960's and early 1970's that some effort was made to bring together enough animals to establish a viable breeding group. Among others, a pair was obtained by the Houston Zoological Gardens in 1969 from an animal dealer on Aruba, and two more specimens were acquired in 1976, source unknown. These animals and their offspring produced nine broods of young over the years at the Houston Zoo, the first in 1973.

This information was presented in an article in 1982 by Gary Carl and others in *Herpetological Review*. Considering that broods from a few wild-caught females have numbered anywhere from nine to 15, the captive results were somewhat surprising. In their study, broods consisted of two to five live young (average of 3.6), and when counting stillborn and infertile egg masses, the range was three to eight with an average of about 4.5. Additionally, there seemed to be a decrease in reproductive potential with increasing age (a factor not apparent in some other reptile forms), and the number of stillborn young could well be an indication of inbreeding.

In the early 1980's, the concept of the Species Survival Plan (SSP) was conceived by the American Association of Zoological Parks and Aquariums. As the plan was developed and implemented, first with a few species of mammals, then birds, and then reptiles, it was specifically defined as "an attempt to develop scientific and cooperative programs to propagate and preserve endangered species in captivity through populational management". The criteria for a species to be considered under an SSP management plan included 1) a degree of endangerment in the wild, as defined by the IUCN, USDI, CITES or similar organization, 2) sufficient captive "founder" stock (wild-caught

specimens or their offspring) to ensure bloodline representation, and 3) an organized group of professionals with knowledge of husbandry and breeding techniques and sufficient support, both facilitative and financial.

More often than not, the second of these criteria has presented the most problems.

A species must be represented at a certain minimal level in captivity, and if not, there must be some evidence that additional wild-caught animals will be available for introduction into the program. Along with this, the captive history of each specimen must be examined to ensure that mistakes in individual identity will not be made as pairs are selected and placed together for breeding. Ironical as it seems, because of this, a number of the species represented in the fewest numbers in North American collections cannot be considered as candidates for the program.

At this time, there are 38 SSP programs, and these include four birds, 28 mammals, five reptiles, and one amphibian. The Puerto Rican toad (*Bufo lemur*) is the single amphibian representative, but a number of other species are under consideration. The reptiles are the Chinese alligator (*Alligator sinensis*), the Orinoco crocodile (*Crocodylus intermedius*), the Radiated tortoise (*Geochelone radiata*), the Malagasy ground boa (*Acrantophis dumerili*), and *C. unicolor*, the Aruba Island rattlesnake.

A few years ago, the Houston Zoo petitioned the American Association of Zoological Parks and Aquariums in an attempt to have *C. unicolor* included as an SSP target species. The petition was accepted, and work begun to formulate a program that would best insure the continued survival of the species in captivity through selective breeding and other techniques. As with all SSP programs, participants had to be selected. Andrew Odum and Karl Peterson of the Houston Zoo were chosen as Species Coordinator and Studbook Keeper, respectively. The Knoxville Zoo, along with zoos in Los Angeles and San Diego, were chosen as the three Primary Institutions to work with the most genetically valuable specimens, and the author was selected to serve on the SSP Propagation Group, a committee which, in short, makes the decisions affecting the future of captive *C. unicolor*.

The primary objectives of the program, as stated in the coordinators report, and not unlike those of other SSP programs, are "to establish a demographically stable population and to retain the maximum possible genetic diversity within the population". Though these may seem to be relatively simple goals, the captive population makeup of *C. unicolor* is such that some inbreeding will have to occur unless additional wild stock can be obtained. As it turns out, there are only three living founder specimens (wild-bred animals) included in the 68 living United States animals, and these were imported prior to 1975. Additionally, there are only eight founder animals represented genetically in this entire captive population. Of these, a single Houston female contributes approximately 50 per cent of the founder representation. The three living founders have no representation, so every effort is being made to breed these because of the potential effects of advancing age, as mentioned above. Though rattlesnakes may live in excess of 20 years, these animals were adults when imported, thus their exact age is impossible to determine.

Of the entire captive population, 38 specimens are inbred from 25 to 37.5 percent. In order to utilize these inbred animals, a plan is being devised to create a number of sub-populations. Through this technique, inbreeding will occur only within each sub-population, and eventual inter-breeding between these populations will produce specimens with a zero inbreeding coefficient. Specimens produced through this plan may ensure the continued survival of *C. unicolor* in captivity, and may be suitable for future release back on to Aruba assuming conditions on the island are favourable.

In late 1984, a number of specimen transfers took place through the program. The Knoxville Zoo received a founder related female (Houston Zoo born) from the Brownsville Zoo, and it bred with a captive-born San Diego male in February of 1985. On 20 July 1985, a first for the Knoxville Zoo occurred when the female gave birth to one male and one female offspring, some of the most genetically valuable youngsters available, again due to a zero degree of inbreeding. Other broods were produced in 1985 by zoos in Los Angeles and Ft. Worth, so breeding appears to be on the upswing.

Most zoo breeding of *C. unicolor* seems to be on what I term the "Los Angeles" or the "Houston" cycle. The former indicates that breeding takes place in the spring, the latter with breeding occurring in the fall. Though the reasons for this are not clear, specimens at these respective institutions seem to follow these patterns. The above brood was produced on the Los Angeles cycle, but in mid-October of 1985, three months after parturition, the pair was again seen to be engaged in courtship activity. Though actual copulation was not observed, a second brood of five males and three females was born on 28 April 1986, just nine months after the birth of the first. This short birthing interval, combined with the above average captive brood size, has provided not only additional life history information on the species, but a "shot in the arm" for the *C. unicolor* program as well.

Recently, the Propagation Group has been in touch with Julio Maduro, a prominent naturalist on Aruba, and the news is not as dismal as expected. Maduro reported that *C. unicolor* has been afforded specific protected status by the government, which may indicate a much more enlightened attitude than in years past. The remaining habitat has been turned into a small national park, and vehicular traffic has been banned from the area. A program has also been initiated for the removal of feral goats. This, combined with an increased tolerance by locals seems to brighten the future for *C. unicolor* in its native environment.

The Propagation Group has also been in touch with government officials regarding a cooperative effort to ensure the animal's survival, and they seem very favourable toward the efforts of the SSP program. On behalf of the *C. unicolor* project, Species Coordinator Andrew Odum recently received a Nixon Griffis Fund for Zoological Research grant, sponsored by the New York Zoological Society, which will support the initial SSP groundwork on Aruba, including meeting with local officials and finalizing future collaborative efforts. Plans are also being formulated for some Propagation Group members to visit the island for a preliminary study of the habitat and possibly for the procurement of some additional specimens for inclusion in the captive-breeding program. If so, a much more genetically diverse captive population could be the result.

