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THE BRITISH HERPETOLOGICAL SOCIETY

BULLETIN

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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.

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 Bulletin is edited and produced by
John Pickett and Simon Townson

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

SUNDAY MAY 31st 1987 2.00 p.m.	*An Introduction to Sand Lizard Surveying* A look in at the "walk in sand lizard vivarium". Followed by a look at prospective sites for surveying during the summer. Meet at the Wardens House, Pinfold Lane, Ainsdale, Southport.
TUESDAY JUNE 9th 1987	*The World of Reptiles and Amphibians: Their care and breeding.* A discussion evening. Members are invited to bring live animals, photographic material, etc.
TUESDAY JUNE 16th 1987 7.30 p.m.	*An Introduction to Great Crested Newt Surveying* An evening pond inspection. Bring wellies and a torch. Meet at the Wardens House, Pinfold Lane, Ainsdale, Southport
SATURDAY/SUNDAY JULY 12th 1987 Saturday 11—5 p.m. Sunday 10—4 p.m.	*Amphibian Antics and Reptile Revels* A weekend meeting open to the public to appreciate amphibians and reptiles at close quarters.
TUESDAY NOVEMBER 24th 1987	*Christmas Social* An informal seasonal get together. (Contact Regional Group Representative for further details)
TUESDAY JANUARY 19th 1988	*Third Annual General Meeting*

Unless stated otherwise all meetings are held at the Wildfowl Trust, Martin Mere, Burscough, Nr Ormskirk and start at 8.00 p.m.

REMAINING MEETINGS 1987

Meetings are held in the Lecture Theatre of the Linnean Society of London, Burlington House, Piccadilly, London W1, and start at 7.00 pm, ending at 9.00 pm, unless indicated otherwise.

MAY 28th	*Education – the link between captive breeding and conservation:* the work of the Education Committee. Speakers: Vic Taylor (Chairman); Colin Fitzsimmons; Dr Graham Walters; Peter Curry. Details to be announced later.
JUNE 27th	Dr J. Seymour (Institute of Zoology, Zoological Society of London): Biomedical survey of the Aldabran giant tortoise population in the Seychelle Is (Indian Ocean). A special Saturday afternoon lecture, starting at 2.30 pm. Joint meeting with the British Chelonia Group.
JULY 22nd	*Amphibia and reptiles worldwide: their care and breeding.* A discussion organized by the Captive Breeding Committee (Chairman: Simon Townson). Members are encouraged to bring live animals, preserved specimens, amphibian voice recordings and 35mm slides for display and to illustrate discussions.
SEPTEMBER 24th	*Care and breeding of amphibians and reptiles: an open meeting.* Contributions from members — slides, live animals, etc. There will be facilities for the sale and exchange of members' private stock.
OCTOBER 13th	Mike Linley ('Survival', Anglia Television, London): Herpetofauna of New Zealand.
NOVEMBER 18th	Dr. C.J. Reading (Institute of Terrestrial Ecology, Furzebrook Research Station, Dorset); Ecology of the common toad (*Bufo bufo*) with reference to breeding strategies.

BHS NORTHWEST REGIONAL GROUP

RAJAN PAUL

Chairman, BHS Northwest

BHS Northwest is a thriving regional group of the British Herpetological Society. Members of the Society living in Cheshire, Lancashire, Cumbria, Merseyside, the Greater Manchester County and the Isle of Man automatically become members of the regional group. They are entitled to attend its meetings and vote at the regional AGM. BHS members living outside these counties are also welcome to attend any of the Group's meetings if its' venues are more convenient than their own regional group or indeed if no regional group exists in their district.

The Group was formed in 1984 when eighteen or so BHS members met, discussed and gave their support and commitment to the formation of a regional group. The obvious benefits to the membership being the generation of local contacts and the possibility of attending locally organised meetings. The advantage of meetings held within a reasonable travelling time/distance was obviously a great attraction to the membership over meetings held in London.

The inaugural meeting of the BHS Northwest Group was held in January 1985, and the Group was formally recognised by Council about the same time.

The Group is now in its third year and attendance averages around the 20-25 mark. With luck this figure should improve this year due to the recent expansion in the area covered by the Group. The meetings are held bimonthly, normally on a Tuesday evening. Lecture meetings are held at the Wildfowl Trust, Martin Mere, Nr Ormskirk. This venue gives credibility to the Group and ties in closely with the Wildfowl Trust's general educational aims.

Field visits are often held a. weekends so that members may bring their families.

The programme of events is varied to cater for the wide variety of interests held by the members. Meetings held over the previous two years have included Natterjack ecology and conservation, the veterinary aspects of reptile keeping and captive breeding of Corn Snakes. A talk on snake venom was arranged at the Liverpool School of Tropical Medicine and an after-hours look at the Reptile House of Chester Zoo. The Group is keen to help in protecting its local assets, the Natterjack Toad and the Sand Lizard. Towards this aim, the Group has started engendering an interest in practical conservation work at the Formby and Ainsdale sand dunes. Contacts have been made and members acquainted with methods of survey work. A Natterjack scrape was dug by the Group in 1986, which filled with water as fast as it was dug since it was raining at the time.

One of the most successful meetings to date was a two-day "reptile rally" held over a weekend in July 1986 at Martin Mere. This was essentially a public relations exercise that allowed members of the public the opportunity to experience reptiles and amphibians at close hand. The Group prepared a varied display of the main divisions of reptiles and amphibians. Members were on hand to encourage visitors to touch and handle the animals and to answer any questions. The opportunity was also taken to give advice okn care and breeding in captivity. Care/breeding leaflets prepared by the Captive Breeding Committee and BHS membership forms were distributed to interested visitors. The display was supplemented by photographic and video material and by a number of lectures. It is estimated that some 800 people passed through the exhibition, some people coming on the Saturday and returning with friends on the Sunday. A similar event is planned for July 1987.

In 1986 the Group also started to produce a quarterly newsletter. The newsletter gives an update on meetings, contains news and articles and has a members' notices section. The newsletter is distributed to all regional BHS members. The Group is currently considering extending its activities to supporting the reptile collection at its local zoological gardens at Chester. This support is likely to be the adoption of a pair of animals so that a breeding programme may be established.

If you are BHS member living within the region and you haven't as yet come to any of the

meetings, please try and do so this year if you can. The Group is friendly and informal and you will be made most welcome. For further details contact me at the address/phone number given at the back of the bulletin. And remember the Regional Group can only exist if there is support from the members.

JOURNAL EDITOR'S REPORT, 1986

PAPERS RECEIVED

There were 27 submissions to the Herpetological Journal in 1986, 2 fewer than in 1985 and the continuation (albeit more slowly) of a downward trend since a maximum of 40 in 1982. Acceptance rate was up, however, at 78% with 2 papers still awaiting decision at time of writing. This does not reflect a relaxation of refereeing or editorial standards, but undoubtedly an improvement in the quality of submissions.

The average delay between acceptance and publication is now 13-14 months, a figure which has not changed appreciably over the last 2-3 years.

I am most grateful to the following reviewers for refereeing papers submitted during 1986: Dr M. Lambert, Dr R. Avery, Dr I. Spellerberg, Dr T. Halliday, Dr P.M. Davies, Dr S. Townson, Dr C. McCarthy, Dr D. Yalden, Prof. Y. Werner and Dr C. Cummins.

COSTS

I have not been able to reduce costs below 1985 levels. The 2 editions of 1986 cost about £3,200, including transport to London and the dispatch of reprints to authors. Income from institutional subscribers (144) and reprint payments amounted to £3,740, so again there was a net profit to the Society though at c.£540 it was rather less than in 1985.

MISCELLANEOUS

I felt that if possible something should be done soon to try and prevent further fall-off in submissions to our Journal. In Autumn 1986 I circulated a brief questionnaire to 50 members of the "Triturus" group, an international association of (mainly) scientists interested in various aspects of this genus. My intention was to ask a representative cross-section of the herpetological scientific community about their opinions of the Journal, and how it could be improved. About half eventually replied; of these: more than 80% read the journal at least sometimes, and moire than 75% do or would be prepared to submit papers to it. I found these figures rather encouraging; negative replies were mainly from the molecular biological end of the spectrum, for which the Herpetological Journal is quite unsuited. With regard to possible improvements, nearly 60% made no comment or said it was OK in its present form. Most common suggestions were: quicker publication time, wider circulation and increase in size. None of these are immediately feasible but I shall be looking into some possibilities arising from these suggestions during the course of 1987.

Trevor Beebee, February 1987

A CRY FOR HELP

For several years the BHS have been trying to improve the survival chances of the rarest of our native reptile races, the unique Sand Lizards of Merseyside in the Southport area. The number of these is down to the low hundreds, at best, and they are threatened by erosion of the dunes by public pressure in several ways. The local N.C.C. office at Ainsdale N.N.R. has frequently asked the Society to help in finding where these animals are and to report the results. The local BHS Group is slowly getting involved in helping but more volunteers are needed.

Help is also needed to monitor the sizes and breeding success of Natterjack Toad populations on the Southport dunes.

If you are interested in helping to survey for these animals and can spare a little time between April-September, you will be helping to ensure the future of these lizards.

For further details, please contact:—

Rajan Paul (NW BHS representative)
Woodburn House
21 Moss Grove
Prentton
Wirral, Merseyside.
Tel: 051 931 4463 (daytime), 051 608 3427 (evenings).

David Wheeler (NCC Warden, Ainsdale NRR)
2 West End Lodge
Pinfold Lane
Southport, Merseyside PR8 3QW
Tel: Southport (0704) 78774.

Chairman of the Conservation Committee or Conservation Officer.

INDIAN HERPETOLOGICAL SOCIETY

The Indian Herpetological Society is functioning mainly on Private and Government grants. The main objectives of the society are ophidian research and public education. We are educating laypeople by organising slide shows and live demonstrations at various villages and cities.

At present the society is taking up various conservation projects of endangered reptiles. Extensive work is being done on captive breeding and ophidian diseases. Future research projects will be on Snake Bite Treatment. Evolutionary morphology of snakes and development of information on Indian herpetofauna. We are interested in hosting seminars and symposia on various herpetological aspects at national and international levels. The society will start publishing a journal which will carry herpetological notes, news, happenings and research papers from all over the world. The IHS plans to develop a herpetological documentation centre in India.

IHS Officers are:

1.	Mr Neelimkumar Khaire	Chairman
2.	Mr Anil Khaire	Treasurer
3.	Dr (Mrs) Meena Katdare	Secretary

Membership is open to all ophiologists and herpetologists all over the world. Annual subscription is Rs.200/- (India) or US $20.00 (abroad).

For other details please contact:

ANIL KHAIRE
Indian Herpetological Society
'USANT', Poona-Satara Road
POONA — 411 009 (INDIA)

BRAILLE FACILITY FOR THE BLIND AT POONA SNAKE PARK, INDIA

Poona Snake Park, has for the first time in the country introduced the Braille Script for the Blind, thus enabling them to learn about snakes. This facility was inaugurated on 26th January 1987, the Republic Day of India. It consists of information charts about each species, prepared in Braille Script. No entrance fee is being charged for the blind and disabled.

Among the Zoos and Museums of India, Poona Snake Park is the first to introduce this facility. The blind will also be allowed to touch and feel non-poisonous snakes. In addition to this, more information about snakes will be recorded on audio cassettes and played.

Mr Neelimkumar Khaire, Director of Poona Snake Park, has also been preparing detailed information, which will be transferred into Braille books. These books will be presented to the Blind Schools and Institutions.

CONSERVATION MATTERS

A review of herp conservation issues in the news during the period September to December, 1986.

Management of rare herp sites

The BHS Conservation Committee was in the news during this quarter when they signed two separate agreements enabling them to manage rare herp sites. On 23rd of September an agreement was concluded with the Forestry Commission enabling BHS to manage 12 heathland sites in Dorset where there are populations of the sand lizard and smooth snake. Invading scrub and trees threatened to shade out the dry heathland habitat required by these endangered reptiles. Meanwhile in Cumbria the Committee obtained a licence to manage a natterjack site at Sellafield, making it the first BHS nature reserve open to members. Further information on this reserve will be available in a separate Bulletin article.

First prosecution for a Great Crested Newt offence

In September James Taggart, of the Chandos Aquarium and Water Garden Centre became the first individual to be prosecuted for possessing and offering for sale specimens of this attractive newt. He was fined £200. The newt is protected under Section 9 of the Wildlife & Countryside Act (1981) under which it is an offence even to handle one without a license from the Nature Conservancy Council.

Cruelty to wild amphibians and reptiles

In a shocking report published by the Fauna and Flora Preservation Society ("Protecting Wild Reptiles & Amphibians in Britain") 44 examples of the deliberate killing of reptiles and amphibians over the past decade are quoted, some of which are absolutely grotesque. It is estimated that several hundred such cases occur each year. The present legislation protecting our wild herps is examined, while the report recommends several ways by which they could be protected. The report can be obtained from FFPS c/o Zoological Society of London, Regents Park, London, NW1 4RY (Price £5.00).

