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THE BRITISH HERPETOLOGICAL SOCIETY

BULLETIN

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BRITISH HERPETOLOGICAL SOCIETY

c/o Zoological Society of London
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Correspondence, membership applications, subscription renewals and purchase orders for the British Journal of Herpetology should be sent to the above address.

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

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

Publications

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

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

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

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

Meetings

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

Subscriptions

Ordinary Members £15. Junior Members £5. (Junior Members do not receive the British Journal of Herpetology). Institution rates £25 (U.S. $40).
All subscriptions become due on the first day of January each year.

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

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

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

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.

MARCH 3rd	Dr C.J. McCarthy (BHS BM(NH) Representative, Reptile and Amphibian Section, Department of Zoology, British Museum (Natural History), London): Sea snakes.
MARCH 24th	A.G.M. (see separate Agenda), followed by Keith Corbett (BHS Conservation Officer and Chairman, Conservation Committee of Societas Europaea Herpetologica): 'Biogenetic reserves' and conservation of European herpetofauna.
APRIL 29th	Dr T.R. Halliday (Dept. Biology, Open University, Milton Keynes): Reproductive cycle and life history of newts.
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.

IMPORTANT NOTICE: CHANGE OF MEETING DATE

To avoid a clash with another lecture of probable interest to several members (details follow), the date of Dr C.J. McCarthy's lecture has been postponed to **Tuesday, 3rd March 1987.** Lectures now are:—

FEBRUARY 24th	Lily Veniselos: *Protecting sea turtles in Greece.* [Ancient Greeks considered loggerhead turtles to be sacred. Turtles still swarm to breed on the island of Zante (Zakinthos). This endangered species is now protected.] This is a meeting of the Anglo-Hellenic League. The meeting will take place at 7.00 pm in the Lecture Hall (Exhibition Road entrance), the Royal Geographical Society, 1 Kensington Gore, London SW7 2AR. BHS and other non-RGS members and fellows should apply to the Anglo-Hellenic League (Room 1B, Chelsea College (University of London), Manresa Road, London SW3 6LX; tel. 01-351 6913) for tickets (£3.00 each, which includes a pre-lecture glass of wine).
MARCH 3rd	Dr C.J. McCarthy (BHS BM(NH) Representative, Reptile and Amphibian Section, Department of Zoology, British Museum (Natural History), London): *Sea snakes. Note change of date (see above).*

NATIONAL AMPHIBIAN SURVEY

Following the successful national crested newt survey, Leicester Polytechnic is conducting a new survey on behalf of the Nature Conservancy Council aimed at identifying and conserving the best frog, toad and newt sites in Britain. In order to do this we need volunteers who are willing to carry out pond surveys of their local areas. The work will involve completing a simple questionnaire for each site and noting the presence and relative abundance of the different amphibian species. Particularly welcome will be contacts from the following areas: Scotland, Wales, Cornwall, Herts., Isle of Wight, Notts., Surrey and West Sussex. For further information please write to Dr R.A. Griffiths, Amphibian Survey, School of Life Sciences, Leicester Polytechnic, Scraptoft Campus, Leicester, LE7 9SU.

1987 ANNUAL MEETING OF THE HERPETOLOGISTS' LEAGUE AND S.S.A.R.

The joint annual meeting of the Herpetologists' League and the Society for the Study of Amphibians and Reptiles will meet concurrently with the Comite Nacional Herpetologico, Mexico in Veracruz, Mexico, 9-15 August 1987. The meeting will be hosted by the Instituto de Biologia of the Universidad Nacional Autonoma de Mexico. The meeting will be held in Hotel Mocambo on the south end of Veracruz, 200m from the Gulf of Mexico. Besides the usual contributed paper and poster sessions, the emphasis will be on the Neotropics, including regional food, music and field trips to observe reptiles and amphibians in the nearby ecosystems. Presentations may be given in either English or Español. The Herpetologists' League Distinguished Lecture will be presented by Dr Henry S. Fitch.

US Participants interested in reduced airfare to Veracruz should contact Holbrook Travel Inc, 3540 N.W. 13th St., Gainsville, FL 32609 (Tel. FL 1-800-345-7111, other parts of US 1-800-451-7111, TLX. 810-825-6340). A call for papers will be sent to all members of the societies in January. Herp Review and Herpetologica will also publish the detailed meeting announcement in March. For further information contact the meeting chairpersons: Richard C. Vogt, Estación de Biologiá Tropical "Los Tuxtlas", Apt. Post. 94, San Andres Tuxtlas, Veracruz, Mexico or Gustavo Casas Andreu, Instituto de Biologia, U.N.A.M., Ap. Post. 70-233, Mexico 20 D.F., Mexico.

MEMBERS' ADVERTISEMENTS

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

- **For Sale:** Unit of 8 vivariums. Complete with all fittings. 7 terrestrial and 1 semi-aquatic. White wooden cabinet with glass sliding doors. Cost over £400 new, £160 or offers/exchange for reptiles.
  C. Boyce, 83 Twyford Road, Willington, Derbys. DE6 6DE. Tel: Burton on Trent (0283) 7017144.