Regardless of potential disasters to natural habitats, islands and otherwise, the future of an ever increasing number of animals may well rest in our zoological parks. Though the situation on Aruba Island is apparently not as grim as predicted, it was only through a last-ditch effort by the Aruba government, local naturalists and the Species Survival Plan that may have turned things around for *C. unicolor*. But how about the others, the geckos, the Komodo monitor, and the giant tortoises ... these may not be so lucky. Zoo work can be exciting and rewarding, and there seems to me no greater reward than in knowing that we are at least partially responsible for the continued survival of an animal species. These are not simply goals for the future, they are commitments that all of us in this field must accept and work hard to achieve ... if not, some species of animals will have no future.

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HERPETOFAUNA OF THE SEYCHELLES

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This article formed the basis of a talk given at a meeting of the BHS on February 26th 1986.

The Republic of Seychelles (a member of the Commonwealth since 1976) covers over a hundred widely scattered islands in the western Indian Ocean. The islands lie between the latitudes of 4°S and 10°S, and hence have an oceanic tropical climate characterised by uniformly high temperatures and humidity with little variation in day length. They have a surprisingly diverse reptile and amphibian fauna with a total of at least 40 species described from the islands. There has been an upsurge of interest in the Seychelles herpetofauna over the last ten years, with results from several studies being published recently. A selected bibliography is given at the end of this article.

The islands of the Seychelles can be divided into three geomorphological types: the mountainous granite islands with their associated islets in the north-east where the vast majority of the human population live; the very low lying sand cays of the Amirantes and Farquhar groups, together with some other scattered cays such as Bird, Denis, Coëtivy and Platte; and the raised coral islands and atolls of Aldabra, Assumption, Cosmoledo, Astove and St. Pierre in the west.

Perhaps the most surprising feature of the herpetofauna is the presence of twelve species of Amphibia, a class generally absent from oceanic islands. In the Seychelles, amphibians are found only in the granitic island group. Eleven of these twelve species are endemic, and include an endemic family of frogs, the Sooglossidae consisting of three species from two genera known from the upland forest of Mahé and Silhouette.

The Sooglossid frogs are very small, indeed *Sooglossus gardineri* may be the world's smallest frog. The mode of reproduction of *Sooglossus sechellensis* is a remarkable example of convergent evolution (Nussbaum, 1984). The eggs are deposited by the female in a hidden terrestrial nest and are then attended by the male. When they hatch the non-feeding tadpoles climb onto the male's back where they remain until metamorphosis. This method of larval transport is also found in the poison dart frogs (*Dendrobatidae*) in Central and South America.

Seven species of caecilian, limbless amphibians of the order Gymnophiona, occur in the Seychelles from three endemic genera, and there is an endemic monotypic genus of tree frog, *Megalixalus sechellensis*. The affinities of the Sooglossid frogs and the caecilians are obscure and this, along with the very high degree of endemism, suggest an ancient origin for these groups. Probably these species or their ancestors were present when the granitic Seychelles became isolated from continental land masses some 75 millions years ago. The final amphibian species, the Mascarene frog *Rana mascareniensis*, is not well differentiated from African and Mascarene populations of this species and may well have been recently introduced by man. This is the most widespread frog species in the islands today.

Eighteen species of lizard are found in the islands comprising eleven geckos, six skinks and one species of chameleon. The lizards of the corraline and granitic islands show no overlap in species composition, other than through species probably recently transferred by man. The corraline islands generally have fewer species, and these are not endemic at the species level illustrating the recency of these islands. It is likely that all the sand cays were submerged by a higher sea level stand in the recent past, with the destruction of all their terrestrial fauna and flora. The raised atolls would have been

reduced to narrow land rims, but not totally covered, and this is reflected in the endemic subspecies of Abbott's day gecko *Phelsuma abbotti* on Aldabra and Assumption. All the native species in the granitic islands are endemic.

Lizards are a conspicuous and abundant part of the fauna in the Seychelles. First to be noticed by the visitor arriving on Mahé will probably be the brilliant green and red day geckos, *Phelsuma sundbergi* and *Phelsuma astriata*. These are very common in gardens and coconut trees and frequently enter houses. These species vary considerably in size and colour pattern between islands, and the races can be identified using my recently published key (Gardner, 1985). These day geckos have an unusual ability in digesting pollen and can be seen busily licking the flowers in any coconut inflorescence for pollen and nectar.

The other conspicuous lizards of the main granitic islands are the skink, *Mabuya sechellensis*, and the introduced house gecko, *Gehyra mutilata*. One needs to search rather harder to see the other species. The large Wright's skink, *Mabuya wrightii*, is very common on the seabird islands such as Aride and Cousin, as is the large nocturnal gecko, *Ailuronyx sechellensis*. The latter species is also usually to be seen in the Vallée de Mai National Park on Praslin.

Two species of litter dwelling skink, *Scelotes gardineri* and *Scelotes braueri*, occur. The former species is common under leaves on La Digue, Curieuse and Aride. A tiny gecko species, *Urocotyledon inexpectata*, which has twin pads under each toe and an additional adhesive pad under the tip of the tail, may be found under flakes of granite, or bark of dead trees during the day. The species of chameleon, *Chamaeleo tigris*, is found on Mahé, Silhouette and Praslin. Although seldom seen the chameleon occurs in almost all vegetation types from sea level to the hill tops.

Two further species of day gecko occur in the coralline islands. The brilliantly coloured gold-dust day gecko, *Phelsuma laticauda* is found in the Farquhar group, as well as on Madagascar and the Comores. This species is bright green with red dorsal markings. The upper back is dusted with golden scales and the eye rings and toes are bright blue. The duller blue-grey Abbott's day gecko *Phelsuma abbotti* is found on Aldabra and Assumption as well as in NW Madagascar. The Assumption species is about double the size of that on nearby Aldabra and is much brighter with a golden undersurface. The small, pantropical skink *Cryptoblepharus boutonii* is found on many of the outer islands, and the Madagascan species *Zonosaurus madagascariensis* occurs on Cosmoledo. Three species of small, brown *Hemidactylus* geckos occur on the coralline islands and one, apparently all female, population of the parthenogenetic species *Lepidodactylus lugubris* occurs on Coëtivy.