A few weeks after the publication of this report, the Nature Conservancy Council advised the government that protection afforded to terrestrial reptiles should be extended to cover killing and injury of all British reptile species. No changes in the law were advocated with respect to the amphibians.

Brian Banks
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HERPETOFAUNA AND HERPETOLOGY IN ISRAEL

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This article is based on a talk given at a meeting of the BHS on July 15th 1986

Our survey area, comprising Israel with the Golan Plateau, West Bank and the Sinai Peninsula, approximates the size of England and Wales south of Birmingham. Its herpetofauna comprises about 100 land and freshwater reptilian species and six amphibians, owing to the heterogeneity of habitats and the area's geographical situation between three continents. The Mediterranean zone in the north, receiving over 200mm of average annual rainfall, carries low forests, maquis and shrub areas; the Saharo-Arabian desert zone in the south receives under 100, in some places under 50mm. The intervening Irano-Turanian steppe zone is narrow in Israel, with its abrupt boudary between mesic and desert habitats.

Based on the material in the National Collections (in Tel Aviv Univ. and Hebrew Univ.), the amphibians are restricted to the north, beginning with *Salamandra salamandra* of the Galilee and Mt. Carmel, through *Pelobates syriacus, Triturus vittatus, Hyla savignyi* and *Rana ridibunda* to *Bufo viridis* which penetrates the desert. The following account of the reptiles demonstrates zoogeographical principles rather than list all the species.

A few reptile species occur throughout the area, some showing different subspecies in and out of the desert: mainly *Hemidactylus turcicus* and *Ptyodactylus hasselquistii* (Gekkonidae; the latter probably comprises three parapatric species); *Agama stellio* (Agamidae); *Chalcides ocellatus* and *Eumeces schneideri* (Scincidae); *Psammophis schokari* (Colubridae).

Several species of southeastern Europe and Turkey occur in Mediterranean Israel but not in the desert. Notable examples are *Cyrtodactylus kotschyi* (Gekkonidae); *Lacerta trilineata, L. laevis* and *Ophisops elegans* (Lacertidae); *Ophisaurus apodus* (Anguidae); *Coluber jugularis, C. nummifer, C. rubriceps, Eirenis decemlineata, E. rothi* and *Telescopus fallax* (Colubridae).

Among species restricted to the desert, the following groups are conspicuous: *Agama pallida, A. savignii, A. sinaita, Uromastyx aegyptius* and *U. ornatus* (Agamidae); *Acanthodactylus boskianus, A. pardalis, A. opheodurus, A. scutellatus, Mesalina brevirostris, M. guttulata, M. olivieri* and *M. rubropunctata* (Lacedrtidae); *Coluber elegantissimus, C. rogersi, C. rhodorachis, Telescopus dhara, T. hoogstraali* (Colubridae) and the venomous snakes *Echis coloratus* and *Walterinnesia aegyptia.*

Sand occurs in the desert as disjunct "islands", to which psammophilous reptiles are often restricted. Many Saharan species are restricted to the Western Negev sands, e.g. *Stenodactylus petrii* (Gekkonidae), *Agama savignii* (Agamidae), *Scincus scincus* (Scincidae) and *Cerastes vipera* (Viperidae). Others extend their ranges for varying distances northwards along the coastal plain or eastwards to other sand patches, such as *Sphenops sepsoides* (Scincidae), *Lytorhynchus diadema* (Colubridae) or *Testudo kleinmanni.*

Several Arabian species occur in the Wadi Arava (along the Jordon frontier) but no further west: *Bunopus blanfordii* and *Stenodactylus (Ceramodactylus) doriae* (Gekkonidae) and *Cerastes cerastes gasperettii* (Viperidae).

The tropical *Atractaspis engaddensis,* together with *Echis coloratus* and other snakes, extends northwards along the warm Jordan Valley.

Endemics are few. *Chalcides guentheri* is restricted to the Mediterranean of Israel and adjacent Lebanon; *Uromastyx ornatus* appears to be confined to Sinai and immediately adjacent areas; *Vipera bornmuelleri* occurs only on the high mountains of Lebanon and Hermon and *Cyrtodactylus amictopholis* Hoofien, 1967, is known only from Mt. Hermon above 1500m (though not rare there)

In summary, if one considers also marine turtles, the Israeli herpetofauna encompasses at least

twelve distinct patterns of zoogeographical distribution.

Several taxa have been described or discovered for Israel since the 1951 review by Haas, mainly in the desert and on Mt. Hermon. Noteworthy are the cases of *Testudo kleinmanni* rediscovered in the Western Negev sands in 1963 and *Psammophis aegyptius* the recognition of which in southernmost Israel only followed its identification in Sinai.

In principle in Israel amphibians and reptiles are protected by law. Few specimens are endangered except through habitat destruction which is the main problem. The Nile crocodile disappeared at the beginning of the century. The endemic *Discoglossus nigriventer* apparently vanished with the drying of Lake Hula, the whole species now consisting of only two museum specimens. *Lacerta trilineata* has been decimated, at least in some places, possibly by feral cats. *Natrix tessellatus* appeared to be mysteriously vanishing in recent years but has been rediscovered as abundant in at least one locality. The softshell turtle *Trionyx triunguis* has disappeared except for one river where it is protected, researched and fed by the Nature Reserves Authority. But the terrapin *Mauremys caspica rivulata* is now spreading southwards in artificial, even polluted, water bodies.

Nature protection is vested in the governmental Nature Reserves Authority, which also takes part in public education. The main effort of public education is carried by the Society for the Protection of Nature in Israel through its manifold and ramified activities, based in part on a network of field schools. The Society also initiated the Israel Herpetological Information Centre which operates in conjunction with the Hebrew University and Tel Aviv University. Among other activities the IHIC collects and computerizes assorted observations and together with the Hebrew University and the Nature Reserves Authority holds an annual Herpetological Symposium Day for a mixed audience of about a hundred.

Formal teaching of herpetology at university level is given mainly at the Hebrew University of Jerusalem which has an undergraduate course (about 15 students annually) and a graduate course (about six students every second year). However, theses (M.Sc., Ph.D.) centered on an amphibian or a retpile are executed also at other universities, especially Tel Aviv University.

Plate 1. *Stenodactylus sthenodactylus sthenodactylus* is a Saharan cursorial gecko widespread throughout the Negev of Israel, extending along the coastal sandy soils up to the Haifa bay, and eastwards to the Wadi 'Arava.
Shown is a hatchling and the egg shell from which it hatched;
the parent had originated from Holon, S of Tel Aviv.
(From Kodachrome diapositive, 21.IX.1979, by Y.L. Werner; scale, cm and mm.)

Recent major research efforts have included population and ecological genetics of *Bufo viridis, Hyla savignyi, Rana ridibunda* and *Agama stellio* (Haifa University); ecological and especially thermal physiology (Haifa University and Technion, Haifa); venomous snakes, snake venoms, and their evolution as well as both reproductive biology and physiology of embryos (Tel Aviv University).

At the Hebrew University, other than listing and mapping, the vocal behaviour of geckos and defensive behaviour of some snakes, as well as the fecundity of common lizard species, have been studied in conjunction with the Nature Reserves Authority. A major computerized ongoing project concerns geographic variation of common reptiles, throughout the Middle East, in morphological and reproductive characters, with a search for inter-character and environmental correlations.

(Additional information as well as literature references may be found in "Herpetological survey of Israel (1950-85), with comments on Sinai and Jordan and on zoogeographical heterogeneity" to appear in "Zoogeography and Terrestrial Ecology in Israel" edited by Y. Tom-Tov and E. Tchernov in the Monographiae Biologicae Series, Junk publishers.)

NOTES ON SOME SKINKS FROM THE NORTHERN TERRITORY OF AUSTRALIA

PAUL EDGAR

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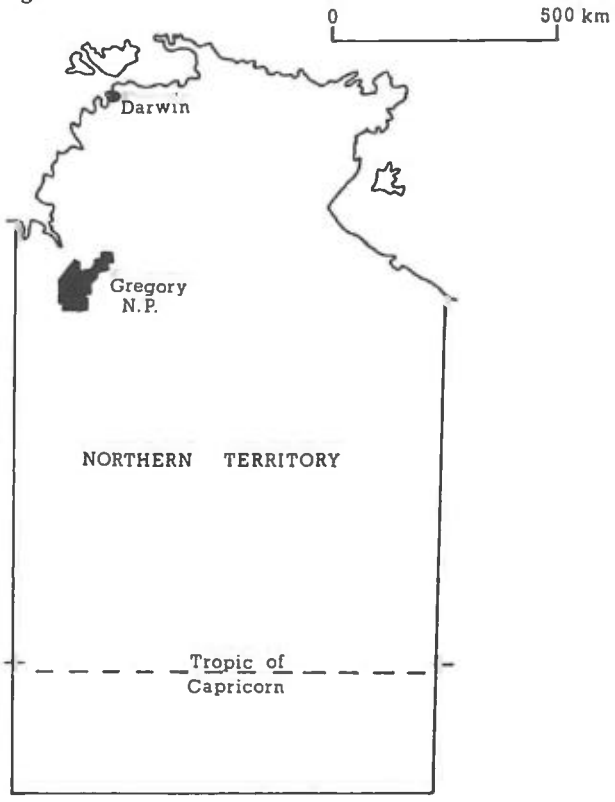
INTRODUCTION

Skinks have an almost world wide distribution but reach their greatest diversity in Australia, where 22 genera and over 250 species occur. The Scincidae is the largest Australian reptile family and the 95 species known to occur in the Northern Territory comprise more than 50% of its described lizard species (Horner 1985). The author had the good fortune to observe a few of these species at first hand, while participating as herpetologist in a fauna survey of the newly created Gregory National Park (Figure 1). This 10,000 sq.km. Park is situated in a transition zone between the tropical forests of the north and the arid interior of Australia and encompasses a wide range of habitats, described in general terms by Edgar (in press) and in far more detail by the Conservation Commission of the Northern Territory (1986). Flat-topped sandstone hills, or mesas, are characteristic of the area and are separated by extensive floodplains covered with savannah vegetation, typical of the monsoonal climate (Plate 1).

Figure 1.



The work was carried out jointly by the Conservation Commission of the Northern Territory (C.C.N.T.) and Venturers of an Operation Raleigh expedition to the region, from May-July 1986. Habitats were sampled for herpetofauna by searching 500 x 20m quadrats for active species. Each quadrat was searched in the morning, late afternoon and just after sunset and this

method was combined with general sorties in promising areas, rock and log rolling and pitfall trapping. The mammalogist working on the survey also turned up several skinks and other lizards in his live traps. A full analysis of the survey data will eventually be published as a major C.C.N.T. scientific report, examining the relationships of the faunal groups to vegetation communities and physiographic features. Because of the importance of the Scincidae in Australia and the paucity of herpetological knowledge about the tropical north of the country it was felt that a few general notes on this family may be of interest.

DIVERSITY AND ABUNDANCE OF SKINKS

The herpetological survey produced 12 amphibians and 60 reptiles species, the first checklist for this area. Of the 40 lizard species recorded, 18 (45%) were skinks. The diversity of skinks in the main habitat types (Table 1) is affected by numerous features, and sampling errors were probably significant. In general, though, the more structurally complex habitats display the greatest species diversity (MacArthur, 1972; Pianka, 1967, 1971). In Gregory National Park these habitats occur where water is most available in the dry season and include narrow riverine forests and savannah woodlands. The stony hills and well-drained limestone floodplains produce more open, less complex habitats with fewer resources and fewer lizard species. Obviously the situation is not this simple and the comparatively low number of skink species in riverine forests, the most structurally complex habitat in the Park, is just one exception. Pianka (1971) noted an inverse relationship between precipitation and species density for Kalahari Desert Lizards and hypothesized that this is due to the more open vegetational structure of the low rainfall areas, affording the lizards more open space for basking and foraging. It may be that the shaded riverine forest is similarly unattractive to certain sun-loving skinks, particularly in the dry season when early morning temperatures can be quite low. On the other hand the difference in taxonomic diversity between the riverine and floodplain habitats may simply be due to the difficulty of seeing reptiles in the former. A reliable method of quantifying the structural complexity of habitats has yet to be devised, which leaves such comparisons open to many variable and produces very broad confidence intervals.