- **Wanted:** Can anyone supply the European Amphisbaenian, *Blanus cinereus,* or any healthy Dwarf Fire-Bellied Newts, *Cynops orientalis.*
  P.J. Wisniewski, 38 Hesketh Road, Burscough, Lancs. Tel: 0704 894503 evenings.

- **Wanted:** Old World Skinks, all species considered. Write stating species/subspecies.
  K.R.G. Welch, 3 Mariners Close, Weston-Super-Mare, Avon. BS22 8JT.

- **Wanted:** Any colour photographs (preferably slides) of Asiatic cobras (*Naja naja*), for a study of the systematics of this species. Please indicate the place of origin of the specimens. If you have any such photographs, please contact:
  Wolfgang Wüster, Department of Zoology, University of Aberdeen, Tillydrone Avenue, Aberdeen AB9 2TN.

British Herpetological Bulletin, No. 18, 1986.

HERPETOLOGY IN JAMAICA WITH GENERAL REFERENCE TO CONSERVATION

MICHAEL LAMBERT

(Chairman, BHS)

This is another of a range of articles published in BHS Bulletin on herpetology in different Commonwealth countries and of importance in relation to the first World Congress of Herpetology being held in the U.K. in September 1989. Every encouragement is to be made for Commonwealth nationals, especially from tropical developing countries (where most of the world's herpetofauna occur), to attend and participate in the Congress.

Jamaica was discovered by Christopher Columbus in 1494, and after British rule from 1655, became an independent member of the Commonwealth in 1962. It is a tropical Caribbean island whose attributes, as far as most of the visitors are concerned (mainly American tourists), are sea, sun and sand! But these are complemented by a great diversity of plant and animal life with many species only found on Jamaica.

The island from east to west is 146 miles (234km) long and 51 miles (82km) wide. Topographically, it consists mainly of coastal plains, divided by the Blue Mountains in the east, and the hills and limestone plateaux (the Cockpit Country) which occupy the central and western areas of the interior. The highest mountain, the Blue Mountain Peak, achieves 7402 feet (2256m). Rivers flow down from the central mountainous area Most are narrow and fast flowing; some with rapids (such as the Dunn's River Falls), and those flowing south are generally longer and are fed by more tributaries than those flowing north. Jamaica is divided into three counties: Surrey, Middlesex and Cornwall, whose names invoke perhaps the country's strongest influence! There are also fourteen parishes with very British names. The Cayman Islands are a dependency of Jamaica.

As part of my official duties, I was given the opportunity by the U.K. Government's Overseas Development Administration to visit Jamaica in May 1986. While meeting the country's increasing nutritional needs, special concern had been expressed in recent years about the environmental effects of pesticide usage in agriculture, and in the state of wildlife (a tourist asset) on account of land development and erosion.

The Natural Resources Conservation Department (NRCD) was formed to administer three Governmental Acts, including the Wildlife Protection Act, 1973. The Aquatic Resources Division within NRCD is concerned about the quality of water used for domestic and agricultural purposes and on the living organisms (including amphibia) supported in freshwater courses and the sea (marine turtles) — freshwater wetlands support the American Crocodile (*Crocodilus acutus*) and beaches provide a medium for egg laying by a range of marine turtles. The Resource Management Division is responsible for the protection of wildlife, especially rare species. About 800 of the 3000 flowering plants are unique to Jamaica, 27 of over 100 species of birds, which include ten distinctive pigeon and dove species, eighteen of the 133 species of butterflies (the largest species of swallowtail is found in Jamaica) and 61 of the 68 native forms of frogs and reptiles. There are also over 800 species of snail in Jamaica.

Under the 1973 Act, it is illegal to take or sell the eggs of any turtle species in Jamaica; the Jamaican Iguana (*Cyclura collei*) — if surviving still — and *Crocodilus acutus* also became protected, and in 1983, all five species of marine turtle. Species protection posters have been produced by NRCD for the crocodile and turtles, and the Jersey Wildlife Preservation Trust has produced one for the endemic Jamaican Boa or locally-known Yellow Snake, *Epicrates subflavus*. The endangered status of the Iguana, the Jamaican Boa and the American Crocodile, and three other species, namely two skinks: the Galliwasp, *Celestus (Diploglossus) occiduus* — a species described by Underwood (1959) — and Snake-Waiting Boy, *Mabuya spilonotus* (or *M. mabouya sloanei*), and the snake, *Alsophis ater*, was highlighted by Mittermeier (1972). All these species are found in or near the Hellshire Hills, a largely undeveloped and impenetratable area

not far (about 10 miles (16km)) south-west of the capital town of Kingston. In his article on the Fauna & Flora Preservation Society's journal, *Oryx,* Mittermeier proposed that properly managed and protected, the hills would be an ideal wildlife reserve or National Park. The Crocodile is used as a symbol by the Jamaican Army and is seen on Staff Cars.