Three species of snakes, all of them harmless, are found in the granitic islands. These are the Seychelles wolf snake *Lycognathophis sechellensis*, the Seychelles house snake *Boaedon geometricus* and an introduced worm snake *Ramphotyphlops braminus*. In the marshes of the wetter islands are found three species of fresh water turtle (*Pelusios* spp), all endemic at either species or sub-species level. In former times, there were abundant giant land tortoises and crocodiles (*Crocodilus niloticus*), but these were exterminated by man. The taxonomy of the extinct Seychelles land tortoises is not clear. There may have been several species, but too few specimens were preserved before their disappearance. The tortoises now living on Curieuse, Cousin, Frigate and in the botanic gardens of Mahé are all of the Aldabran species, *Dipsochelys elephantina*. On their native island, these tortoises are very numerous and Aldabra is a most unusual ecosystem in having a reptile as the top herbivore!

The remaining reptiles are two species of sea turtle, the green turtle *Chelonia mydas* and the hawksbill turtle *Eretmochelys imbricata*. The green turtle was heavily exploited for meat and callipee, and probably no longer nests in the granitic islands. Some are still

taken from the outer islands, particularly Cosmoledo, and their meat is highly regarded by the Seychellois. The hawksbill is exploited for 'tortoiseshell' bangles and for selling as stuffed, polished specimens. A long term study on hawksbill nesting is in progress on Cousin where they receive effective protection.

The Seychelles herpetofauna has survived the arrival of man remarkably well, especially when compared with the extinctions on Mauritius and Rodrigues. The only species known to have been lost are the crocodile and the giant tortoises. However the combined effects of the loss of habitat and the depredations of introduced predators such as black rats, feral cats and tenrecs has led to some species becoming rare.

In particular two species of caecilian have not been recorded since 1910 (*Grandinsonia brevis* and *Praslinia cooperi*) and may be extinct. The Sooglossid frogs are largely dependent on the mountain moss forest, which has suffered some destruction and fragmentation and has been invaded by several exotic species. The effects of this invasion on the frogs are hard to predict. Other caecilians and the freshwater turtles have lost considerable areas of their former range through the draining of marsh land. *Ailuronyx sechellensis* and the *Scelotes* species are now rare on Mahé and Praslin, probably through predation by introduced mammals. However the sheer abundance, tameness and beauty of the reptiles and amphibians in their exquisite tropical setting cannot fail to delight the visiting herpetologist.

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MATING BALLS IN THE COMMON TOAD, *BUFO BUFO*

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Abstract of a talk given to the BHS at an evening meeting on 24th April, 1986.

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In the common toad, *Bufo bufo*, the breeding season may be as short as two or three weeks in duration, and on any one night, males may outnumber females by as many as five to one (Davies & Halliday, 1979). Males obtain females by searching and by wrestling for partners already engaged in amplexus. Depending on the density of the population, larger males may enjoy disproportionate mating success and/or there may be a positive correlation between the body sizes of males and females in amplexus (Davies & Halliday, 1977, 1978; Arak, 1983).

We observed mating behaviour in a population of common toads breeding in a culvert connected to Willen Lake, Milton Keynes on 9 and 10 April 1985. Mating activity was very conspicuous at this site, mainly because as many as 14 males were found struggling for the possession of a single amplexant female. As shown in Table 1, we observed eight such 'mating balls' during our two-day observation period. Removing the males from mating balls revealed that three of the eight females (37.5%) were dead, perhaps drowned.

On 10 April, we attempted to count the total number of toads present in the culvert. Only three females were found, all at the centre of mating balls. Thirty males were counted in mating balls, and at least 30 single males were found. We thus estimate the operational sex ratio on this day as at least 20 males per female. We believe that no more than 10 strings of spawn were deposited in the culvert in 1985.

Several interesting points emerge from our observations. First, large mating balls can form around living females. Secondly, females may drown as a consequence of being at the centre of mating balls. Tim Halliday (pers. comm.) has also observed mating balls in common toads, and has stressed that it is often impossible to determine whether balls kill females or balls form around females which are already dead. We suggest that the former may be the case. Finally, it seems that mating balls occur in populations with highly male-biased sex ratios. We are tempted to suggest that the mortality inflicted on females may drive such populations to extinction.

Table 1. Details of the composition of mating balls.

Date:	Number of males/ball	Female:
9 April	10	Dead
	8	Alive
	8	Alive
	6	Alive
	5	Alive
10 April	14	Alive
	10	Dead
	6	Dead

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THE CARE AND BREEDING OF COMMON BRITISH REPTILES AND AMPHIBIANS - PART V, THE VIVIPAROUS LIZARD (*LACERTA VIVIPARA*)

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INTRODUCTION

This attractive little lizard is the most widespread and abundant British reptile and can still be casually encountered in most areas of Britain. However, as with all our native herpetofauna its status has declined drastically since the end of World War II and the decline is accelerating due mainly to urbanisation and environmental degradation brought about by more efficient farming methods.

DESCRIPTION, DISTRIBUTION AND HABITAT

The viviparous lizard attains an overall length of 15-16cm. There is little difference in size between the two sexes. The body is moderately slender, the head rather short and flat. The neck and tail are thick but relatively short; the legs also are comparatively short.

Colour and pattern is very variable, being greyish, greenish or reddish-brown on top, with the back slightly lighter in colour than the sides. There is usually a stripe along the back which is often incomplete. There are often a number of light streaks and sometimes scattered light or dark spots or ocelli (eye spots) usually better developed in males. The sides have a dark band and are frequently speckled with yellowish or black spots. The underside is yellow or greyish in females; in males it varies from golden-yellow to orange or even red, spotted with black. Young specimens are very dark, almost black with a bronze hue.

The viviparous lizard is very widespread, occurring in most parts of Europe including Arctic Scandinavia, Northern Spain, North Italy, South Yugoslavia and Bulgaria. It also occurs through much of North Asia through to the Pacific Coast but is absent from the Mediterranean Area. In Britain it is the only reptile to be found in Ireland.

It is essentially a ground-dwelling species although it will occasionally climb in vegetation. A humid environment is favoured. Typical haunts are among tussocks of grass or dense herbaceous plants. It can be found at altitudes of up to 3,000 metres; in the south of its range it is mostly montane and confined to moist places, alpine meadows, banks of ditches, marshes and the edges of damp woods. Elsewhere it occurs in woodland glades, field margins, heaths, bogs, grasslands, sand-dunes, sea cliffs and man-made habitats such as hedge banks, disused quarries and the embankments of railways or motorways.

CARE IN CAPTIVITY

ACCOMMODATION

An aquarium tank or garden cold-frame can be used to house viviparous lizards outdoors but the former has many disadvantages as permanent accommodation for lizards. If left uncovered outdoors it will rapidly flood during prolonged rainfall and the inmates will also be at the mercy of predators such as cats or birds. If covered and left in the sun the interior may become intolerably hot with disastrous consequences. Problems will also arise during the winter when the lizards wish to hibernate. Unless the tank is insulated, has a good depth of soil on the base and can be kept in an unheated but frostproof building for the duration of winter it is most unlikely that they will survive.