A qualitative assessment of the habitats sampled leaves one with the impression that skinks exhibit greater taxonomic diversity and abundance in areas of well lit, open woodland with numerous *Acacia* shrubs, grass clumps, logs and rocks, areas of thick leaf litter and a significant soil layer (which is frequently almost absent in this region). Mesa tops lack many of these desirable features but may have a surprisingly thick soil, particularly under large flat rocks, due no doubt to the virtual absence of run-off of the wet season rains, which gradually percolate through the flat sandstone plateau instead. The number of skink species found on these plateaux equals that of riverine habitats, possibly because of this one important aspect. Table 2 gives an indication of the abundance of the Scincidae, compared to other reptile and amphibian families, recorded during quadrat searches. Quadrat searches in riverine habitats are examined separately to remove the influence of amphibians from the rest of the quadrat results. The remaining quadrats are combined, to give an overall impression of the relative abundance of the families, because of the above mentioned difficulty in comparing habitats directly. After doubling the figures for nocturnal quadrats (since diurnal searches were twice as frequent) the number of skinks recorded in all habitats, by day and night, is still 37.5% of the total. With the riverine quadrats removed, skinks comprise 54.2% of all reptiles recorded, with the figures for nocturnal quadrats again doubled. These simple observations illustrate the fantastic abundance of skinks in this part of Australia in terms of both species and individual lizards, even when the frogs and geckos, numerous in their own right, are included. The relative abundance of several species are mentioned in the following notes. An estimation of their densities (per hectare) has not been attempted from the limited data.

SPECIES NOTES

The nomenclature used here follows that of Cogger *et al* (1983) and the maximum snout-vent lengths (max. S.V.L.), given for each species, are taken from Horner (1985). Most individuals are obviously much smaller than this, but the figures provide a useful guide to relative sizes. Sample specimens of each species are lodged in the N.T. Museum of Arts and Sciences in Darwin.

Genus *Carlia* Gray, 1845

A genus of small, terrestrial, diurnal skinks with about 25 species occurring in Australia (6 in the N.T.), New Guinea, the Moluccas and Timor (Storr *et al,* 1981). Sexually active males develop attractive breeding colours. The 3 species recorded were all observed actively foraging in leaf litter, occasionally pausing to bask in patches of sunlight for short period, usually less than 30 seconds. The tail is thrashed slowly with a sinuous motion when hunting. Horner (1985) considers all 3 species to be common in the N.T.

Carlia amax Storr, 1974. Max. S.V.L. 40mm. This species was only recorded in riverine forest quadrats and around the first expedition camp on the Victoria River. Its apparent scarcity at the second camp on the East Baines River is possibly due to its association with rocky hills and ranges (Cogger, 1983; Horner, 1985), since the latter camp was situated in an area with more extensive floodplains and fewer outcrops. One specimen caught possessed a perfectly forked tail.

Carlia foliorum (De Vis, 1884). Max S.V.L. 44mm. (Plate 2). Recorded from riverine forest plus sandstone and limestone floodplains, but not hilly country. Very common around the camp on the East Baines River, remaining active throughout the day, but retreating to shaded areas during the hottest period. Of all the terrestrial skinks positively identified in quadrats, 49% were *C. foliorum.* On cold mornings this species was occasionally observed basking on tree trunks, at about 30cm, to catch the rays of the rising sun.

Carlia triacantha (Mitchell, 1953). Max. S.V.L. 52mm. Found in dry habitats including the more barren floodplains, hills and outcrops. This species was the only skink recorded from rolling limestone hills, the driest habitat. Often found near dead logs or clumps of spinifex (*Triodia* spp.), characteristic grasses of the desert regions.

Genus *Cryptoblepharus* Wiegmann, 1934

A very widespread genus with 6 species found in Australia (4 in the N.T.). One non-Australian species, *C. boutonii,* has a discontinuous distribution from east Africa to Hawaii (Mertens, 1931) although several island races are now recognized as distinct species. The small, diurnal and very active members of this group are usually found on vertical surfaces such as tree trunks and rock faces.

Cryptoblepharus megastictus Storr, 1976. Max. S.V.L. 40mm. A small colony of these saxicoline lizards was discovered on the vertical walls of a sheltered gully, near the top of a large sandstone outcrop. They moved with great agility over the rock although, like the following species, they could easily by tempted to take flies offered to them on grass stalks and approach humans very closely.

Cryptoblepharus plagiocephalus (Cocteau, 1936). Max. S.V.L. 47mm. A very common arboreal species which occurs across most of Australia and often inhabits human dwellings, fences etc. This species was recorded in every habitat surveyed (except limestone hills) and comprised 42.5% of all skinks, arboreal and terrestrial, identified during quadrat searches. This may partly be a reflection of the ease of spotting and identifying this skink scuttling over tree trunks, but it was nonetheless a very abundant and ubiquitous lizard. Several were also seen foraging on the ground and two were caught in pitfall traps. The trees being used by this species that were measured ranged from 5 to 50cm diameter at breast height ($\bar{X} = 22.5 \pm 1.79$cm S.E., $n = 47$). More important, however, was the texture of the bark and species such as the paperbark and corkbark trees, which offer numerous retreats on their trunks, are particularly favoured. Significantly no *C. plagiocephalus* were observed on the smooth barked *Eucalpytus* species despite their abundance in the Park.

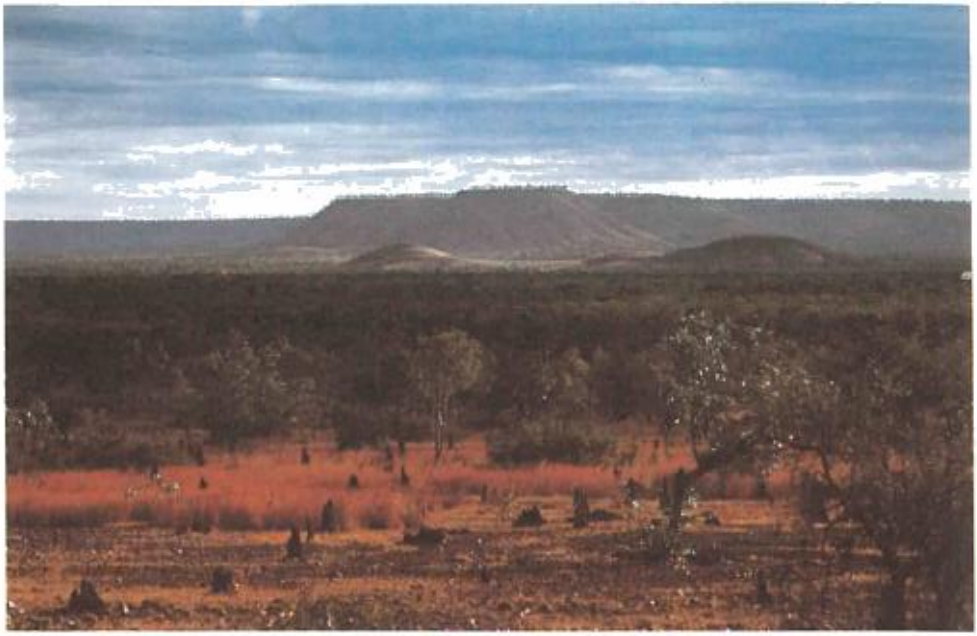


Plate 1. Gregory National Park. Typical view showing arid floodplain and savannah woodland with sandstone mesas in the background.

Plate 2. *Carlia foliorum,* pausing briefly to bask in a sunlit area of leaf litter in riverine forest.

Plate 3. *Ctenotus pantherinus,* photographed on a limestone block, under which it was caught, in a dry floodplain area.

Plate 4. *Lerista borealis,* an elongated skink with reduced limbs, this specimen was discovered under a flat rock on a mesa plateau.

Genus *Ctenotus* Storr, 1964

This group is confined to Australia (apart from 1 species in New Guinea) as is the largest of all the reptile genera found there. There are about 74 species in Australia of which 40 occur in the N.T. (Horner, 1985). The general view has been that these skinks have undergone their main diversification in the more arid regions of Australia (Storr *et al,* 1981; Cogger, 1983), although many of the species are now recognised as specialized tropical forms (Horner & King, 1985). These terrestrial or semi-fossorial lizards are largely diurnal and possess well developed legs and characteristic pointed ear lobules. The generic name is derived from the Greek *cten* (comb) and *ot-* (ear) (Storr *et al,* 1981).

Ctenotus decaneurus Storr, 1970. Max. S.V.L. 50mm. This attractive skink, marked with 10 pale stripes on a dark background, prefers stony hills and ranges (Cogger, 1983; Horner, 1985). Common in suitable habitat, hill slopes covered with small stones and rocks, specimens were also found on dry limestone floodplain by turning rocks in the early morning.

Ctenotus inornatus (Gray, 1845). Max. S.V.L. 95mm. Common in sandstone areas, from floodplains to mesa plateaux. When rubbish and other debris in dry situations near human habitation was turned over this was usually the species found.

Ctenotus pantherinus (Peters, 1866). Max. S.V.L. 114mm. This large handsome lizard (Plate 3) was mainly recorded from dry floodplain areas but small numbers were also observed on a sandstone plateau. Occasionally found under debris or rocks, this species was most often seen as the sun was setting and Horner (1985) also states that they are most active on warm evenings. Four subspecies occur in Australia of which the largest, *C.p.calx* Storr, 1970, was recorded from Gregory National Park.

Ctenotus robustus Storr, 1970. Max. S.V.L. 123mm. A large species, found in a wide variety of habitats, which is the only tropical representative of the genus to also occur on the eastern seaboard and in south Australia (Horner & King, 1985). Although a common skink, only one specimen was recorded, caught in an Elliott trap set in a sandstone floodplain area on the mammal survey. The foraging activity of many species is curtailed in the dry season, making them hard to find, and *C. robustus* also excavates short, shallow burrows under ground debris (Cogger, 1983; Horner, 1985).

Ctenotus saxatilis Storr 1970. Max. S.V.L. 100mm. Very similar to *C. inornatus* apart from the narrow, dark vertebral stripe of the present species. Recorded from the rocky slopes and plateau of the sandstone mesas. Horner (1985) indicates that *C. saxatilis* is common in the N.T. but it was found to be extremely difficult to search the mesa side slopes without causing disturbance, so it was impossible to assess its abundance.

Ctenotus tantillus Storr, 1975. Max. S.V.L. 45mm. Horner (1985) remarks that this species prefers rocky hills and outcrops. During the survey *C. tantillus* was only discovered at one site in a grassy floodplain area, although this was within 500m of a sandstone outcrop.

Genus *Lerista* Bell, 1833

This genus is comprised of 41 species (14 in the N.T.) of nocturnal, terrestrial or fossorial skinks with elongate bodies, which exhibit various degrees of limb and digit reduction. Fossorial species could be uncovered by raking through the soil beneath objects on the ground.

Lerista borealis Storr, 1971. Max. S.V.L. 50mm. A fossorial species displaying a reduced limb condition (Plate 4), with 2 digits on each forelimb and the hindlimbs with 3. Found under a variety of objects such as logs, rocks and fallen termite mounds from floodplains to mesa plateaux, usually on a sandy substrate.

Lerista orientalis (De Vis, 1889). Max. S.V.L. 45mm. An uncommon species in the N.T. which possesses 4 digits on each limb and prefers thick leaf litter (Horner, 1985). Only 2 specimens of an undescribed subspecies were found, both in the same pitfall trap, among a small clump of trees in grassland on sandstone floodplain. Compare the location of Gregory National Park (Figure 1) with the distribution map of this species in Cogger (1983) for an example of the work still needed on the tropical Australian herpetofauna.

Genus *Menetia* Gray, 1845

A group of small, terrestrial, diurnal litter-dwelling skinks with 4 species found in the N.T. and 7 in Australia.

Menetia greyii Gray, 1845. Max. S.V.L. 38mm. A moderately common skink preferring dry habitats (Horner, 1985) which was recorded from riverine forest, sandstone floodplain and the drier limestone floodplain. Sometimes seen on open ground, away from the cover of leaf litter, but easily overlooked because of its small size.

Genus *Morethia* Gray, 1845

Small, terrestrial, diurnal skinks, 8 species occur in Australia (4 in the N.T.). The throat of the breeding males of most species is bright orange-red. (Storr *et al.* 1981).

Morethia ruficauda (Lucas & Frost, 1895). Max. S.V.L. 36mm. A glossy black skink with white dorsolateral and midlateral stripes and a bright red tail and hindlimbs. A small number of the subspecies *M.r. ruficauda* was seen among leaf litter and rocks at the base of a sandstone outcrop.

Genus *Notoscincus* Fuhn, 1969

Two species of these terrestrial, diurnal skinks occur in Australia (1 in the N.T.) and very little is known about their biology.

Notoscincus ornatus (Broom, 1896). Max. S.V.L. 39mm. The subspecies *N.o. wotjulum* (Glauert, 1959) is present in the region of Gregory National Park and was particularly common in the thick leaf litter of the riverine forest near our camp on the East Baines River. Any sizeable object, left on the ground for a few days, would reveal up to half a dozen small skinks when lifted, mostly this species and *Carlia foliorum*. *N. ornatus* was also recorded in lower densities in floodplain areas usually in the leaf litter associated with *Acacia* bushes and stands of trees.