Possibly the most distinctive, certainly the most active and conspicuous reptile species on Jamaica, and for that matter elsewhere in the West Indies, are the *Anolis* lizards. These small iguanids (snout-vent length about 4 inches or 100mm) were first worked out on Jamaica by Underwood & Williams (1959). Dr Garth Underwood, a long-standing BHS member and former member of Council (now an International Herpetological Committee member for the first World Congress of Herpetology), spent several years on Jamaica while lecturing at the University of the West Indies. He undertook seminal studies on the reptiles until leaving in 1960, but making a last visit in 1964. Before 1953, a preliminary study by Barbour (1910) unfortunately confused the anoles and only recognized six amphibia. Lynn & Grant (1940) followed-on from this. They outlined the history of herpetology in Jamaica and the work formed the first in a series of monographs o the natural history of Jamaica and its dependencies, published by the Institute of Jamaica in Kingston. *Anolis reconditus,* which only occurs in the Blue Mountain forest region, was discovered, described and named by Underwood & Williams (1959). Lazell (1966) collected further specimens in 1965. The paper was also published by the Institute of Jamaica.

Much work on the herpetofauna of the West Indian islands, not unexpectedly and on account of proximity, has been carried out by herpetologists from North America. Schwartz & Thomas (1975) and with Ober (1978) quite recently published a check list of West Indian amphibia and reptiles. They included detailed information on the distribution of many of the species. Island lists have also been produced by Maclean, Kellner & Dennis (1977) and for Jamaica, they list 24 amphibian and 45 reptile species and subspecies. In light of some taxonomic revision since, Schwartz & Henderson's (1985) guide to their identification (exclusive of Hispaniola) makes 57 full species for Jamaica (21 amphibia, 36 reptiles) of which nineteen amphibia and 27 reptiles (the remarkable proportion of 90% and 75%, respectively) are endemic (see Appendix). Species include sixteen (fourteen endemic) *Eleutherodactylus* Whistling Frogs (family Leptodactylidae) and seven each of *Anolis* lizard (family Iguanidae) (six endemic), *Celustus* Galliwasp (family Anguidae) (six endemic — the other, *C. crusculus,* only otherwise occurs on Little Cayman and Cayman Brac) and *Sphaerodactylus* Wood Slave (family Gekkonidae) (six endemic). Other notable amphibia include the giant toad (*Bufo marinus*), introduced like the American Bull Frog (*Rana catesbiana*), and endemic Tree Frogs (family Hylidae): *Calyptahyla crucialis,* two species of *Hyla* and *Osteopilus brunneus.* Other reptiles include an endemic, edible freshwater terrapin (*Chrysemys terrapen*), an endemic teiid (*Ameiva dorsalis*), the Croaking Lizard (*Aristelliger praesignis*) and *Gonatodes albogularis* (both geckos), an endemic burrowing snake (*Typhlops jamaicensis*) and three endemic species of *Arrhyton* snake (family Colubridae). *Anolis sagrei,* the bush lizard, occurring in the west of the island, has been introduced from Cuba.

In the town of Kingston itself, several species of herpetofauna may be seen:— *Anolis grahami:* many individuals, mostly immature, were to be seen on the leaves, trunks and branches of ornamental garden shrubs by buildings everywhere, especially in the Hope Botanical Gardens where they were also on walls.

Bufo marinus: tadpoles of the giant toad (called "bull frog" locally — the *Eleutherodactylus* tree frogs are called toads!) were to be seen feeding in small shoals on the carcass remains of adults that had drowned in pools around fountains in the Hope Botanical Gardens (13.v).

Ameiva dorsalis: this quite substantially-sized teiid is often found in gardens within the city. It runs actively through long grass and other vegetation and alarms the womenfolk. The lizard is regarded as a nuisance in town gardens, like *Anolis grahami,* and pest control operators advertise lizard control as one of their services. The control chemical used is apparently mocap or ethoprop (U.S.A.) — ethoprophos (Europe) — and is normally recommended for the control of nematodes, wire-, cut and rootworms and beetle larvae.

Chrysemys terrapen: two full-grown terrapins, probably of this species, were to be seen swimming in the murky water and coming to the surface for air in the pool around the fountain in the gardens of Devon House (2.v), which has the National Gallery of Art.

HOPE ZOO, KINGSTON

The Hope Zoo is situated in the Botanical Gardens. About seven *Crocodilus acutus* were on display in a large pool and enclosure with information plaques indicating that the species is preserved in nature reserves in Jamaica, including the Black River Lower Morass (Garrick, 1986). School parties were also visiting the Zoo, which plainly has an educational function in Jamaica. About twelve Jamaican boas (*Epicrates subflavus*) were kept singly or in pairs in cages with glass fronts. The Jamaican Boa is rare, but occurs in the mountains. One of the Jersey Wildlife Preservation Trust's posters was on display to give more information on the snakes. There were also two Reticulated Pythons for educational purposes.