By contrast a cold-frame makes an excellent home for small lacertids although the initial expense is rather high. An aluminium framed type can be assembled easily and has the advantage of putty-free dry joints. The smooth sides of glass and aluminium minimises the chance of escape.

The frame is best stood upon concrete blocks or breeze blocks which were first cemented onto a permanent foundation. The blocks are then rendered over with cement to seal any gaps around the base of the frame and to improve the finished appearance. After the cement has dried out completely soil is filled to the level of the frame's base. A light sandy soil or peat/sand/loam mixture is ideal for drainage and to facilitate burrowing down for hibernation in the winter.

In my own cold-frame, measuring 120cm x 75cm x 60cm, I have arranged large pieces of bark as basking sites which are surrounded by clumps of heath grass, heather and dwarf hebe plants to provide a suitable micro-habitat. I have included a small shallow pond 30cm x 25cm x 15cm using an off-cut from a butyl pond liner. The sides are gently sloping and the grass has been allowed to trail into the water to lessen the risk of drowning should the lizards enter the water. The pond provides humidity and drinking water although small lizards prefer to lap the dew from grass blades.

The great advantage of a cold-frame is that the glass protects the lizards from chilling winds (which they detest) while allowing the entry of light. During summer the top of the frame can be opened or removed altogether and replaced with a sheet of wire mesh to keep out predators. This will allow the entry of sunlight thereby reducing or obviating the need for vitamin D3 supplement.

FEEDING

Mealworms, woodlice, crickets, earthworms and spiders will all be accepted readily. I also periodically tip in the results of hedge-beating or grass-sweeping to provide more variety. A further source of food is the slugs and non-hairy caterpillars which infest lettuce and cabbage plants.

Viviparous lizards quickly become confiding in captivity once they have familiarised themselves with the topography of their new surroundings. Mine soon came to associate my presence with an imminent meal, racing towards my outstretched hand to look for the mealworms I hand-fed them and to test my fingers for edibility!

They will allow themselves to be gently handled but this should not be attempted until they have become tame enough to clamber onto the arm without taking fright. If handled roughly or grabbed at suddenly they may well resort to shedding their tail. This is a defence mechanism designed to baffle predators by creating a diversion. The severed tail writhes and twists conspicuously while the former owner escapes unnoticed. A new tail eventually grows but never to the same length as the original one.

Vitamin D3 powder can be given as a supplement, very sparingly dusted onto their food, but if the top of the frame is removed this is not really necessary. The same applies to calcium which can be given in the form of crushed eggshell or powdered cuttlefish bone.

BREEDING

This should take place automatically in the type of accommodation described above; mating occurs during April or May with the females becoming progressively stouter until one day in July or August 4-10 fully formed young are produced. The babies at birth measure between 37 and 47mm overall, being almost black in colouration. From

the outset they are able to fend for themselves but because of their tiny size I always remove the gravid females to a smaller vivarium furnished in similar manner to the cold-frame where they can give birth unmolested by the males and small amphibians which share the cold-frame.

When the young have been born I return the mothers to the cold-frame in order to feed the young intensively so that rapid growth is attained before hibernation. At first they will accept aphids, fruit-flies and other similar sized invertebrates. Later they can be given small mealworms, baby crickets and small caterpillars. I usually end up with more young lizards than I can cope with and the surplus ones are released along a railway cutting nearby which already supports colonies of viviparous lizards. I have experienced no success in releasing young or adult viviparous lizards in our garden or small open copse, both of which appear suitable. I suspect they were preyed upon by marauding cats or magpies.

HIBERNATION

Towards the end of October viviparous lizards will gradually lose interest in food even though outside temperatures may still be quite high. Some time during November they will disappear, burrowing under the grass tussocks or under the pieces of bark to re-emerge in early or late March depending on the mildness or severity of the weather. Within a week or so of emergence the skin is sloughed and interest is shown in food again.

CONCLUSION

The viviparous lizard is a very hardy, lively and intelligent little creature which thrives in captivity, breeding regularly when given favourable conditions. It is undemanding in its requirements and will live in amity with other similar sized lizards or small amphibians, such as *Bombina variegata*, *B. orientalis* or *Alytes obstetricans*.

The next article will deal with our only other relatively common British lizard, the slow-worm or blind-worm (*Anguis fragilis*).

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REPRODUCTION OF THE ROSY BOA, *LICHANURA TRIVIRGATA*

S. NORRIE

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INTRODUCTION

During early 1984 several young Rosy Boas were obtained from California. These were the Mexican Rosy Boa (*L.t. trivirgata*) and two intermediate forms known as 'Intermedia' and 'Myriolepis'. There is however no geographical basis to regard the intermediates as a separate sub-species. (See section on Distribution). The following account of reproduction relates to the form known as 'Intermedia'.

DESCRIPTION

Intermedia are an extremely attractive form of the variable Rosy Boa. The markings consist of 3 even edged broad stripes of pale brown on a buff background. The dorsal stripe being slightly lighter than the stripe on the flanks. The belly markings are off-white with dark brown flecks and spots.

RAISING THE YOUNG

The young snakes were approx. 280mm; long and marked as the adult colouration described above. Pelvic spurs were clearly visible on the male but probing proved to be inconclusive.

To encourage consistent growth the young were housed in plastic boxes in an incubation unit on 15 hours light per day throughout the first summer and winter. Temperature ranging from 24°C to 30°C (75°-85°F). Pink mice were given every 3-4 days.

By the spring of 1985 the female was approx. 440mm, the male slightly larger. The adults were placed in permanent cages with no heating apart from the light source. Minimum temperatures were approx. 13°-16°C (55°-60°F).

REPRODUCTIVE BEHAVIOUR

Feeding became erratic in both the male and the female during early June and finally ceased on the 14th June.

The adults had been segregated into respective sex groups until 7th July when the female was introduced to the male. The male followed the female constantly using his spurs to stimulate the female by erecting them and prodding her flanks. Within 20 minutes they were copulating. The pair were left together and during the next 10 days continued to show mating activity. They were seen to mate again on the evening of the 10th July.

When mating activity ceased in mid July the male resumed feeding heavily, the female however did not feed again until after giving birth.

During the gestation period the female constantly moved to areas of optimum temperature, near the underfloor heater during the night and near the light during the day.

Average temperatures were 23°-28°C (74°-82°F) although directly under the lamp the temperature would be somewhat higher.

On the 6th October, 91 days from the first mating, the female sloughed. At the end of October she was often observed to be lying out straight as opposed to a more normal coiled or looped posture. By the 6th November (122 days) she was very restless.