Genus *Proablepharus* Fuhn, 1969

Very small, diurnal, terrestrial litter-dwellers, all 3 species found in Australia occur in the N.T.

Proablepharus tenuis (Broom, 1896). Max. S.V.L. 32mm. The smallest species of skink recorded on the survey, very hard to spot in the thick leaf litter it inhabits and subsequently difficult to catch. Only 11.3% of the skinks positively identified in quadrats were *P. tenuis* whereas this species represented 42.1% of the skinks caught in pitfall traps. Although many habitats were too rocky for their installation, pitfall traps probably provide a more reliable estimate of the abundance of this tiny lizard than that obtained searching large quadrats. This species was present in riverine forest and the savannah woodland and grassland of the floodplains.

Genus *Tiliqua* Gray, 1825

Large, heavily built lizards, familiar for their blue tongues, with 5 species occurring in Australia (3 in the N.T.) and one, *Tiliqua gigas*, in Papua New Guinea and Indonesia. Three former members of this group have been placed in the genus *Omolepida* (Storr *et al.* 1981).

Tiliqua scincoides (White, 1790). Max. S.V.L. 370mm. A common blue-tongued skink which inhabits a variety of habitats, preferring those with extensive ground debris (Horner, 1985). The northern subspecies, *T.s. intermedia* Mitchell, 1955, was observed during the day, by other zoologists driving through floodplain areas, and caught at night by the author in Darwin, in very warm, humid weather. This species is capable of moving surprisingly fast when disturbed and will try to bite when captured.

DISCUSSION

The estimates of the diversity and abundance of skinks given in this article are extremely coarse for a number of reasons. Reliable sampling techniques are very difficult to devise and are subject to large errors, even when comparing relatively stable (although structurally complex) environments such as rainforests (Inger, 1979). These problems were further compounded in Gregory National Park by the diversity of habitats and differences in their structural complexity and physical features. In addition, relatively small samples of each habitat were obtained during a limited period of the dry season, a time of reduced activity for many species. However, the

survey has succeeded in its aim of providing a data base for the formulation of a Park management plan, and for future work, and useful observations were made on numerous species which are still virtually unknown ecologically. A rough picture of the diversity and relative abundance of several skink species has been obtained and this will become more accurate with future investigations. An enormous amount of work remains to be done and the skinks alone would provide suitable subjects for many research projects. It is hard for European herpetologists, with just 5 skinks occurring in southern Europe (Arnold *et al.* 1978), to appreciate the numbers of the Australian Scincidae and the species mentioned here are but a small example of this stunning variety.

ACKNOWLEDGEMENTS

The author is indebted to the following for their encouragement and help in making the work possible:— Dr Bill Freeland and the staff and rangers of the C.C.N.T., Dr Max King of the N.T. Museum of Arts and Sciences, Eibleis Fanning and the Directing Staff, Venturers and Aboriginal tribesmen involved in Operation Raleigh Expedition 6A. Particular thanks are due to Paul Horner of the N.T. Museum for sharing his expert knowledge of skinks, the use of his excellent identification keys, his encouragement in the field and the hospitality he and his wife Judy showed me in Darwin.

Table 1. Taxonomic diversity of the main habitat types (figures derived from all sampling methods).

Habitat type	Amphibian Species	Reptile Species	Skink Species
Riverine	11	25	6
Sandstone Floodplain	—	31	12
Limestone Floodplain	—	15	8
Rolling Sandstone Hills	—	10	3
Rolling Limestone Hills	—	5	1
Mesa Slopes and Escarpments	2	16	4
Mesa Plateaux	—	17	6
Human Habitation	2	7	1

Table 2. Relative abundances of amphibian and reptile families (determined by quadrat sampling) expressed as percentages of the total numbers of individual animals recorded.

	Riverine Forest		Other habitats	
Family	Diurnal	Nocturnal	Diurnal	Nocturnal
Myobatrachidae	—	5.7	—	—
Hylidae	17.8	77.0	—	—
Gekkonidae	—	15.8	—	93.3
Pygopodidae	—	—	1.2	—
Agamidae	11.1	—	12.9	—
Varanidae	—	—	1.8	—
Scincidae	68.9	—	83.5	—
Boidae	—	1.5	—	2.2
Colubridae	2.2	—	—	—
Elapidae	—	—	0.6	4.5
Total percentage	100	100	100	100
Number of Quadrat Searches	14	7	62	31

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ADDITIONAL RECORDS OF BRITISH PLEISTOCENE AMPHIBIANS AND REPTILES

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INTRODUCTION

Several British Pleistocene sites have yielded herpetofaunas large enough to publish separately (Holman, 1985, 1986; Holman, Clayden, and Stuart, in preparation), but other sites have produced a few fossil herptile records that should be published. Moreover, sites previously published (Newton, 1894; Holman, 1985) have yielded new information. The purpose of this paper is to bring these new records to light. Fossils of this report are housed in the British Museum (Natural History) where Dr A. Milner kindly arranged for me to study in 1984 and again in 1986. A Research Initiation Grant from Michigan State University in 1984 and a United States National Science Foundation Grant (NSF BSR-851-5665) in 1986 supported my work in Britain.

MIDDLE PLEISTOCENE RECORDS

Hoxnian Interglacial Age — The Hoxnian is the last interglacial age of the Middle Pleistocene in Britain and follows the Anglian glacial age (Stuart, 1982).

Barnfield Pit, Swanscombe, Kent — The Barnfield Pit Hoxnian Site is where a very famous human skull was discovered. The stratigraphy, archaeology, and palaeontology of this locality was detailed by Ovey (1964). Stuart (1982) describes it as "..... a series of fluviatile gravels, sands, and silts occupying a broad channel cut by an early River Thames ....." BUFO BUFO LAURENTI — BM(NH) R-8985: the posterior part of an appendicular skeleton in a block of sandy matrix (both ilia preserved) from SC71, TRC3, LL. — BM(NH) R-10172: a right ilium from SC70, BILG, No. 143. Holman (1985) has given osteological characters for distinguishing *Bufo bufo* ilia from *Bufo calamita*. *Bufo bufo* occurs in the area today (Frazer, 1983).

Ingress Vale, Swanscombe, Kent — The Ingress Vale Hoxnian Site is important because of the record of *Emys orbicularis* from the locality (Stuart, 1979, 1982). The Ingress Vale sediments appear to have been deposited in the same manner as the Barnfield Pit material above. NATRIX NATRIX LINNAEUS — BM(NH) R-8286: three vertebrae. Szyndlar (1984) and Holman (1985) give characters for distinguishing the individual vertebrae of *Natrix natrix*. This species is found in the area today (Frazer, 1983).

Remarks on Published Hoxnian Herpetological Records — At present, the total published records of Hoxnian amphibians and reptiles are as follows: *Bufo bufo* (this paper, Barnfield Pit, Kent): *Bufo* or *Rana* (Stuart, 1982, Ingress Vale, Kent); *Emys orbicularis* (Stuart, 1979, 1982, Ingress Vale, Kent); and *Natrix natrix* (this paper, Ingress Vale, Kent). Considering the rich Hoxnian mammalian fauna which has such exotic species as monkey (*Macaca*), elephant (*Palaeoloxodon*), lion (*Panthera leo*), and rhino (*Dicerhorhinus*), the herpetofauna is surprisingly depauperate.

LATE PLEISTOCENE RECORDS

Flandrian Interglacial Age — The Flandrian interglacial age is defined as the period after 10,000 radiocarbon years before the present. (Stuart, 1982). It is the time period frequently called the Holocene in World Literature.

Dog Holes, Warton, Lancashire — The herptiles from the Dog Holes Flandrian Site are all from the J.W. Jackson Collection that was presented to the BM(NH) in 1910. BUFO BUFO LAURENTI — BM(NH) R-8983: three right ilia — BM(NH) R-8985: a sacral vertebra. Bohme (1977) has given characters for distinguishing the sacra of various European species, including *Bufo bufo*. The species occurs in the area today. A minimum number of three individuals is indicated by the three right ilia. RANA TEMPORARIA LINNAEUS — BM(NH) R-10185: 16 right and 14 left ilia — BM(NH) R-8982: five maxillary fragments. Bohme (1977) and Holman

(1985) have given characters for distinguishing the ilia of *Rana temporaria* from other British and European species. This species occurs in the area today (Frazer, 1983). A minimum number of 16 individuals is indicated by the 16 right ilia. ANGUIS FRAGILIS LINNAEUS — BM(NH) R-8987: a mass of osteoderms — BM(NH) R-9299: one Maxillary fragment; one right dentary; 10 vertebrae. Holman (1985) discussed the identification of isolated osteological elements of *Anguis fragilis*. The species occurs in the area today (Frazer, 1983). A minimum number of one individual is indicated. NATRIX NATRIX LINNAEUS — BM(NH) R-8986: a vertebra. The species occurs in the area today (Frazer, 1983). A minimum number of one individual is indicated. The Dog Hole Flandrian Herpetofauna is a depauperate *"Rana bufo"* assemblage as is the Flandrian Cow Cave, Chudleigh, Devon, herpetofauna (Holman, 1986). *Rana*, however, is the dominant species in the Dog Holes fauna (Fig. 1), whereas *Bufo* is the dominant one in the Cow Cave fauna.

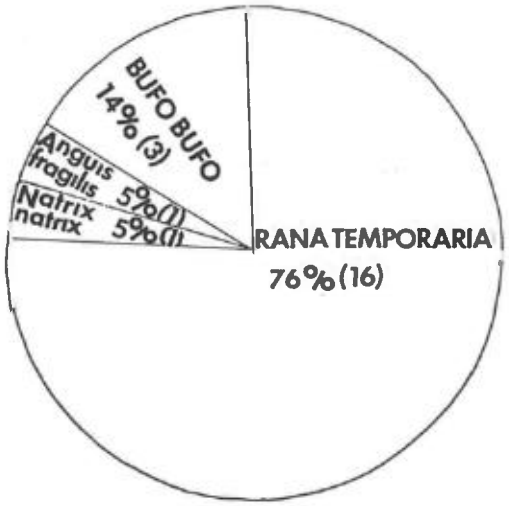

Figure 1. Pie graph indicating the minimum number of individuals and rounded percentages of minimum numbers of individuals of the depauperate Flandrian *"Rana-Bufo"* fauna of Dog Hole, Warton, Lancashire.

Bathford, near Bath, Somerset — The Bathford Flandrian records are from material presented to the BM(NH) by Mrs Joseph Ward in 1859. BUFO BUFO LAURENTI — BM(NH) R-10205: one right ilium. The species occurs in the area today (Frazer, 1983). RANA TEMPORARIA LINNAEUS — BM(NH) R-10203: a pelvis with both ilia preserved. The species occurs in the area today (Frazer, 1983).

Netteswell, Essex — This record is from material purchased from the A.S. Kennard Collection in 1949 by the BM(NH). RANA TEMPORARIA LINNAEUS — BM(NH) R-10202: three left and five right ilia. The species occurs in the area today (Frazer, 1983).

Happaway Cave, Torquay, Devon — These Flandrian records are all from a collection purchased by the BM(NH) in 1896 from Mrs Pengelly. BUFO BUFO LAURENTI — BM(NH) R-10204: left ilium — BM(NH) R-4314: two sacral vertebrae. One of the sacral vertebrae is fused to the following one. The species occurs in the area today (Frazer, 1983). RANA TEMPORARIA LINNAEUS — BM(NH) R-10201: one sacral vertebra. The species occurs in the area today (Frazer, 1983). NATRIX NATRIX LINNAEUS — BM(NH) R-4314: one vertebra. This snake is present in the area today (Frazer, 1983).

Ightham Fissures, Near Sevenoaks, Kent — Holman (1985) dscribed this Flandrian site which yielded a large fossil herpetofauna. Holman (1985) that the herpetofauna represented a time early in the Flandrian when the climate first became as warm as it is in southern England today. *Triturus* sp. listed by Holman (1985) is now identified to species. TRITURUS HELVETICUS (RAZOUMOSKI) — BM(NH) R-4736: a partial skeleton of a single individual. This specimen is

assigned to species on the basis of skull characterers (see Arnold and Burton, 1980, p.21). The otic capsule separates the parietal and squamosal in *Triturus vulgaris* and *Triturus helveticus*, but the parietal and squamosal are in contact in *Triturus cristatus*. The anterior end of the otic capsule, however, is wider in *Triturus helveticus* than in *Triturus vulgaris*. The fossil skull resembles *Triturus helveticus* in these characters. *Triturus helveticus* occurs in the area today (Frazer, 1983).

COMMENTS

The two British Middle Pleistocene species reported above represent extant forms that occur in Britain today. Nevertheless, several unpublished British Middle Pleistocene sites have yielded exotic species derived from continental northern Europe (Holman, Clayden, and Stuart, in preparation).