UNIVERSITY OF THE WEST INDIES, MONA

There are two herpetologists presently researching on the herpetofauna of Jamaica and attached to the University. Dr Peter Vogel (University of Bochum, F.R. of Germany), a Swiss from Basle, is working on *Anolis* feeding strategies and Stefan Zabanski (University of Hamburg, F.R. of Germany) is working on the influence of predators on *Anolis* hatchlings. *Anolis grahami grahami,* which is blue-green in colour, occurs in the west and central part of Jamaica and *A.g. aquarum,* which is emerald green, in the east. When still at the Department of Zoology, Garth Underwood remembers observing that at the road bridge across the Morant River on the south coast and east of Kingston, *A.g. grahami* was on the west side and *A.g. aquarum* on the east side, the Morant River being the exact divider. On the north coast, an intermediate population may be found at Mt. Pleasant about 4 miles (7km) west of Port Antonio. The south-west slopes of the John Crow Mountains in the extreme east of the island are in the lee of north-east trade winds and dry, and are preferred by *A.g. grahami.* On the coast also on the east, under cocout husks at the rear of beaches, the active Galliwasp, *Celestus crusculus,* can be found, and on one occasion, Garth Underwood also remembers finding 50 *Eleutherodactylus* frogs. Stewart & Martin (1980) later described such husk piles as a unique habitat! The *Anolis* lizards on Jamaica are very common, active and really lend themselves to observation. They are easy to catch, either with a noose during the day, or picked off leaves of forest trees, like fruit, when inactive at night. *Anolis* lays a single egg — with good rainfall, one a week, but none during the dry season — and this is probably related to food abundance and/or water availability. In the Fairy Glade Trail between Hardwar Gap and Newcastle in the Blue Mountains, there is another species, *Anolis l. lineatopus,* inhabiting dense rain forest and difficult to see. Away from the towns, the local Jamaicans regard *Anolis* as helpful in the environment because they eat insects. Such a species as *A. grahami* seems to thrive in changed habitats, often where there are buildings. This probably explains the abundance of the species within the confines of Kingston town.

JAMAICA SAFARI VILLAGE — CULTURAL CENTRE AND CROCODILE SANCTUARY, FALMOUTH

Just 2 miles (3km) west of Falmouth, there is a safari village amidst the mangrove swamp of the coastal part of Trelawney Parish with a number of American Crocodiles on display in enclosures. There was also an American alligator to add variety! Two or three Jamaican Boas were also on display in a tall glass-fronted cage with branches. Some of the crocodiles were basking in the late morning sunshine at the time (11.v) on muddy banks amidst the tangle of mangrove roots, and others in the brown water. It was at this Village that some of the scenes for the James Bond film "Live and Let Die" were shot. Our hero (an Indian stunt man was used!) was obliged to escape from a small lake island when threatened by crocodiles from all sides and ran to safety across their backs! The stunt man survived without problem but sadly sustained wounds during the filming that required over 50 stitches! Ian Fleming, the author of the James Bond books, who like Noel Coward lived in the north of the island, named his hero after an ornithologist who wrote a book on the birds of Jamaica. *Epicrates* (it can only be *subflavus*) even features in one of his novels, "The Man with the Golden Gun", when the main villain, Scaramanga, decapitated one with a knife, carefully skinned and ate it raw while resting after a chase ending in one of the island's Morasses. "Dr No" was also filmed on Jamaica.

INSTITUTE OF JAMAICA, KINGSTON

The Museum of the Institute of Jamaica has a Natural History Section. Several of the typical Jamaican herpetofauna are on display as museum specimens. These include *Anolis garmani* and *A. valencienni,* the former green with orange dewlap, the latter pale grey with a pale mauve

dewlap or gular flap, and both are described as being common on the island. *Tropidophis haetianus* is known locally as the Lazy Snake.

WEST INDIAN RANGE OF SOME JAMAICAN REPTILES

Crocodilus acutus: besides Jamaica, the American Crocodile only otherwise occurs in the West Indies on Little Cayman, Cuba (with *Crocodilus rhombifer*) and such Cuban islands as Isla de la Juventud (Isla de Pinos) (with *C. rhombifer*), Cayo Cantilles and Cayos Largo. It also occurs on Cayo Real (Cayo de San Felipe islands) and Hispaniola (Haiti and the Dominican Republic).

Chrysemys terrapen: the Jamaican species of freshwater turtle is endemic and there is a remarkable dearth of freshwater chelonians on the West Indian islands generally. This is probably because most have few areas of slow-moving or standing water in such small land masses. *Chrysemys decussata granti* occurs on the Jamaican dependencies of Grand Cayman and Cayman Brac, and other subspecies elsewhere. *C.d. decussata* occurs on Cuba and the Cuban islands of Isla de la Juventud and Cayo Santa Maria (Jardines de la Reina), *C.d. vicina* on Hispaniola and Marie Galante of the Iles des Saintes, and on the latter with *C.d. stejnegeri,* which also occurs on Puerto Rico and possibly Vieques of the Passage islands.

JAMAICAN LAND TORTOISE

It is surely certain that no land tortoises now occur on Jamaica. Accounts of Sloane (1707-1725), who was a resident on Jamaica for 15 months during 1688/89, indicated that a land tortoise answering to a similar description to *Geochelone carbonaria* was common in the woods between what are now Guanaboa Vale and Spanish Town (St. Catherine Parish) everywhere. While *Geochelone denticulata* is a native species on Trinidad, *G. carbonaria* has almost certainly been introduced to the West Indian islands from northern South America. Barbour (1934) has refuted the tortoise's indigeneity anywhere in the West Indies and Pritchard & Trebbau (1984) discuss this in more detail. Maclean et al. (1977) list *G. carbonaria* on several of the islands, Schwartz & Thomas (1985) likewise and Underwood (1962) reported it on many of the Grenadines (Mustique is one of these). While there in May 1986, I saw none nor spoke with anyone whom had ever seen land tortoises on Jamaica.