Plate 1. *Lichanura trivirgata trivirgata*

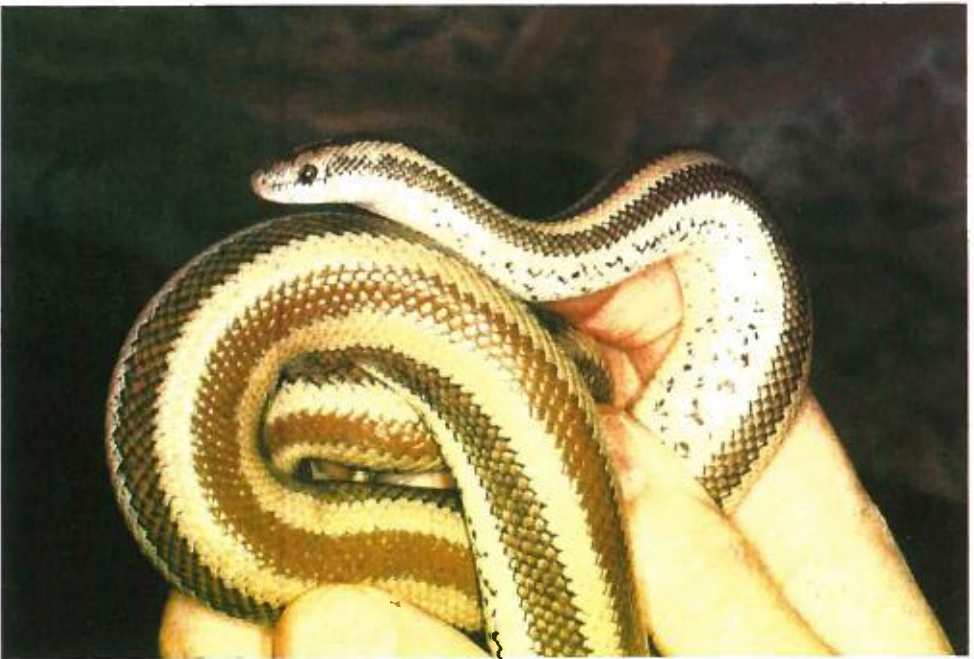


Plate 2. *Lichanura trivirgata* 'intermedia'

BIRTH

During the night of the 124th day of gestation, (based on first mating), 3 young were produced each approx. 270mm in length. Although the female had not fed for 156 days there were no signs of massive weight loss. The overall body shape was still firm and round.

The young sloughed 14 days from birth and began feeding on the 25th day, taking pink mice. It is recorded that they do, however, sometimes feed before sloughing (Van De Pols, 1985), (Granger, 1982). From spur size identification there are 2 females and 1 male.

ROSY BOAS IN GENERAL

There are three widely recognised sub-species of Rosy Boas all originating from California, Baja, California, Arizona and Sonora (Stebbins, 1966), (Townson, 1979).

The 'Mexican' Rosy Boa (*L.t. trivirgata*) is a very attractive sub-species having three dark chocolate stripes on a light cream background.

The Coastal Rosy Boa (*L.t. roseofusca*) has three stripes of pink, reddish brown or dull brown with irregular edges. The background colour is bluish/grey.

The Desert Rosy Boa (*L.t. gracia*) has three stripes of rose, or reddish brown with even edges on a background colour of grey or beige.

A fourth Rosy Boa has been described coming from Cedros Island adjacent to the Pacific coast of Baja California del Norte, Mexico (Ottley, J.). This has been claimed as a separate sub-species (Ottley, J.) and named *L.t. bostici*.

Other forms of Rosy Boa are generally described as either intergrades or intermediates.

Until recently the Rosy Boa was considered to be difficult to maintain for long periods in captivity often becoming susceptible to respiratory and intestinal ailments and dying in a very short time. However these observations were made on wild caught animals. The success in keeping captive bred specimens is totally different.

Rosy Boas are easy to keep and require none of the elaborate temperature requirements associated with other boas and pythons.

Despite the relatively small head size they can in fact swallow quite large prey and are extremely powerful and efficient constrictors. Prey consists of small mammals and young birds.

The Rosy Boa has been bred in the U.K. on one previous occasion. This being the Desert Rosy Boa (*L.t. gracia*) (Granger, 1982). From personal communication, experience in the reproduction was very similar to the above account.

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CONSIDERATIONS ON MARKING METHODS IN NEWTS, WITH PARTICULAR REFERENCE TO A VARIATION OF THE "BELLY PATTERN" MARKING TECHNIQUE.

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Studies on population dynamics and biometry often need a good method to identify animals.

There are in any case some ethical implications, since it is important that the marked animal shows a natural behaviour and that the marking is not painful (Ferner, 1979).

It is essential that the marking method makes individual recognition possible, is long lasting, easily observable and identifiable, and adaptable to animals of different sizes.

Cost is also important and if it can be utilized either in laboratory or in the field.

Unfortunately a marking method seldom satisfies all these standards.

Large anuran species can be marked with numbered rings, like those ones utilised in ornithological studies, and it is also possible to stick or to fasten with a thread, passing under the skin, a small plate, painted with a sign or a number.

Salamanders and other urodeles are often marked by 'toe clipping'. Results are not always very good, since these kinds of amphibians have a high regenerative capacity. Toe clipping is useful in short period studies, not exceeding one year. In large urodeles, for example *Ambystoma tigrinum*, it is possible to mark them with a label fixed to the tail.

Bearing in mind that a single method is not always sufficient it may be necessary to make a double marking (i.e. toe clipping and the recording of the animal belly or back pattern).

In this article I would like to describe the method I have used for a study on population dynamics of two sympatric species of newts (*Triturus vulgaris meridionalis* and *Triturus cristatus carnifex*) in a pond near Turin (north western Italy).

I have observed that the best species to study is the crested newt since it is large and it may be handled and marked easily. I always bring the animals to the laboratory and there I mark them after anaesthesia. This can be induced by total immersion of the animal in a 0.1% solution of Sandoz MS 222, a specific chemical compound for cold blooded animals (Rafinski, 1977).

There are many advantages to this kind of procedure: the newt is totally motionless, and therefore the measurements are more accurate, and furthermore it is clear that the animal suffers less than if it were conscious.

The first marking method I have utilized is 'toe clipping'. The limitations of this method are shown immediately: newts have a high regenerative capacity, and by the end of the breeding season the amputated toes were practically regrown. It is possible to recognize this new part by its paler colouration. This method should therefore be considered additional to the others described now.

These are the recording of belly pattern and the autotransplantation of skin.