All of the British Flandrian sites reported here and elsewhere (Newton, 1894: Holman, 1985), with the exception of the Mundesley, Norfolk Site, which yielded *Emys orbicularis*, have produced extant forms that occur in Britain today. Unlike North America, which had a vast southern rservoir of herpetological species in the Pleistocene, Britain was able to derive her herpetofauna only from the limited northern European fauna available during the temperate interglacial stages. The new records presented here do nothing to change that picture.

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NATTERJACKS AT SELLAFIELD

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"Sellafield" is not a place that many people associate with nature conservation but over the last ten years British Nuclear Fuels plc, who own the site, have been actively involved with the conservation of Natterjack toads. This article is an account of the success of these efforts and of future plans for the conservation of this attractive amphibian on the site.

More than ten years ago a small group of interested people in Seascale started a local group of the Cumbria Naturalists' Trust and at the first meeting the discussion turned to West Cumbria's only protected amphibian, the Natterjack. Mention was made of a breeding colony on land close to the village and, on further investigation, this was found to be a thriving colony of approximately one hundred adults and thus one that had a good chance of survival given reasonable help.

Soon after its "discovery" it was found that the land it occupied belonged to BNFL, the firm well known for operating the Sellafield nuclear fuel reprocessing factory. It was also found that BNFL were planning to build a footbridge over the River Calder to replace an existing one that was in danger of collapse. Part of this development was to divert the New Mill Beck which fed the toad's breeding pools and to fill in the pools themselves.

The Senior Management of the Company were approached and agreed to delay the bridge building from May to October to allow the toads to have left the vicinity and gone into hibernation and also to dig new pools for them to breed in. This was completed during the winter of 1975/6 and the new pools were used successfully the following spring.

Unfortunately the rerouting of the Beck caused problems with the water level over the succeeding years such that once or twice pools dried out prematurely and stranded tadpoles before they reached metamorphosis. These problems were minimised by the use of sandbags filled with a mixture of sand and cement supplied by BNFL that were used to create temporary dams during the spring and early summer each year. The dams were breached in about August or September to allow the water to drain and let the pools dry and to reduce the risk of flooding in the winter.

These dams were never very satisfactory and during the winter of 1983/84 an agreement between BNFL and the North West Water Authority was reached whereby the NWWA designed and built a dam using materials provided by BNFL. This dam was altogether a much grander affair consisting of four steel girders sunk vertically into the sand in a line across the mouth of New Mill Beck close to its junction with the River Calder. Oak planks were slid in between the girders to produce a wall that was then waterproofed using plastic sheets. The height of the top of this dam was carefully chosen to give a satisfactory level of water in the Beck whilst not risking flooding on the Seascale Golf Course up stream of the toads' pools. Again this dam was dismantled by removing the planks in the autumn and rebuilt the following spring.

In 1977 a public enquiry was held into BNFL's planning application for a major expansion of their facilities which came to be known as THORP. After acceptance of these plans a number of smaller applications were submitted for other work including the use of some waste land for the storage of spoil dug from the construction sites. These spoil heaps were designed to make use of the land occupied by the toads by engineers at the Company's Head Office in Warrington who were unaware of the toads' existence. Luckily it was spotted, and following a warning to the Nature Conservancy Council, an objection was made and the application rejected until the toads had been taken into consideration. The engineers then entered into detailed discussion with the BHS and a revised design that made the spoil heaps higher but ensured that they did not come close to the Beck or the pools was accepted.

During 1985 the Company decided that they needed to improve the rail access to the site and that the best route for this lay across the toads' land. This time consultations between the BHS, the NCC, the NWWA and BNFL's engineers were held right from the beginning and it was decided that a major development should be undertaken that would safeguard the toads' habitat permanently instead of having to make different arrangements every few years. This has resulted in part of the Beck being diverted under the railway-line to the seaward side and making a new channel for it to run down to a confluence with the Calder. Adjacent to this new stream two large pools were to be built with stop-logs to allow the water to flow into them from the stream and which could be used to adjust levels as and when needed. A further stop-log was also to be built downstream of the two pools to aid water level control. On the inland side of the railway large culverts were to be built to take the flood water from the Beck straight to the Calder and thus prevent flooding both of the new pools and upstream as had happened in the past. The total budget for this work, including the preparation of the new rail access was placed at £1M with a substantial proportion of that being due to the work directly for the toads.

Probably the most important feature of this work to the readers of this article is the fact that an agreement has been reached between the Conservation Committee of the BHS and BNFL allowing the Society to manage this new breeding area as a nature reserve. It has all come at an opportune time as in recent years the pools on the inland side of the railway-line had become thickly vegetated. This problem will have to be carefully controlled in the new pools on the nature reserve. The old pools resulted in improved reproductive success for this toad colony, and as a result it is now very easy to find large numbers of juvenile and young adult toads around the pools and on the adjacent golf-course. At the same time the other commoner anuran species have succeeded in establishing larger populations at the site. Up until the early 1980's Common Toads were rather rare in the New Mill Beck pools, but in 1984 about 50 pairs were observed spawning in the pools. The first Common Frogs were found there in 1986. These commoner anurans can out-compete Natterjacks in the tadpole phase, and were starting to be a cause of concern. Experiments over the past two years have shown that if the pools are not flooded until late May the Natterjacks still spawn in large numbers, while the Common Toad and Frog are unable to spawn at all, of course. It is intended to manipulate the water levels like this so that Common Frogs and Toads are able to breed only every other year. This way it should be possible to build up large populations of all three amphibian species.

The Beck has now been re-routed and the breeding pools created for the 1987 season. Before the old site is completely developed an attempt will be made to remove any remaining animals. The remaining terrestrial habitat will then be returned to a condition suitable for Natterjacks.

A public footpath runs across the reserve which BHS members are, of course, free to use. Access to the Natterjack breeding pools is restricted, however and possible only on issue of a permit from the voluntary reserve warden Roger Asquith, c/o BNFL Sellafield Works, Seascale, Cumbria.

BHS members can find the reserve by walking along the coast heading north from Seascale, or by crossing the Seascale Golf Course using the public footpath. Alternatively it is possible to drive almost all the way to the reserve leaving the A595 at Calder Bridge and driving to Sellafield railway station.

THE CARE AND BREEDING OF COMMON BRITISH REPTILES AND AMPHIBIANS
PA RT VI — THE SLOW WORM *(ANGUIS FRAGILIS)*

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INTRODUCTION

The Slow Worm (*Anguis Fragilis*) is also known as the blindworm, but both these appellations are inappropriate for this species is neither slow in its movements, blind or even poor-sighted. It can move through long grass or burrow into light soil with surprising speed and is keen-sighted enough to spot intended prey or potential predators from several feet away.

It is rather secretive by nature, being often overlooked in areas where it is reasonably plentiful. Perhaps this is fortuitous for the slow worm as it is still occasionally killed when encountered in the mistaken belief that it is a venomous snake. Although it is in fact a limbless lizard it does superficially resemble a serpent, an attribute which has been the main reason for widespread persecution in the past.

Wood (1865) informs us that "according to popular notions, the blindworm is a terribly poisonous creature, and by many persons is thought to be even more venomous than the viper whereas it is perfectly harmless, having neither the will nor the ability to bite, its temper being as quiet as its movements, and its teeth as innocuous as its jaws are weak. The origin of this opinion may be found in the habit of constantly thrusting out its broad, black, flat tongue with its slightly forked tip: for the popular mind considers the tongue to be the sting, imagining it to be both the source of the venom, and the weapon by which it is injected into the body and so logically classes all creatures with forked tongues under the common denomination of poisonous".

More than 120 years on, there are, unfortunately, some who still subscribe to these beliefs. Anyone examining a slow worm carefully would note that its movements are altogether stiffer, less supple than a snake and that it possesses eyelids which snakes do not.

DESCRIPTION, DISTRIBUTION AND HABITAT

Slow worms average 40-45cm in overall length when fully grown although some specimens may attain 50cm. Adult males are fairly uniform in colour above and on the sides; brown, grey, reddish or coppery, occasionally with blue spots. The underside is usually greyish with dark grey or black mottlings.

Females frequently have a dark brown or black vertebral stripe; the sides are dark and often flecked or striped dark brown or black. The underside is usually black. Males have larger heads than females. In both sexes the scales are very smooth, the individual scales quite small in size.

The range of the slow worm is extensive, almost the whole of Europe with the exception of South Iberia, Ireland and North Scandinavia. It is also found eastwards as far as the Ural Mountains, in South-West Asia and North-West Africa. It is fairly widespread in the U.K., being most numerous in the south and south-west of England. In north and east England it is less plentiful and in many parts of Scotland local.

The slow worm likes well vegetated areas with good ground cover. It favours a range of habitats: heaths, commons, hedgerows, pastures, open woodlands, gardens, scrub-land and railway embankments. It may occasionally be found basking in the sun especially during spring, but is more likely to be discovered under sun-warmed objects such as flat stones or sheets of discarded iron. It can also be found under piles of rubble or scree, in dry stone walls and even among the crumbling and fallen gravestones in churchyards.

In late summer gravid females can be observed basking in the open; this assists incubation of the developing eggs inside her body.

CARE IN CAPTIVITY

Accommodation

Slow worms can be kept successfully outdoors in a walled enclosure or under glass in a greenhouse or cold-frame. If the former mode is used, a good layer of soft soil must be provided to a depth of at least 50cm to enable the slow worms to burrow down a sufficient depth to escape winter frosts. The enclosure should be covered with netting to prevent predation by cats or large birds.

If a greenhouse is used it must be well ventilated as slow worms do not like excessive heat. A cold frame is probably the best form of outdoor housing; it can be set up and maintained in exactly the same way as I described for keeping viviparous lizards in my previous article.

Slow worms enjoy burrowing in soft soil, spending much time with just their heads protruding; in captivity they will quickly make a network of underground tunnels. Within a short space of time they will become confiding enough to allow gentle handling, weaving themselves around the fingers to gain anchorage.

By contrast a wild slow worm when first caught will thresh wildly about, quite often voiding the contents of its cloaca. Males will sometimes extrude their penes. The tail will be readily shed (the specific name, "*fragilis*" refers to this propensity). It regenerates but as little more than a stump.

Feeding

The slow worm is inordinately fond of slugs, particularly the small, greyish-pink garden slug, *Agrolimax agrestis*. When this species is in plentiful supply all other prey is likely to be ignored. Other types of slug will be eaten when *A. agrestis* is not available and earthworms, leatherjackets (crane-fly larvae), maggots, spiders and small snails will also be taken but usually with little relish. I have found that some specimens will eat mealworms while others will refuse them completely.

Slugs or earthworms offered can be occasionally dusted sparingly with multi-vitamin powder to provide all the necessary nutritional requirements.

Periodically during the year food will be refused; in a healthy slow worm this is a sure sign it is about to slough its skin. After this has occurred feeding will recommence.

Breeding

This is not difficult even in a fairly small vivarium; mating takes place during late April, May or June. Males will fight during this time and can inflict serious injuries upon each other in confinement, so it is best to keep one male with several females or at least segregate the males during mating time.

When the females become noticeably gravid it is advisable to remove them to a nursery vivarium, smaller than the main accommodation but furnished in a similar way. They can then give birth unmolested by the males after which they can be returned to their permanent quarters leaving the young in a safe environment.

The slow worm is ovo-viviparous, giving birth to an average litter of 6-12 young in late August, September or early October depending on the warmth or coolness of the summer. The young are born in a protective membrane which they rupture and escape from either at birth or a few minutes aftewards.

They measure 65-90mm in overall length; the dorsal colouring is quite variable, pale golden brown or light yellowish, greenish or silvery. The sides of the head and body and the undersides are jet black. There is a small black parietal spot just behind the eyes which is continued as a stripe down the middle of the back to the tip of the tail.

New born slow worms are very lively little creatures which appear to enjoy burrowing into soft soil even more than the adults. I have experienced difficulty in rearing them in captivity because I can never seem to find enough tiny slugs and earthworms. However, I have partially overcome this problem by introducing a handful of garden compost into their vivarium every day. This provides many small invertebrates for the baby slow worms as well as providing an excellent

flooring medium which retains a certain amount of heat. This is beneficial to the baby slow worms which love to burrow into this warmth, there to remain for long periods.

Fruit flies, whiteworms, baby mealworms and hatchling crickets were all ignored by my baby slow worms but small spiders and caterpillars captured by grass-sweeping were accepted, albeit rather reluctantly. The same slug, *Agrolimax agrestis* was as much relished as it was by the adults.

I never try to raise more than 3 or 4 young at a time; the remainder are released on a nearby railway embankment.

Hibernation

During the latter part of October, activity will slow down and the slow worms will cease feeding. They will shortly disappear from view burrowing into the soil for the duration of the winter often using a communal hibernaculum as they do in the wild.