ACKNOWLEDGEMENTS

I would like to thank Mr Paul Carroll (Acting Principal Director, Natural Resources Conservation Department, Kingston) for useful information relating to the protection of wildlife on Jamaica.

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APPENDIX

A CHECK LIST OF THE AMPHIBIA AND REPTILES OF JAMAICA AND ISLANDS.

After Maclean, Kellner & Dennis (1977) and Schwartz & Henderson (1985).

AMPHIBIA

Bufonidae

Bufo marinus†

Leptodactylidae

*Eleutherodactylus alticola**

*E. andrewsi**

*E. cavernicola**

*E. cundalli** *cundalli*

*E.c. glaucoreius**

*E. fuscus**

*E. gossei** *gossei*

*E.g. oligaulax**

*E. grabhami**

*E. jamaicensis**

*E. johnstonei**

*E. junori**

*E. luteolus**

*E. nubicola**

*E. orcutti**

*E. pantoni** *pantoni*

*E.p. amiantus**

*E.p. pentasyringos**

*E. sisyphodemus**

Hylidae

*Calyptahyla crucialis**

*Hyla marianae**

*H. wilderi**

*Osteopilus brunneus**

Ranidae

Rana catesbeiana†

REPTILIA

Emydidae

*Chrysemys terrapen**

Gekkonidae

Aristelliger praesignis praesignis

*Gonatodes albogularis notatus**

Sphaerodactylus argus argus

*S. gilvitoques**

*S. goniorhynchus**

*S. oxyrhinus** *oxyrhinus*

*S.o. dacnicolor**

S. notatus atactus[1]

*S. parkeri**

*S. richardsoni** *richardsoni*

*S.r. gossei**

*S. semasiops**

Iguanidae

*Anolis garmani**

*A. grahami** *grahami*

*A.g. aquarum**

*A. lineatopus** *lineatopus*

*A.l. ahenobarbus**

*A.l. merope**

*A.l. neckeri**

*A. opalinus**

*A. reconditus**

A. sagrei sagrei†

*A. valencienni**

*Cyclura collei**

Teiidae

*Ameiva dorsalis**
Scincidae
*Mabuya mabouya sloanei**
Anguidae
*Celestus barbouri**
*C. crusculus crusculus**
*C.c. cundalli**
*C.c. molesworthi**
*C. duquesneyi**
*C. fowlweri**
*C. hewardi**
*C. microblepharis**
*C. occiduus**
Typhlopidae
*Typhlops jamaicensis**
Boidae
*Epicrates subflavus**
Tropidophidae
*Tropidophis haetianus jamaicensis**
*T.h. stejnegeri**
*T.h. stulli**
Colubridae
*Alsophis ater**
*Arrhyton callilaemus**
*A. funereum**
*A. polylepis**
Crocodylidae
Crocodilus acutus

[1] On N.E. Morant Cay, not Jamaica
* Endemic forms
† Forms known to be introduced

DEVELOPMENT OF HERPETOLOGY IN ZAMBIA — HISTORY AND FUTURE PROSPECTS

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HISTORICAL ASPECTS

Until recently, herpetology in Zambia has hardly ever been considered a biological discipline. The first attempts at studying the herpetofauna of Zambia were done by field workers who only had a peripheral interest in the subject and were themselves not trained herpetologists. The first serious work on the herpetofauna of Zambia was that of Pitman (1934), entitled "A check list of reptilia and amphibia occurring and believed to occur in Northern Rhodesia". Broadley (1971) discussed briefly several interesting earlier reports of herpetofauna of Zambia. His 1971 work however, was to form the foundation upon which future work and advances in the field of herpetology could be based. Some of the most interesting, earlier reports of the herpetofauna of Zambia included work by Vesey-FitzGerald (1958) — a review of Zambian snakes, Broadley and Pitman (1960) on snakes collected by H.J. Bredo in the Northern Province and Wilson (1965) on snakes of the Eastern Province of Zambia. All these studies have essentially been on taxonomy of Zambian reptiles and the level of knowledge of the herpetofauna then had not advanced beyond that of descriptive natural history.

This was all to change and in the late sixties, the research division of herpetology was founded at the Livingstone museum. However, the division had not gained a status of its own. i.e. executing research in herpetology, until a professional research officer (Assistant Keeper of Herpetology) was employed by the National Museum's Board in March 1975.

This officially marked the birth of herpetology as a biological discipline in Zambia. Since we pioneered the field of herpetology, lower vertebrate research in Zambia is only carried out at the Livingstone Museum. I and my research assistant, Anderson Muyundu, bear the burden of studying the herpetofauna of Zambia and the responsibility of collecting and documenting the herpetological heritage of the country. This is an insurmountable task indeed.

PRESENT NEEDS

There is generally an urgent need in Southern Africa to train taxonomists. Many active taxonomists who have retired from active research have never been replaced. Technical aid for training of taxonomists must be forthcoming within the next decade otherwise progress in many research fields, including herpetology, cannot be expected.