The belly pattern method was described by Hagstrom (1973), and is based on the individual pattern of the black and orange spots of the belly. This kind of disposition doesn't change during life. The original method adopted by several herpetologists describes the use of a camera, the newt being usually put in a small transparent basin over the lens. This can be an expensive method.

I have modified this method by using a simple photocopying machine. There are many advantages to this technique: the anaesthetised animal is put motionless on a transparent plastic sheet, in order to keep the glass of the photocopying machine clean. It is then recorded in its real dimensions and in a relaxed position, making possible a better reproduction of the belly spots. The picture is immediate and the copy is ready to be utilised in the identification work, after having written on the sheet an appropriate number or sign. It is also possible to directly measure the photo of the newt.

The recording of the belly pattern is a sure method to identify newts, but unfortunately it is quite inconvenient, a photocopying machine must be available, and not very accurate when the number of animals is high.

It does in fact take a long time to examine very carefully hundreds of sheets in search of a particular spot, and it is sometimes possible to miss a specimen and thereafter impossible to recognize a newly caught newt.

The belly pattern technique must be used along with other methods. In my personal experience one of the best marking methods for newts is the so-called "autotransplantation" of the skin, described by Rafinski (1977) for *Triturus alpestris* but also applicable to *T. cristatus*. It requires the extirpation under anaesthesia of a piece of coloured belly skin, which is then transplanted on the back, where another piece of skin has been previously removed.

After this simple operation the newt must be put in a box with wet paper in the bottom, but without free water, whilst adhesion of the transplanted skin takes place. They must stay there for about 2-3 hours. The advantage of this method is that it is lasting, and the orange spot on the back is very visible in the field and during the night under torchlight. By changing the position of the pieces of the skin it is possible to recognize each individual. This is especially useful for studies on newt movements in the water, when it is not possible to pick up the animals. Rafinski (1977) in his article suggests transplanting a piece of skin from the back to the belly, but I have observed that this operation is difficult, as often the piece detaches. In my studies, after removing a piece of belly skin I leave the wound to heal, which provides an additional marker. I have noticed that in about 10% of the caught newts the skin graft detaches. They are then recognized by toe-clipping and the unpigmented spot of the belly.

The autotransplantation method is useful for immediate recognition, after which it is necessary to look at the belly pattern to know the identity of the animal.

Unfortunately all these methods are acceptable only for *Triturus cristatus*. *Triturus vulgaris* is very small and it is difficult to use the autotransplantation technique. The belly pattern is also less clear than for *T. cristatus* and it is impossible to photocopy it. The only remaining method for this species is to clip one or two toes, for a general marking, bearing in mind that they will grow in a short period (about 1 year), and therefore it is impossible to study a population for a longer time and to identify each specimen.

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REPRODUCTION IN THE SMOOTH NEWT, *TRITURUS VULGARIS*

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As anyone who has tried will know, it is very difficult to obtain information on the way in which male mating success is determined in newts and salamanders (Order Caudata), mainly because it is almost impossible to observe the activities of individual animals in the natural environment. Consequently, we are forced to rely on rather indirect data to provide us with the information we need. The approach that I favour is one which combines field- and laboratory-based observations and experiments. Field data on the dynamics of breeding populations can tell us much about how a male's mating success is constrained by factors external to him, such as the availability of sexually responsive females bearing eggs for fertilization. Laboratory studies can reveal details of the behavioural strategies a male can enjoy in order to inseminate such females. And finally, behavioural experiments coupled with more physiological investigations can indicate how a male's mating success is constrained by events occurring within his own body, such as the process of sperm formation. Needless to say, all of these factors must surely interact in complex ways in order to produce the patterns of individual male mating success which occur in natural populations.

Over the last six years, I have been investigating the way in which male mating success is determined in our most common tailed amphibian, the Smooth Newt (*Triturus vulgaris*). This work has adopted the multidisciplinary approach outlined above. Here I can only present a brief summary of the major results of this work. Before I start, I have great pleasure in acknowledging a number of other biologists with whom I have collaborated: Tim Halliday, Dave Sever, Helene Francillon, Norah McCabe and Miriam Griffiths.

Male smooth newts exhibit two behavioural strategies which enable them to inseminate females. The first is for the male actively to court the female; he stimulates her with his courtship display, and then inseminates her by transferring at least one spermatophore. The second strategy is for the male to interfere in an ongoing courtship, and quite literally 'steal' an insemination by behaving in a sneaky way. This second, competitive strategy should be most frequently adopted by males in natural populations at those times in the breeding season when responsive females bearing eggs for fertilization are least frequently encountered. Such a time is when females are busy laying their eggs in the leaves of water plants and are not responsive to male courtship.

In a study of the dynamics of a Smooth Newt breeding population, we found that, in mid-summer, females tend to lay their eggs in a very synchronized manner, *en masse*. This observation led us to predict that competition between males for responsive females should be particularly intense during this period. We are now testing this prediction by observing male sexual behaviour in a natural population; our preliminary results suggest that, during the egg-laying period, many of the sexual encounters we see involve males adopting the sneaky, competitive strategy described above. In this way, they obtain opportunities to inseminate the few responsive females which are available.

However, it does not matter how many responsive females are available to a male if he has insufficient sperm to fertilize their eggs. After all, it is the fathering of offspring, not simply the transfer of sperm, that is the goal of reproduction in male animals. As

part of a larger study of the annual reproductive cycle of the Smooth Newt, we investigated the issue of sperm availability by examining the structure of the testes of males collected at different times of the year. The picture which emerges is one which is typical of amphibian species which live in temperate regions. Within any one breeding season, males seem to have a limited amount of sperm in their testes and associated ducts. This is a consequence of the way in which sperm are made; sperm for use within any one breeding season are formed in the previous year. Incidentally, female Smooth Newts yolk their eggs in a similar manner. What is more, this long-term limitation in overall sperm supply appears to be accompanied by a shorter-term limitation in spermatophore availability. This is indicated by the observation that an interval of more than one day is required between two courtship encounters if the male is to deposit the same number of spermatophores during each encounter. We think that this is due to a temporary depletion of the materials necessary to produce spermatophores; these materials are secreted by at least two clusters of glands situated in the male's cloaca.

All of this information can be integrated to provide a general picture of the determination of mating success in male smooth newts. During the breeding season, the availability of both eggs for fertilization and sperm to fertilize them vary over time. At the beginning of the season, responsive females bearing such eggs are relatively abundant and sperm are freely available. However, as the season progresses such females become harder to find and males compete amongst one another for opportunities to inseminate them; at the same time, the males' sperm supply becomes depleted, and their testes make sperm for use in the next, not the current, breeding season.