They will re-appear the following year about mid-March; actual dates will, of course, vary with temperatures outside. It may well be a week or two after emergence before they start feeding. Water for drinking is very important at this time of year.

Conclusion

The slow worm is an interesting and unusual lizard which will live happily for many years in captivity, breeding readily if the correct conditions are provided. Young slow worms are comparatively difficult to rear in confinement unless enough tiny slugs or very small earthworms can be provided. It is therefore not advisable to attempt raising more than a small number at once. Slow worms can be safely housed with viviparous lizards, wall lizards and small amphibians such as *Bombina variegata.*

All our native herptiles are under threat due to the rapid changes taking place in their environment by man's activities. The situation is likely to become far worse in future years as increasing pressures are exerted on the resources of our small and very overcrowded island.

Responsible herptile keeping, where surplus offspring are used to boost existing wild colonies or to pioneer new ones can go a long way to ensure the continued survival of our indigenous herptiles for future generations to see.

Footnote

I have not included the adder (*Vipera berus*) in the series of articles although it is our most widespread British snake. Its care in captivity is realistically beyond the scope of the average herpetologist and best left to zoological institutions or specialist breeders.

Jones (1985) adequately described the stringent legal requirements for keeping this species in captivity, which I feel sure is enough to deter all but the most determined individual.

The Grass snake (*Natrix natrix helvetica*) is rather more difficult to maintain in captivity than any of our common amphibians or lizards. It is also under intense pressure in the wild due mainly to changes in land usage. However, to complete the series an additional article on keeping grass snakes with the emphasis on conservation will appear in the "Bulletin" soon. I am indebted to Marcus Langford of the BHS Conservation Committee who has agreed to co-write this article with me.

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EXPLOITATION OF TORTOISES IN EASTERN EUROPE

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Problems concerning the conservation of Mediterranean tortoises (genus *Testudo* L.) have been highlighted by Lambert (1984), but little information was presented on the situation in Eastern Europe.

Many amateur herpetologists from Hungary and elsewhere in Eastern Europe, mostly secondary school students, make private visits to the Balkan peninsula, especially Bulgaria, during their summer vacations to collect amphibians and reptiles. Apart from lizards and such relatively scarce snakes as *Eryx jaculus* and *Elaphe situla,* many take home a large number of tortoises, *Testudo graeca ibera* and *Testudo h. hermanni,* both of which occur throughout much of Bulgaria (Beshkov, 1984). Juveniles are mostly collected for they are easier to transport than big, mature adults. A small proportion of the tortoises are retained in a terrarium or given as gifts to friends and relatives, but the greater proportion enter trade and are for sale in pet shops. An estimated 500-600 tortoises enter Hungary in this way annually, brought in by amateurs from Bulgaria, and this figure is increasing. Hungarian dealers pay 200-500 forints (£3-8) per specimen and sell them off at 300-800 forints (£5-12). To give some indication of the relative cost of these creatures, an "average working man's" mean monthly income in Hungary is about 5200 forints (£80). Referring to the red-eared terrapin, *Chrysemys scripta,* which is heavily exploited in the U.S.A. (Warwick, 1986) and exported, a retailer recently visiting the University of Veterinary Sciences in Budapest said that it was in his interest financially to allow turtles to perish at the buyer's home as quickly as possible so that the child for whom the creature is a pet will whimper to his parents to buy another as a replacement. Although referring to *Chrysemys picta,* the same probably applies to tortoises. Most of the dealers therefore do not provide proper information on their correct care and breeding. This attitude is probably confirmed for, as a result, many amateurs make visits every day to Dr M. Janisch, an authority at the Department of General Zoology and Parasitology (University of Veterinary Sciences, Budapest), bringing with them their pet tortoises in an extremely weak condition. This is large due to their being kept in unsuitable conditions and provided with inappropriate food.

Attention has been drawn to the decline of tortoises in Bulgaria by Dr Vladimir Beshkov (Zoological Institute, Bulgarian Academy of Sciences, Sofia) — mainly due to increasingly intensive agriculture (Beshkov, 1984) — whom is aware that despite protection, many tortoises and other reptiles are being exported illegally to other Eastern European countries (German Democratic Republic, Czechoslovakia, Hungary). In his paper, he makes the plea that the "protection of tortoises should be intensified by raising public awareness on their status as protected animals (under an ordinance 128/1981 by the State Committee on Environmental Protection) and discontinuing illegal collection by poachers and tourists". In other words, existing regulations should be made more publicly known and enforced. Dr Beshkov has produced and distributed a poster against the illegal export of tortoises from Bulgaria.

The importation of tortoises to Hungary by amateurs began in the early 1980s, but unfortunately, Hungarian Nature Protection Laws, prohibiting trade, only apply to Hungarian species of herpetofauna. They do not regulate the entry of amphibians and reptiles from outside. However, since Hungary has been a signatory of the Washington Convention (CITES) since 1985, trade in internationally protected species is officially prohibited there as well. Somewhat regrettably, there is no real control on the conditions of transporting, keeping and selling animals.

ACKNOWLEDGEMENTS

I would like to express my gratitude to Dr V. Beshkov for providing information on the situation for reptiles in Bulgaria and to Dr M.R.K. Lambert for his valuable comments for the preparation of the manuscript.

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CAYMAN TURTLE FARM

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The Cayman Turtle Farm (CTF) was originally established in Governor's Creek on Grand Cayman Island in 1964. The Farm's founders envisioned providing reliable supplies of inexpensive sea turtle products, such as turtle steaks, soup and jewellery. To this end, over 378,000 turtle eggs and nearly 100 adult turtles were brought into the Farm from the wild.

In 1975, however, Mariculture Ltd, the company running the Farm, went bankrupt. In 1976, a German couple and the Cayman Islands Government purchased the Farm and moved it to a series of land-based concrete and fibreglass tanks. Over the next three years, the Farm imported another 91,000 eggs and 117 adults. By August 1978, there were 63,000 sea turtles swimming in the tanks and exports (primarily to the United States) were expanding.

In meetings with IUCN in 1975, the Farm's Research Manager, Dr James Wood, stated that the Farm planned to be independent of wild populations of sea turtles., i.e. to be "self-sufficient", by 1980. This was meant to counter rising criticism that the Farm would have to depend upon wild sea turtles to meet its production goals.

At the time, the Farm's target of slaughtering 13,000 turtles each year depended exclusively upon hatchlings produced by the imported wild adult sea turtles or from the imported eggs. Their projection was that by 1980, they would have switched to the hatchlings produced by the "farm raised" turtles, i.e. eggs brought in from the wild, hatched and raised on the farm.

As more experience was gained, the projections were lowered. However, the Farm was to fall far short of these revised projections even, and by 1980, it was clear that the Farm was still depending upon production by the imported adult turtles for more than 97 percent of its slaughter needs.

CTF AND CITES

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) regulates international trade in endangered and threatened species. All species of sea turtles are currently listed on Appendix I of the treaty. Appendix I is reserved for those species most in danger of extinction and, therefore, most threatened by international trade. Only Appendix I animals that have been "bred in captivity for commercial purposes" may enter international trade with the endorsement of CITES.

At the Second Meeting of the Conference of the Parties in Costa Rica, the exact meaning of "captive-bred" was determined by the Parties in a resolution known as "Conf. 2.12". This resolution limited trade in "captive-bred" specimens to those that had been born in captivity to parents that mated in captivity. Furthermore, the breeding programme had to be capable of reliably producing offspring of the F2 or second generation. This would ensure that a captive operation would be truly self-sufficient and not be dependent on continued additions from the wild. It is clear that the intention of the Parties was that the eggs collected in the wild and hatched and raised in captivity were part of the parental generation and not F1. When Conf. 2.12 was being drawn up, it was done very much with CTF in mind. The UK delegation did not register any protest at the time.

At the Fourth Meeting of the Parties, at the instigation of the UK, a draft resolution, Doc.4.45 Annex, entitled "Captive Breeding and Long Maturing Species", concerning farming of long lived animals, was considered by the Technical Experts Committee (TEC). John Goldsmith, head of the UK delegation and Chairman of TEC, strongly supported the resolution, arguing that until captive breeding is achieved, limited trade in these species should be allowed. The resolution was opposed by a number of countries, on the grounds that Conf. 2.12 had been adopted after much deliberation and careful consideration and that it would go against the principles of Conf. 2.12. Eventually the Parties decided to refer Doc. 4.45 back to TEC as a "diplomatic" form of rejection.

As the Fifth Conference of the Parties approached (held in Buenos Aires in April 1985), the Farm was no nearer producing any F2 generation turtles, let alone reliably doing so, as called for in Conf. 2.12. The UK Government decided that the simple solution was to call the Farm a ranch, and have it governed by Conf. 3.15 instead.

In 1979 the Parties felt that rather than adapt, (and consequently badly distort) Conf. 2.12 to deal with ranching as well as farming, it would be preferable to address the issues separately. Thus Conf. 3.15 was drawn up in 1981 to deal with ranching. The essence of Conf. 3.15 is that a population of an Appendix I species may be transferred to Appendix II for ranching purposes (and commercially traded), as long as the ranching operation conforms to the following standards:

the operation must be primarily beneficial to the conservation of this population,
the products of the operation must be adequately identified,
the operation must have no significant detrimental impact on the wild population,
the operation must be biologically and economically successful.

The UK Government felt the Farm satisfied all the requirements of Conf. 3.15 and submitted a proposal to transfer the CTF population of green turtles to Appendix II for ranching purposes. The CITES Secretariat opposed this proposal on the grounds that Conf. 3.15 was designed to apply to wild populations of Appendix I species and not to operations such as the Cayman Turtle Farm. The Secretariat suggested that the UK Government submit a Special Resolution calling for an exemption for the Farm from the F2 requirements of Conf. 2.12. This they did, but left the ranching proposal in for good measure.

At the meeting in Buenos Aires, both of the UK proposals (and the ranching proposals of Indonesia, Surinam and France) were rejected by the Parties.

The Parties believed that any such legalisation of trade in turtle products would have severe detrimental effects on wild turtle populations. The ranches would not be able to replace wild turtle products on the markets as claimed, but would merely stimulate new ones such as the former large market of the USA, and the flagging market of the EEC.

In the particular case of CTF, the Parties agreed with the Secretariat that it was not appropriate to call the Farm a ranch under Conf. 3.15. The Special Resolution was rejected for the above reasons, and on the grounds that it was not a desired precedent to deal with an uplisting or delisting of a species by a Resolution and not a Proposal. (Resolutions only require a clear majority, whereas Proposals have the in built safety-net feature of requiring a two-thirds majority. Usually any movement of a species from one Appendix to another is done through such Proposals.)

In some ways, however, these were merely peripheral reasons why the CTF proposal and resolution were rejected. The fundamental reason was that from the production figures submitted by the Farm, it was quite apparent that the Farm was not successful in reliably producing F1 generation animals, let alone F2. Biological success (and concomitantly, economic success) is a fundamental requirement in CITES for all farming and ranching operations. CTF quite clearly did not fulfil these requirements.

ANALYSIS OF CTF PRODUCTION FIGURES

The current number of turtles held at the Farm is approximately 22,000, of which 283 are used for breeding. (The figures used are taken from the UK ranching proposal submitted in Buenos Aires, so will be slightly out of date. When approached for the latest figures, the CTF refused to give Greenpeace this information.)

The breeders are divided into the following groups: 88 purchased from various countries in the Caribbean (CWO), 96 purchased from Mexico (MEX), 59 were raised from eggs collected from the wild (FR), and 40 from eggs conceived and hatched in captivity (FRC). (Only the offspring of this last group will form the F2 generation).

For the eggs collected from the wild, the average hatch rate was approximately 70%. Limited studies have shown the hatch rate to be 80-90% for nests in the wild. For adults collected from the wild, the hatch rate of eggs conceived in captivity drops to an average of 35% for CWO animals and 32% for the Mexican animals — half that of the wild-collected eggs. The hatch rate

of the farm-raised turtles drops to 9.6% and down to 7% since 1978 when they began nesting in appreciable numbers. The true F1 generation animals (FRC) have only had two turtles nesting in 1984 and 1985, and none of the eggs have yet hatched.

Equally of interest is how many of these turtles survive to slaughtering age (usually 3 to 4 years). The Farm provides data of animals surviving to one year, expressed as a percentage of animals hatched. For a measure of overall productivity it is also important to know the proportion of all eggs laid which hatched and survived to one year. For captive wild adults, the average percentage of hatchlings reaching one year is 32%, (3099 animals), but is only 10% of the total number of eggs laid. Since 1978, 22% (116 individuals) of the hatchlings of the farm-raised turtles survived to one year. This is 1.4% of the overall number of eggs laid. (See Table 1.)