The other most urgent issue is that of financial support for research scientists working in the so called less industrially developed countries (LDC). Our situation in the Livingstone Museum is worth noting. Since the beginning of the economic problems that Zambia has been facing, the division of herpetology has suffered considerably. We have been forced to abandon subscribing to herpetological and other scientific journals relevant to our research work because of the inflation caused by the weakening of the local currency, the kwacha, compared to sterling and the American dollar. This has caused us, after five to six years, to discontinue subscriptions to the *Journal of Herpetology, Herpetologica* and *Evolution.* Suffice it to say, these journals provided our only link with other herpetologists outside Zambia. Worse still, we have not been able to buy new books for the past two years. We have an updated check list of reptiles and amphibians of Zambia, with a bibliography of the Zambian herpetofauna (Simbotwe, 1986) ready to publish, but this cannot be printed because of lack of funds. We last went out to collect herpetological specimens seven years ago and yet there are areas in Zambia not hitherto collected by any herpetologist! I have in mind areas around Mwinilunga, Lake Bangweulu, Mweru Wantipa, Muchinga escarpent etc. Most important also is the rapid rate of development in the country which leaves behind great destruction to the environment. Exploitive development continues without regard for the natural heritage which is rapidly disappearing. It is apparent that to work in an as little known biological discipline as herpetology, one must not

only be knowledgeable in the subject but one must have in addition an interest. Besides many personal financial sacrifices in building up a paper research library, there is the problem of isolation in the absence of professionals in the same field of work. When working in Africa, a good library is a priority function of research. We would like the international herpetological community to understand our plight and to realize that a discipline-like herpetology does not feature in the official thinking of the developing countries in Africa (except perhaps South Africa). According to local funding agencies, reptiles and amphibians are considered non-commodity resources hence not on the priority list.

FUTURE PROSPECTS

Since the early seventies, herpetology in Zambia has advanced rapidly and the taxa are now relatively well known. Our research activities have produced good data and these we have been able to publish over the years (see list of publications). We also have under our care a wet collection of 3,000 plus specimens.

We have hoped however to do better, but because of financial problems, any form of field research has recently been abandoned. Attempts to secure funding within and outside Zambia have failed and yet we need for example only $US3,000 to carry out a full season of research or undertake a collecting trip. Our duty is to study the herpetofauna of Zambia which is in fact part of the world heritage in itself. Hence it is also the responsibility of each and everyone of us in the field of herpetology to provide help in the best way we can. Perhaps together we can manage to influence the thinking of many people in developing countries and arouse in them a consciousness of their responsibilities towards ensuring a lasting future of natural resources in their countries. Without a noble effort of this kind, the prospects of advancement of the less known biological disciplines like herpetology will only be a distant dream. We count on the international herpetological community for urgent help. We have so far done well and it would be a great shame if our work comes to a halt merely because of the lack of research funds.

Ed. Note: Dr Malumo Simbotwe is Head of the Department of Natural History at the Livingstone Museum, the national museum in Zambia. His research interests are in the population and community ecology of reptiles, amphibians and birds. His Masters Degree research was carried out under Prof. W.E. Duellman (University of Kansas, Lawrence, U.S.A.) and Ph.D. under Prof. H. Heatwole (University of New England, Armidale, Australia). He has published in *Amphibia-Reptilia* and other journals, mainly in Africa but also in the U.S.A., and has been in contact with a few herpetologists in the U.K. One important article he has published is entitled "Southern Africa in need of taxonomists", whose title is self-explanatory, and he has written this article in the hope of helping the case of the Livingstone Museum to receive financial assistance in order to purchase much needed books and to subscribe to essential herpetological and other biological journals. He would particularly appreciate receiving any donated herpetological publications for the Museum. He is also very interested in participating actively at the first World Congress of Herpetology in the U.K. in 1989, but seeks sponsorship for this purpose.

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AMPHIBIANS AND REPTILES ON THE SPANISH ISLAND OF MALLORCA

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INTRODUCTION

The island was visited for seven days in the company of three ornithologists, commencing the 4th of May, 1986, during which there was something of a heat wave. Mid-day air temperatures averaged 85°F; the average for this time of year normally being in the mid-60°F. Every day was hot and sunny with slight breezes which were stronger near the coast. Ca'n Picafort, a quiet resort in the N.E. was used as a base and a car was hired to make the most of the short time available. A small publication entitled 'A Guide to Bird-Watching in Mallorca' proved to be an excellent guide to the various habitats on the island.

GEOGRAPHY

Mallorca covers an area of 1,405 square miles, about the same size as Cornwall, and is the largest of the Balearic Islands. The heavy tourist industry which gives many people their only image of the island is concentrated mainly on the S.W. coast, the remainder of the island being largely unaffected consisting of a large fertile plain called 'Es Pla' irrigated by subterranean water deposits. Most of the island is cultivated and abounds with orchards, fields and vineyards creating a 'semi-natural' habitat. Along the western coast runs the Sierra del Norte, a tree studded high mountain range rising to 1,443 metres with spectacular valleys. A smaller mountain range in the east, the Arta mountains rise to 560 metres. Just north of the Arta lie the Albufera and Albufureta marshes. The climate is typically Mediterranean, characterized by hot, dry, sunny summers, and moist warm winters.