As is usually the case when one does research, the work that led to the conclusions discussed above has also led us to ask many other questions about the reproductive biology of smooth newts. For example, we know that the size of a male's testes, and thus the number of sperm he can produce, depends on his body size; this depends on his growth rate. One area we are now pursuing concerns the relationships between an individual's size, his age and the amount of effort he invests in reproduction. It is certainly clear that much remains to be done.

SAVE-AS-YOU-EARN WITH CROCS OF GOLD

NORMAN MYERS

Reprinted from The Guardian newspaper, January 24, 1985

"When conservationists berate commercial loggers, cattle ranchers and others for wrecking tropical forests, they are sometimes short on ideas for alternative ways to derive hard-cash benefits from the same forests. Now there appears to be a breakthrough in Papua New Guinea, in the form of two innovative types of stock raising. The creatures in question are crocodiles and butterflies, unlikely-seeming sources of income for local people.

But experience is demonstrating that there is scope to harvest a sizeable natural bounty from the forest, without disrupting the ecosystems — and with direct benefit to people whose needs should count first (but are often ignored), — the people who live in it.

Crocodiles supply acceptable amounts of a commodity that, when derived from cattle, constitutes a regular item of standard agriculture: leather. For sure, the people of Papua New Guinea are not the first to raise "domesticated crocodiles" in compounds especially established for the purpose: projects in India, Thailand, Zimbabwe and elsewhere have pioneered the techniques. But local tribes of Papua New Guinea are the first tropical forest people to attempt this novel way of exploiting a top-dollar type of forest wildlife.

Crocodile leather is used for an array of luxury articles, ranging from shoes to luggage to watch straps. Only a few fashion-conscious markets are involved, notably those of Paris, Rome, Frankfurt and Tokyo. Yet so great is demand, that since about 1950 suppliers have been unable to keep up with the appetites of crocodile-leather enthusiasts. International turnover in hides has actually declined since a peak in the mid-1960s, when the main markets absorbed more than two million crocodile skins a year. Not that the trade has declined through lack of demand, rather it has contracted by reason of shrinking supplies. As long as there is plenty of legitimate crocodile leather available, there are plenty of potential purchasers who will pay highly for a crocodile-skin handbag or wallet.

To meet the demands of this affluent clientele, a number of local communities in Papua New Guinea have gone into the business of crocodile farming. By 1981, at least 300 farms were in operation, containing some 30,000 crocodiles, and ensuring a sustainable output of at least 10,000 skins a year, worth between \$1 million and \$2 millions. Were additional farms to be established the country could probably support half a million crocodiles on farms, 50 times more than at present. But even this number would do no more than take up part of the slack in demand.

Papua New Guinea features two native crocodile species. Until the late 1960s, both were losing numbers drastically, due to unregulated hunting of the creatures in their forest habitats. Today, the decline has been turned around, and the farming operations are helping wild stocks to build up their numbers again — as there is no longer incentive for local people to poach crocodiles in the wild.

A crocodile that is well cared for reaches a length of one metre in its first year, and becomes ready for harvest by the time it reaches two metres in its third year. Hatchlings have a good conversion rate of about 50 per cent, that is, a crocodile puts on one pound of weight for every two pounds of food consumed. (If cattle, sheep and pigs were to achieve the same rate of growth, they would have to eat between three and five times as much food as they do). By the time the crocodile reaches its third year, its conversion rate has fallen to about 30 per cent or less, whereupon it yields a piece of belly leather between 10 inches and 20 inches wide and 3½ feet to 7½ feet long, worth an average of \$150.

Not only does crocodile farming in Papua New Guinea turn wildlife protection into an economic proposition. It supplies a cash income for people who live in parts of the country where they would otherwise find it hard to gain a livelihood: swamplands and marshy zones. More important still for long-term considerations — and as has been stressed by Dr Noel D. Vietmeyer of the National Research Council in Washington D.C., a scientist who is an ardent proponent of new ways of livestock farming in tropical forests — the strategy enables local people to earn their way by mobilising resources within their native environments. After all, crocodile farming, by contrast with conventional stock husbandry, requires no forest clearing, grass planting, fence building and pesticide spraying that are essential, not to say expensive, factors in the raising of cattle and sheep.

A still more imaginative way to exploit natural wildlife resources of tropical forests is being attempted in Papua New Guinea: butterfly farming. In various parts of the country, at least 500 villages are rearing butterflies in captivity, or harvesting them in the wild. Both of these approaches are handled in such a way that they constitute sustainable use of a uniquely valuable resource. The same villagers also seek to exploit beetles and other insects for export, to the extent that the government now views all insects as a national resource, and Papua New Guinea has become the only nation in the world to specify insect conservation as a constitutional objective.

There is much mileage in butterflies. The plainest-looking specimen is worth half a dollar, and a run-of-the-mill creature can readily bring \$10. A specimen of a rare species, such as the mauve swallowtail, sells on international markets for \$50, while a specimen of a brilliantly coloured, and particularly rare, birdwing species can be worth up to \$1,000. Because of their resplendent appearance, butterflies are sold mainly for decorative purposes. Many species are enriched with “structural” colours, which cause their wings to flash iridescently in the sun as they “bend” the light they reflect. When these gorgeous specimens are mounted in glass or plastic, they serve to adorn trays, tabletops and screens, even bar-counter coasters and toilet seats. While many conservationists, and citizens in general, may find these products an abomination from the aesthetics standpoint alone, they constitute a large and fast-growing market in many parts of the affluent world.

The bulk of butterflies harvested for these purposes are common varieties, raised in factory-like operations in Taiwan and South Korea, where the numbers sold each year run into hundreds of millions, possibly half a billion. Because the cropping of captive populations is carefully controlled, the offtake does no harm to species in question. Because of its exceptional variety of butterflies, Papua New Guinea now seeks part of the commercial action.

Some observers might suppose that in the case of top-market specimens, worth as much as \$1,000, there could be excessive exploitation of butterflies in the wild. But this is not the case in Papua New Guinea. On the contrary, the seven birdwing species that are endangered receive protection from local people. Attractive as the most exotic and threatened butterflies are to the poacher, they turn out to be yet more attractive to the butterfly farmer with an eye to future profits: the seven species are being helped through “habitat enrichment” (for example, planting of vines), measures that have already led to better times for several of these troubled species.

The worst placed of all, the Queen Alexandria’s birdwing, being the largest and one of the most spectacular butterflies on Earth, is limited to one small sector of Papua New Guinea; worse still, the species’ lifestyle makes it unusually vulnerable, on the grounds that, during its caterpillar stage, it feeds on only one species of forest plant, and most of its forest habitat is being degraded if not destroyed through sundry exploiters. Fortunately, the care and attention of local villagers is helping this particular birdwing slowly to recover its numbers.