In their ranching proposal at the 1985 Meeting of the Parties, the Farm stated that it expected to produce at least 10,000 hatchlings per year from the Captive Wild Stock breeders, which should provide sufficient time for the problems associated with the farm raised animals to be solved. "Assuming a mortality of 50% and 10,000 hatchlings per annum, production of 5,000 animals for processing per annum is expected" (Doc. 5.44 Annex 3).

However, as Fig. 1 illustrates, such a level of productivity is highly unlikely. After approximately 3 years, the mortality of age class C8 was 84.3%; for the age class C9, it was 97.7%; and for the age class C10, it was 60.7%. (Age class C8 assumes a harvest of 500 animals).

A detailed analysis of the productivity of the farm raised turtles shows that they are unlikely to be able to replace the captured wild adults as their productivity declines. Since 1978, the maximum number of off-spring for farm raised turtles of any age class to survive to one year has never been more than 210 animals.

Furthermore, the overall productivity of farm raised animals measured by the number of hatchlings surviving to one year, and expressed as a percentage of the number of eggs laid, never exceeded 3.3%. This would mean that even under optimum conditions, 150,000 eggs would have to be laid to achieve economic viability. To date, the maximum number of eggs laid in any year is only 13,212.

UK FLOUTS CITES: CONTINUES IMPORTS OF CTF PRODUCTS

The UK Government have always maintained that they will not sign a Convention that they do not intend to abide by, unlike so many other countries. It is, therefore, difficult to understand why products from CTF are allowed to be imported into the UK, and subsequently laundered throughout Europe, under a captive bred exemption.

The British Government's argument that Conf. 2.12, as a subsequent resolution, is not part of the actual CITES agreement and therefore is not binding, is specious. Although a strict legal interpretation would confirm the UK's position, it was clearly the intention of the Parties through Conf. 2.12 to clarify what was meant by "bred in captivity" in the original agreement. This clarification has not changed the original agreement, merely solved the problem of differing interpretations. A Court of Law would clearly look at Conf. 2.12 for guidance as to the real intention of the Parties.

For the UK Government to continue to insist that CTF's "farm raised turtles" are captive bred, is a flagrant breach of CITES. This breach, allowing the sale of "illegal" products throughout Europe, undermines any attempts by Britain to improve the EEC's tarnished image within CITES. Thus their CTF policy seriously weakens any attempts by Britain to be an active party in the monitoring and enforcement of CITES.

CONCLUSION

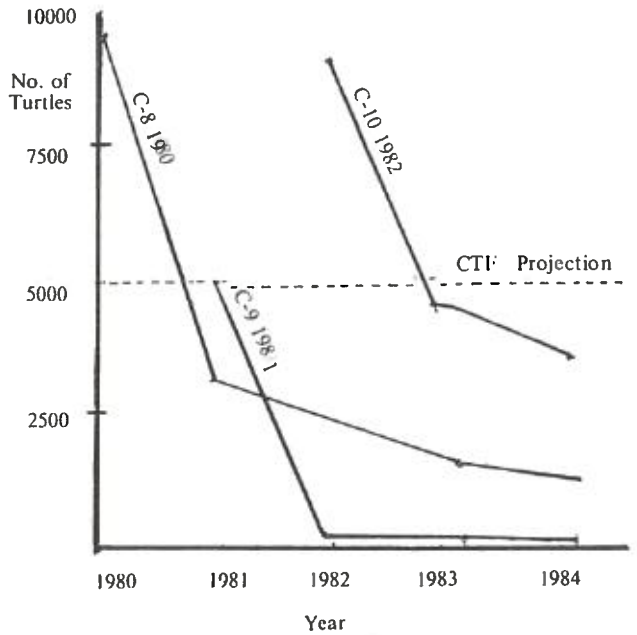
It is beyond dispute that the intention of the Parties is that any farming or ranching venture must not constitute a continuous drain on wild populations. It was for this reason that the F2 requirement for farming wild populations was introduced.

From the analysis of the Farm's productivity, it is equally clear that CTF has only been able to continue as a result of the original adults imported from the wild. If the original decision had been only to import eggs laid in the wild, the Farm would have had to close long ago.

There can be no clearer signal to the UK Government than the decisions concerning Conf. 2.12 and CTF taken at the last two Meetings of the Parties. If Britain persists in its endeavours to by-pass the will of the Parties, and raise this issue again before the Farm reliably produces F2 generations, or continues to import CTF products, it will seriously tarnish the UK's image as a responsible member of CITES.

In Buenos Aires, the Secretariat heavily criticised the EEC for its failure to adequately implement CITES. The underdeveloped countries will have no incentive to fully implement CITES when the example of the EEC remains so bad.

Fig. 1. Survival of age classes, C-8, C-9 & C.10.



N.B. C-8 assumes a harvest of 500 animals

Table 1. Productivity of Farm-Raised Turtles

Year	Eggs Laid	Numbers Hatched	Numbers Surviving to 1 year	% eggs laid surviving to 1 year
1978	4293	1159	143	3.3
1979	8462	604	210	2.5
1980	8861	370	72	0.8
1981	8928	25	0	0
1982	13212	74	25	0.2
1983	9271	546	59	0.6

Source Duc 5.44 Annex 3

CAYMAN TURTLE FARM REPLIES

Dr James R. Wood, Managing Director of Cayman Turtle Farm (1983) Ltd., makes the following comments in response to the above paper, "Cayman Turtle Farm", by Jeff Canin:

1. CTFL was originally established in Salt Creek in 1968 and moved to the land-based tank system in 1970-71. The farm was purchased in April 1983 by the Cayman Islands Government.

2. CITES is a treaty to control the trade in endangered and threatened species of wildlife not a treaty to prevent trade. There is absolutely no reason why the rational utilization of sea turtles under either CITES ranching or farming criteria should be anything other than beneficial to sea turtles. The fact that not a single turtle proposal was approved at the Buenos Aires CITES conference due to an intense lobbying effort by the various environmental groups represents a failure on the part of CITES to live up to its obligation for an objective, rational and non-emotional review of the proposals.

3. I would agree that at the present time the reproductive performance of the farm reared breeding stock on its own is inadequate to maintain a reasonable level of production. Obviously these problems must be solved or there is no long term future for turtle farming although turtle ranching would still be viable. I am hopeful that the problems will be solved but solutions will not be found by quitting at this stage.

4. While production has not been as great as we would like it has been sufficient to allow CTFL to release into Cayman waters some 14,421 green turtles during the past seven years. Of these 6,909 were yearlings while the remainder were hatchlings. Current evidence indicates that many of these turtles have survived and remained in Cayman while several tag returns have been received from Cuba. It is worth noting that captive females lay 2 to 5 times the number of eggs per season as do turtles in the wild.

5. Either through research done on site or through animals or materials provided to outside investigators, CTF has played a part in over 60 scientific papers enhancing the general knowledge of sea turtles. CTF was the first to successfully breed the green sea turtle in captivity. In 1986 CTF was the first to successfully breed the critically endangered Kemps ridley sea turtle. Much of this work could not have been done were it not for the facilities provided by a commercial sea turtle farm.

6. It is not for me to comment on the position taken by the UK Government regarding the products of CTFL. I would point out that the turtle farm was founded 5 years before the initial meeting of CITES. The last collection of eggs from the wild occurred in March 1978. For the past 9 years the farm has been totally independent of the wild. All products sold are derived from turtles which were conceived and reared in a totally captive environment and as such can only be referred to as captive bred.

CAYMAN TURTLE FARM (1983)LTD.

James R. Wood, Ph.D.
Managing Director
PO Box 645, Grand Cayman, Cayman Islands, British West Indies.

SOME RANDOM THOUGHTS ON HOBBYISTS

R.D. BARTLETT

ED. NOTE: This article was originally published in "Notes from Noah", the newsletter of the Northern Ohio Association of Herpetologists, XIV(6), 1987. Written in a North American context, its subject is nevertheless of more general interest and relevance, and for this reason it is reprinted here.

A few months ago I happened across a few lines in some publication that had been written by a curator of reptiles of one of our larger zoos. In this he admonished the private sector of collectors (of which I am one) for their (supposed) limited herpetological interests . . . their predisposition to collect mostly tricolors, giant serpents, albinos, or rarities and "oddballs" (this latter term a holdover from my tropical fish-collecting days). And as I read, I thought how incongruous this admonishment was and that maybe, just maybe, the curator was a little out of touch with at least SOME of the private sector.

There is no disputing that tricolors hold a great interest for many persons. Further, there is no denying the fact that many collectors dote upon some of the more seldom seen forms . . . or at least many were seldom seen until we in the private sector began producing them in large numbers. But is it the rarities alone that command our interest? I think not. I know, for instance, more persons interested in Scarlet Kings and Louisiana Milks (*Lampropeltis triangulum elapsoides* and *L.t. amaura*) than those who are holding out for Gaige's or Andean Milk Snakes (*L.t. gaigeae* and *L.t. andesiana*) . . . MANY more! And while the term "tricolor" is often reserved by hobbyists for the members of the *triangulum* and *mexicana* Kingsnake complexes, used in a broader sense it accurately describes a number of other species. Among these are some beautiful and lesser-known serpents . . . *Erythrolamprus* (a tricolored opisthoglyphid genus), *Aspedilaps* (the Coral Shield-Nosed Snake, *A. lugubris*, in particular) and *Leimadophis* (small, semi-aquatic colubrines) among others, all of which have their devotees.

And certainly there is nothing rare about Corn Snakes (*Elaphe g. guttata*). Through the efforts of the private sector these extraordinarily beautiful serpents are now available, and as importantly, easily affordable, in morphs that had not been dreamt of 15 years ago . . . and more phases, hopefully many more, are forthcoming. I truly believe that in another 15 years corns will be considered the guppy of the herpetological world . . . not, I hope, that they will be adorned with veil or trident-tails, but rather from the standpoint of color.

As far as albinos go, in many cases, it is that mutation, not the given species, that is "rare". How often have you heard anyone call the Sonoran, San Diegan or Pacific Gopher Snakes (*Pituophis melanoleucus affinis, annectens* and *catenifer*) rare? Or how about Plains Garters (*Thamnophis radix*) or Black Rats (*Elaphe a. obsoleta*)? And now, thanks to the efforts of the private sector, not even the various color mutations of these animals are uncommon.

Go into their habitat and try today to find a "good" Everglades Rat Snake (*Elaphe o. rossalleni*) or either of the *getulus* King morphs, the "Brook's" or the "Blotched" (*Lampropeltis g. floridana*. If given ENOUGH time you will undoubtedly find one or more specimens, but most will bear intergrade characteristics. However, thanks to the efforts of the private sector GOOD specimens . . . VERY good ones . . . of all three of the above are readily available.

While it is true that there are few among us of "advanced" status who routinely collect normally colored Eastern Garter Snakes (*Thamnophis s. sirtalis*), given the incentive of nominal financial return at least one north eastern hobbyist raises a substantial number of Red-Sided Garters (*T.s. parietalis*). His market? Not only beginning hobbyists in the states but also many collectors of advanced status in Europe.

Fortunately, interests vary as much by country as by individual. European hobbyists take at least as great an interest in our Garter and Water Snakes as we in the U.S.A. do in their Rat Snakes. Indeed, it seems little more than "human" to be interested more in something slightly more infrequently seen than a species that may be found in one's own back yard.

The private breeders are faced with a single unrelenting dilemma that is not as much of a problem in a zoo — space constraints. A zoo's reptile house may have 50 or more cages, many of which are designed to hold more than a single species. And the role of a zoo, no matter how antiquated or advanced, is perceived as basically educational. With this in mind they are almost obliged to display a general cross-section of reptile species ranging from the most common to those far less so. Most hobbyists have neither the space nor the obligations of a zoological garden.

But, allow me to reassure you, it is not the hobbyist alone who seeks the rarities. I have seen the various curators covetously vie their not inconsiderable assets against one another in an attempt to acquire an uncommon this or a rare that. In fact, some of the rarest of creatures can be found in the collection of the curator whose comments stirred me to write this article. I wonder how satisfied he would be with his lot if his reptile house displayed more Garter, Water or Vine snakes? If, in fact, the acquisition of rarities is acceptable for the professionals, why, then, is it not so for the amateurs?

Certainly arguments exist for the perpetuation of aberrancies. One such is that in a growing number of states it is becoming illegal to collect, keep or deal in indigenous wildlife. However, aberrant specimens, such as albinos or hybrids, are often expressly exempted from the laws.

The mention of hybridization and intergradation opens a new can of worms. A great many herpetologists of all ranks are vehemently opposed to such manipulation. Others, especially the amateurs, it seems, advocate it. In some cases it is an attempt to circumvent laws which, on the surface, seem unnecessarily restrictive that initiates the mixing of genes. One such example is the intergradation of the endangered Indian Rock Python, *Python m. molurus,* with the basically unrestricted Burmese Rock Python, *P.m. bivittatus.* Interstate movement of pure *molurus* is, for the most part, illegal except under permit. However, pure *bivittatus* or *bivittatus x molurus* intergrades may be moved freely, needing no authorization.