PRINCIPAL SITES

AREA 1 Albufera marshes. Extensive marshland with streams and ditches. Disused salt pans near main road.

AREA 2 Casas Vegas. Road to Cap Formentor. Surrounding hills consist of dense vegetation and scrub. Dry area with many stone walls.

AREA 3 Embalse de Cuber. Large reservoir in valley near Puig Major (1443m). Streams and small marshy area. Stone walls.

AREA 4 Salinas de Levante. Salt pans with surrounding brackish water-ways. Stone walls.

AREA 5 Porto Colom. Rocky cliffside. Scrub. Stone walls.

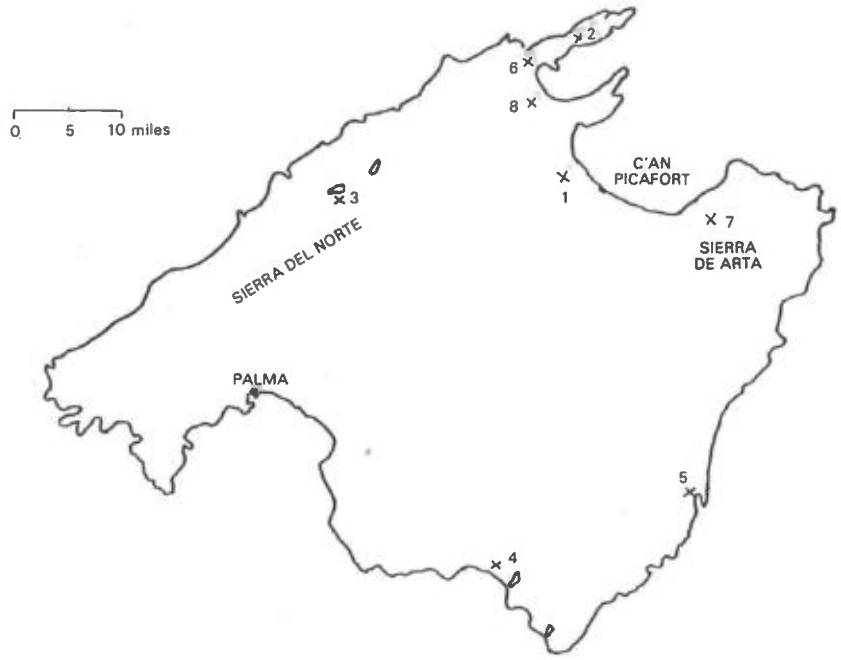
AREA 6 Boca Valley. Mountain valley with rocky scrub land, streams. Orchards at base of valley. Stone walls.

AREA 7 Arta mountains. Orchards. Fields. Stone walls.

AREA 8 Albufureta marshes. Typical marsh land. Streams. Stone walls.

(Areas shown in Figure 1.)

Figure 1.



SPECIES LIST

RANIDAE

Rana ridibunda. Marsh Frog.

First located in Area 1 where it was heard calling. Very numerous in this marshy region. Active at day and at night. Area 3; next to dam in small marshy area at bottom of trickling mountain stream; numerous juveniles present. Area 6; established in private pond next to orchard at entrance to Boca valley where one pair was observed in mating activity. Further up the valley literally thousands of 1-2cm tadpoles to be seen in mountain stream, though no adult frogs were seen in same stream or immediate area. Numerous adults and juveniles observed in river beside road going through Area 8. None found far from water.

GEKKONIDAE

Tarentola mauritanica. Moorish Gecko.

The most frequently encountered reptile on the island. First found at Area 3 where six adults, measuring about 12cm, were discovered when turning rocks on slope above marshy area. Also present on a stone wall beside track leading towards dam. Area 4; under stones in rock piles between the salt pans. Several adults found by turning rocks and one observed basking in mid-day sun (Temp. 84°F) on top of rock pile; this gecko being diurnal as well as nocturnal, usually in cooler weather. Several captured for close examination. Variation in colour minimal, typically grey to brown with occasional specimens being almost black. Ventral surface 'yellowish' and red spots between toes. Abundant in Area 5 under rocks and between stones of walls. Young geckos 4-5cm head to tip of tail, captured. Remains of hard shelled eggs found under rocks. Very common throughout Area 6 in stone walls. Numerous juveniles and one seen basking on a tree. Healthy population in roadside stone walls in Area 7. Very large (15cm) specimen basking on roadside vegetation beside orchard with no rock cover in immediate area. Road through Area 8 to Pollenca, geckoes common in stone walls. Found in six of the eight sites investigated. Several individuals were minus their tails. One observed in Area 6 in the bill of a Hoopoe, just one of many predatary birds on the island.

LACERTIDAE

Podarcis lilfordi. Lilford's Wall Lizard.

Only sighting of *P. lilfordi* in Area 2. Observed at 12.30 with temp. at 84°F. First specimen seen running from ground rocks to stone wall surrounding fig field. Five other adults, 17cm and under approx., were disturbed when turning rocks at base of wall facing sun. Four were green-backed and two melanistic. As none were caught, and identification was by sight only, the colony could possibly have been *P. pityusensis* but *P. lilfordi* considered most likely geographically.