Dr Norman Myers is a consultant in environment and development.

ZOO NEWS

It is hoped to include regular items of news from zoos within Britain and Overseas:

COTSWOLD WILDLIFE PARK

Curator of Reptiles: Nigel Platt

1. Breeding successes:

Geochelone gigantea — the Aldabra tortoise laid 4 eggs 30.2.86. Expected incubation period 162 days.

Terrapene c. triunguis — three toed box turtle laid one egg 10.5.86.

Eublepharis macularius — leopard gecko — two eggs produced by female less than 1 year of age on 13.5.86.

In addition the following have been seen mating/appear gravid:

Agkistrodon c. contortix — southern copperheads.

Python reticulatus — reticulated python.

Thamnophis marcianus — chequered garter snake.

2. Recent stock additions:

Sistrurus catenatus tergeminus — western massasauga — pair from London Zoo.

Liasis childreni — children's python, male from London Zoo.

Ctenosaura hemilopha — spiny iguana, male obtained from Linton Zoo.

3. Breeding loans:

Geochelone denticulata — female yellow foot tortoise lent to Bristol Zoo.

Trionyx triunguis — Nile softshell, sent to Bristol Zoo.

Cyclura cornuta — rhinoceros iguana, male obtained from Edinburgh Zoo.

4. *Tomistoma schlegeli* — false gavial, male died of pneumonia.

Bufo viridis — died after appearance of black warts on skin which bled profusely. John Cooper to undertake a post mortem.

NEW BOOK ANNOUNCEMENT

INTRODUCTION TO THE HERPETOFAUNA OF COSTA RICA

INTRODUCCION A LA HERPETOFAUNA DE COSTA RICA

by Jay M. Savage & Jaime Villa R. About 250 pages, 15 figures including a map, 8½ by 11 inches, clothbound. To be published September 1986.

THE BOOK

The Costa Rican herpetofauna is one of the largest and most diverse in the world and this new book is the first to cover comprehensively all of the species of amphibians and reptiles native to Costa Rica. Because extensive field work and systematic studies have been carried out recently in Costa Rica, its herpetofauna is the best known of any country in the Neotropics.

This book is both in English and Spanish. There is a checklist that also gives the range for each species. The major portion of the text is comprised of illustrated keys to the genera and species, and separate keys to tadpoles and to poisonous and non-poisonous coral snakes. There is an extensive annotated bibliography, a bibliographic index, a separate index to published illustrations of tadpoles, and a comprehensive index.

THE AUTHORS

Jay M. Savage is Professor of Biology and Chairman of the Department of Biology at the University of Miami and head of the university's Program in Tropical Biology. Together with his many students and associates, Professor Savage has conducted field work and systematic studies on the amphibians and reptiles of Costa Rica for over 25 years and is the acknowledged authority on the Costa Rican herpetofauna.

Jaime Villa R., Associate Professor of Biology at the University of Missouri, Kansas City, is the leading expert on the lower vertebrates of neighbouring Nicaragua and the author of books on the poisonous snakes, amphibians, and fishes of that country. He has had extensive field experience throughout Central America, including Costa Rica.

NEW BOOK ANNOUNCEMENT

THE TURTLES OF VENEZUELA

by Peter C.H. Pritchard & Pedro Trebbau. 1984. 414 pages, 48 colour plates (25 watercolour and 165 photographs of turtles and their habitats), 16 maps, 8½ by 11 inches, bound. Covers the systematics, life history, and distribution of 22 species, half of the turtle species found on the South American continent. A detailed four-page colour prospectus is available on request.

From recent reviews:

"An unprecedented accomplishment as a comprehensive summary and review of a segment of the South American turtle fauna."

J. Whitfield Gibbons, *Quarterly Review of Biology*

"This handsome volume should be purchased by everyone interested in turtles. The authors have provided more detail than any previous single volume on the systematics of turtles. The cliché 'mine of information' is here wholly justified. The colour paintings are glorious, comparable to the best 19th century animal illustrations and are by themselves a reason for owning the book."

Ernest E. Williams, *Herpetological Review*

"The first monograph on the turtle fauna of a South American country, and it delivers considerably more than one would have expected from the title alone. It combines the highest standards of a reference work with the aesthetic qualities of a modern field guide. The book is a major milestone in its field."

Wolfgang Böhme, *Salamandra*

ORDERING INFORMATION

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SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

BOOK REVIEW

I.U.C.N. RED DATA BOOK, PART 1. TESTUDINES, CROCODYLIA, RHYNCHOCEPHALIA. Compiled by Brian Groombridge assisted by Lizzie Wright of the I.U.C.N. Conservation Monitoring Centre (1982). 425pp I.U.C.N. Gland, Switzerland.

This book is a revised and expanded edition of the I.U.C.N. Amphibia-Reptilia Red Data Book and is about species or subspecies of Chelonina, Crocodylia and Rhynchocephalia whose survival is known or suspected to be in some way under threat. It is a comprehensive account of what is known, previous to 1982 of the geographical distribution, population status, reproductive biology, habitat and ecology of 83 taxa consisting of 60 chelonians, 22 crocodiles and 1 rhynchocephalian (*Sphenodon*). Included are 4 species (3 crocodiles and 1 chelonian) which were listed in the earlier Red Data Book but which are not now considered to be under threat. Each taxon is assigned to a category which defines the level of concern, i.e. Endangered, Vulnerable, Rare, Indeterminate or Insufficiently Known. Previous to the main section of the text dealing with the data sheets, there is a section listing each taxa in systematic order, Red Data Book category and zoogeographical region. The references are placed at the end of each data sheet which results in a fair amount of duplication, but this is still preferable to the method of lumping them together in one long list at the end of the book. In the introduction it is stated that a major aim of the book is to reach and influence readers outside the environmentalist and conservationist world who may be attracted initially by the basic zoological data. This aim was certainly achieved with me, I was greatly impressed by the wealth of information in the book particularly from unpublished research reports or through communications. As an example, H. Mendelssohn of Tel Aviv University has provided 4 pages of text on the Egyptian tortoises (*Testudo kleinmanni*) of which previously very little information was available in the literature. This will be a valuable data base for future research on this species. There are no photographs or drawings in the book and inevitably some of the accounts will soon be, or are, out of date, but this should not detract from its great value as a source of information or reference.

Compilation must have been an enormous task and Brian Groombridge and his assistant Lizzie Wright are to be congratulated for producing such a comprehensive work. I certainly enjoyed reading it and learned a great deal from it.

Roger Meek

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