The second incentive is experimentation, pure and simple. To this end there are a few hobbyists who are creating bi- or even tri-specific crosses or, more rarely, bi-generic ones. The cry of outrage from the herpetological purists has been heard by all. Being initially a tropical fish person where such goings on occur with great regularity, I am, perhaps, more understanding of such efforts. Certainly some inordinately beautiful creatures are occasionally produced in this manner (to wit, certain of the tricolor hybrids).

Thirdly, intergradation may be initiated in an effort to perpetuate a given characteristic or when a mate of the same subspecies is not readily available. To this latter end I have occasionally personally perpetuated certain intergrades (as in intergrading Carpet with Diamond pythons (*Python spilotes* ssp.) when a female of the latter race was not available. But I feel it imperative that the parentage of such endeavours be faithfully recorded and the facts passed on to the purchasers.

The breeding of amphibians is only now coming of age in both public and private facilities. Many persons, erroneously, considered the members of this large and diverse class less amenable to captive conditions than the reptiles. While a few breeding programs (of even fewer species) were firmly established in the '60s and '70s Axolotls [*Ambystoma (= Siredon) mexicanum*] University of Indiana; Bull and Leopard frogs [*Rana catesbieana* and *pipiens* ssp.], Oriental Fire-Bellied Toads [*Bombina orientalis*] and Axolotls, Amphibian Research Facility; African Clawed Frogs [*Xenopus* sp.], many persons; other Pipids [*Pipa* sp.] and Blomberg's Toads [*Bufo blombergi*], Brookfield Zoo; etc.), they were the exception rather than the rule. In the late '70s serious research was begun with several of the Dendrobatid (arrow-poison) frogs by numerous facilities, both public and private, and the efforts and resulting successes of the Cincinnati Zoo with various salamanders is acknowledged worldwide.

Today, not only the zoos but also the private sector as well are reporting an ever-increasing number of amphibian species being bred regularly. The success story by private hobbyists with the intriguing South American Leptodactylid frog, *Ceratophrys ornata,* is well known. As a result of those programs the cost of the animals has decreased by 90%. A year or two ago albino Bullfrogs (*Rana catesbeiana*) were selling for $250 each. Today (February 1987) good-sized juveniles may be purchased for as little as one-tenth that amount (private breedings). The prettily colored, somewhat grotesque, Microhylid known as the Tomato Frog (*Dyscophus antongilli*),

once among the most uncommonly seen anurans in the U.S.A. are readily available . . . and at affordable prices (this, too, thanks to private breedings). Also readily available are two of the most desirable treefrogs, the White's or "dumpy" (*Litoria caerulea*), and the White-Lipped (*L. infrafrenata*). While zoos have successfully bred these last two, it is the private sector that has made them readily available to all.

These breeding successes are only the tip of the iceberg. There are more . . . oh so many more. And somehow I don't feel that if my interest or that of others happens to be in tricolors, albinos or giant serpents that I owe anyone an apology. Neither do I feel that an admonishment from colleagues, be they professional or private, is called for. Rather, I feel that we should all — yes all of us — join hands and forces and support the efforts and interests of each other. I seriously doubt that there are among us any who cannot still learn from the next.

PICKETT'S PIECE

An irregular column of personal observations, notes, commentary.

Orsini's Viper and CITES

There is a proposal to include *Vipera ursinii* on Appendix I of the Convention on International Trade in Endangered Species, at the meeting of the Parties to the Convention in Ottawa, July 1987. The species is not currently listed in either Appendix I or II.

This proposal would seem to me to be difficult to justify on scientific grounds. As a species, it cannot be said by anyone to be endangered. It has an extensive range from the isolated populations of southern Europe through Central Asia as far as western China. In the bulk of this range there is nothing to suggest it is under any sudden, serious or widespread threat. Much of its distribution is in high mountains, in secure refuges difficult of access and in quite stable conditions. In such places, where it is often abundant, it is safer in conservation terms than most other species.

The population which gives most cause for concern and can genuinely be described as threatened is that found in the lowlands of Austria, Hungary and possibly Rumania and Bulgaria, and known as *V.u. rakosiensis.* Changes in land use have destroyed most of its habitat. The relict French population of *V.u. ursinii* is also very small. There is no reason to believe that the Italian and Yugoslavian populations of *V.u. ursinii* are threatened. I know it to be quite common in its Italian range.

If considered necessary, the subspecies *rakosiensis* could be given Appendix I listing, while other subspecies are included in Appendix II, as is the case with the two subspecies of the Indian Python, *Python molurus molurus* and *Python molurus bivittatus.* In my opinion, Appendix II listing would seem most appropriate for all subspecies. Controls over Appendix II species are adequate to restrict trade. It would be precipitate to jump from no international listing to an indiscriminate Appendix I listing for all populations of a wide ranging animal in which there is very little trade, and certainly no commercially significant trade. Appendix II controls are more flexible and yet are nevertheless strong enough to protect the small and vulnerable populations of *V.u. rakosiensis,* and of *V.u. ursinii* in France; these populations already enjoy national protection.

The classification of common or widespread animals as endangered, in order to protect local populations, undermines the scientific integrity of CITES, whatever the political advantages. Such proposals should be looked at critically and objectively, and Appendix I listing reserved for those species and populations genuinely needing it.

The Tomato Frog: another Axolotl?

In the last few years the Madagascan Tomato Frog, *Dyscophus antongilli,* has been imported into Europe by dealers, in small numbers. These have been distributed around the European countries, sometimes with the appropriate legal paperwork, sometimes not. Some specimens have been re-exported to the United States. In England, and I suspect also in other European countries, these imports were the subject of some fuss when a dealer was caught by H.M. Customs at a port with the frogs, but no licences. Stories appeared in the press about the smuggling and trade in "endangered" species. Nobody really seems to know the true status of the species in the wild — at least I have seen no published reports, and I assume that statements that *Dyscophus* is an endangered species are based on conjecture.

However, whatever the status of the species in the wild, its status in captivity seems secure. The frog was quickly bred, first in the U.S. and later in England, and now several hundred young frogs have entered the "market" at prices considerably less than those of wild caught animals. The Tomato Frog is an amenable captive, and apparently a ready breeder. The young are strong, voracious, and fast growing. Perhaps there will not be any more imports of wild animals, but captive bred animals will become available for those who want them, in increasing numbers. I suspect they will become as commonplace as the Axolotl, which has long been bred in large numbers as an aquarium and laboratory animal, though as a wild animal it is very restricted in range and protected. None are exported from Mexico. Yet trade in Axolotls attracts no controversy: it is not newsworthy. It seems that in this respect the Tomato Frog will join the

Axolotl, and the fuss made over the import of a few animals, from which it has become well established in captivity, will appear irrelevant.

If the frog had not been sought after by a few vivarium enthusiasts because of its unusual and bright colour, no doubt its occasional import would also not have attracted the attention of conservationists. A less "special" animal but perhaps more needy of attention would perhaps be overlooked by all.

POST SCRIPT: There is a cloud on the horizon which may end this success story. The Tomato Frog is proposed for inclusion on Appendix I of CITES at the meeting in Ottawa in July 1987. The restrictions on the movement and trade in Appendix I animals act as a powerful disincentive to their breeding in captivity. In this case to make disposal of offspring contingent on the acquisition of licences, difficult and slow to obtain, may rapidly end the captive population explosion. Surely Appendix II listing would be more appropriate for this species and supply all the powers necessary to restrict or eliminate trade in wild caught animals, should the Malagasy Republic decide it desirable.

BOOK REVIEW

BREEDING TERRARIUM ANIMALS, by Elke Zimmerman.
Published by T.F.H. Publications, 1986. An English language edition of *Das Zuchten von Terrarientieren,* published by W. Keller & Co., Stuttgart, 1983.
384pp. price £24.95.

This is an ambitious book, attempting to cover all the groups of reptiles and amphibians kept and bred in captivity. There are detailed accounts of 94 representative species, and notes on a great many more. It is comprehensive and substantial. The author's wide life-long experience of keeping and breeding reptiles and amphibians makes the book particularly valuable and authoratitive.

There are excellent detailed chapters on types of vivariums: techniques of construction, furnishings, plants, light and heat; foods and methods of breeding food animals; disease; a general account of reproduction, including sound instructions on the various methods of rearing young animals and the sexual characteristics of the adults.

The bulk of the book, of course, is made up of accounts of individual species. There is a great deal of original knowledge in these accounts, especially where they reflect the personal experience of the author. This is most apparent in the accounts of the amphibians, especially the Poison-Arrow Frogs. For many species, the publication of this book will be the first time that information on breeding has been made readily accessible in the English-speaking world.

A good feature is the choice of less well known species for some of the more detailed accounts, for example *Plethodon cinereus, Tylototriton verrucosus, Mantella cowani (= madagascariensis), Hymenochirus boettgeri* in the amphibians; *Acanthodactylus boskianus, Sceloporus jarrovi, Chamaeleo chameleon, Teratoscincus scincus, Varanus gilleni* in the reptiles.

There is much information on behaviour in the species accounts; the author seems to have a particular interest in this aspect.

The many plates are mostly good, a few outstanding, and most, refreshingly, are original.

The book's weakest point is the section on snakes, which is comparatively short and with some errors and omissions. Too many species are grouped together as requiring the same conditions, when in fact they should be kept quite differently. An important omission is the lack of any mention in the account on the Common Garter Snake, *Thamnophis sirtalis,* of the fatal effect of Thiaminase "poisoning" as a result of a diet of fresh fish on this species and other *Thamnophis.*

The book is chiefly of value as a source of information on the breeding of amphibians, lizards, tortoises and terrapins. Its value in these fields is very great.

The book should reveal to the sceptical the great possibilities of breeding captive reptiles and amphibians. To quote the author:

"Anyone who applies himself diligently through personal observation and studies of the relevant literature so that he becomes knowledgeable about amphibians and reptiles and their requirements, and who uses this knowledge correctly, will be successful in breeding these animals . . ."

Quite often it is difficult to obtain licences, for the international movement of captive bred animals because governments' scientific advisors do not believe it is possible to breed some species, or suspect the claims to be false. While undoubtedly a very small number of silly people may make false claims, the vast majority are genuine. This book — if it is read by them — may convince those responsible for implementing laws of the great many species which are being bred, of the potential for the future, and, I hope, of the positive values of the keeping and breeding of these animals in captivity. Too often, the keeping of animals is, strangely and erroneously, made out to be in conflict with conservation. As a result of the controversy caused by this, a great deal of energy has been wasted which should have been spent in real, much needed conservation work. The division is entirely artificial and unnecessary. The author, in her introduction, puts the contrary view, placing the keeping and breeding of animals in its correct relation to conservation:

". . . This not only satisfies our aesthetics and excitement of discovery, but it also helps combat environmental destruction. After all, protection of species and the environment are as important to us as terrarium care. Therefore, it should become a firm goal for all of us to not only keep animals taken from the wild in accordance with their species — specific requirements, but also to breed them regularly and so to conserve these species, at least in captivity. I sincerely hope that this book will be able to persuade you to seek such aims and objectives . . .

. . . I am aware the the topic of breeding terrarium animals is far from being exhausted by this book. Breeding reptiles and amphibians will gain increasing significance in the future, not only within the spirit of nature protection and species survival, but also as part of a wider public environmental education platform."

This book will, I believe, have a great stimulating effect on the breeding of reptiles and amphibians in captivity. This will be helped by its wide availability through the popular "pet-book" publisher, TFH, with its large and world-wide distribution network. Also unlike many other publishers, TFH usually keep their titles in print for many years; I hope they do so in this case.

The author is to be congratulated for her great effort in compiling so much detailed information. It will be of tremendous practical value to very many people, who could not find elsewhere so much knowledge distilled into one convenient volume. It is probably the best manual currently available, and cannot be too strongly recommended.

John Pickett

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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.

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* **Wanted:** pairs of Green Toads (*Bufo viridis*), Alpine Newts (*Triturus alpestris*), Banded Newts (*T. vittatus*), Marbled Newts (*T. marmoratus*), Common Tree Frogs (*Hyla arborea*).
M. Horne, 21 Maffit Road, Ailsworth, Peterborough, PE5 7AG.

* **Wanted:** Captive bred specimens of any Garter Snake species to augment private breeding stock. Also North American Water Snakes, especially *Nerodia taxispilota.*
N.H. Clayden, Llyg-y-Fynydd, Clocaenog, Ruthin, Clwyd, LL15 2BB. Tel: (Office) 08245 208/615.

* **Wanted:** Garter Snakes, *Thamnophis marcianus marcianus,* male and female.
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