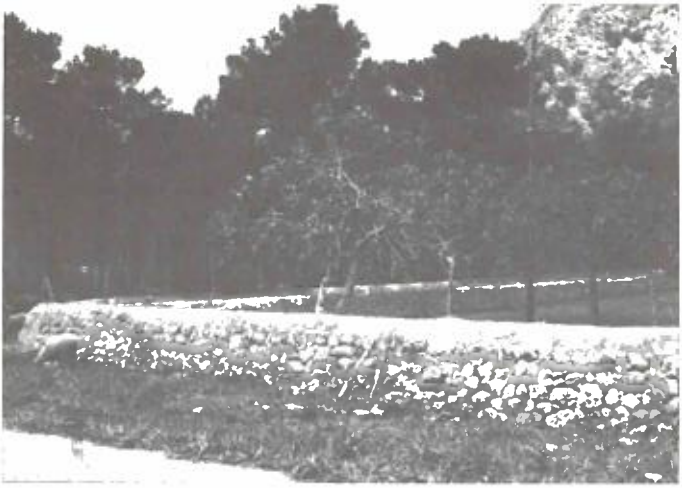


Plate 1. View of stone wall in Area 2 where *Podarcis lilfordi* colony was found. These stone walls are found all over the island, many inhabited by *Tarentola mauritanica.*

Plate 2. Small marshy area with trickling stream in Area 3. *Natrix maura* and *Rana ridibunda* were abundant. *T. mauritanica* was also to be found among the rocks.

COLUBRIDAE

Natrix maura. Viperine Snake.

Fairly common wherever there was fresh water. First specimen spotted making for cover when disturbed near track parallel to stream in middle of Area 1. This 30cm snake was very dark with no distinct dorsal markings. *N. maura* very common in this area following the stream towards the "lone pine", and in other waterways through the Albufera. 28cm specimen seen moving off when

disturbed in same vicinity as *T. mauritanica* first discovered in Area 3. Most specimens found under rocks sheltering from hot sun (85°F). Several seen swimming on water surface of marshy area and in aquatic vegetation. Some dived when disturbed and others swam to thicker cover. Biggest snake captured, while making for reed cover, was approx. 55cm. No attempt was made to bite when handled, hissed softly but otherwise settled down quickly after capture. On first being grasped several voided contents of anal gland producing very pungent smell which fortunately did not linger. Varied considerably from plain brown with weak dorsal pattern to well defined 'Viper-like' zig-zag stripe. Juveniles about 18cm in length were abundant. 50cm adult observed hunting at base of Boca valley (Area 6) lying on ledge at edge of pond with fore part of body and head submerged. Struck unsuccessfully at small *R. ridibunda* passing by and when aware of my presence swam round pond scattering frogs as it went before finding cover. Found in Areas 1, 3, 6 and 8, where *R. ridibunda* and fish are also abundant.

Macroprotodon cucullatus. False Smooth Snake.
Also known as the Hooded Snake or Cowl Snake. One adult of approx. 50cm discovered at Porto Colom (Area 5) at 15.45, Temp. 86°F. Found when rock was turned at base of stone wall where *T. mauritanica* is common. Swiftly made good its escape into crack at base of wall. Illustration on plate 38 of Arnold, Burton and Ovenden Field Guide is identical to one observed. This elusive, rear fanged venomous snake, the only member of its genus, is a nocturnal lizard hunter and is not dangerous to man owing to the small size of its head preventing effective use of venom apparatus. Being an 'ophiophile' this sighting was the high spot of the trip.

TORTOISES
None were observed by the author but ornithologists reported seeing a tortoise in Area 2. *Testudo hermanni* and *T. graeca* are known to occur on the island.

TERRAPINS
None seen by the author but two separate reports given. One specimen reported having been captured in a scoop net by party of children on school nature trip. This was described as "being about 15cm head to tail with bright yellowish marks on back of shell". Possibly *Mauremys caspica* has been introduced to the island from the mainland. The above reported specimen was found in the canal between the main road and Albufera marshes near the "Orange Bridge". The second reported turtle was also seen in Area 1.

NOTE

All lengths quoted were of the whole animal, that is, from snout to tail tip. Needless to say any rocks turned, etc. should be left as they were originally found and any habitat disturbance kept to a minimum.

DISCUSSION

The reptile life in other Mediterranean countries I have visited has been dominated chiefly by 'Wall Lizards' with Geckos turning up occasionally. On Mallorca I was surprised to find the reverse was true. The species most frequently seen was *T. mauritanica* which is one of the most prolific species I have ever encountered. *Lacertidae* were apparently scarce on the island, only one colony being found. No Turkish Geckos, *Hemidactylus turcicus,* were found, although they are reported to be similar in habits to *T. mauritanica.* This could be a case of one species thriving at the expense of another. *N. maura* was, as expected, abundant, as were *R. ridibunda.* Other species not seen included *Bufo viridis,* the Green Toad and *Hyla meridionalis,* the Stripeless Tree Frog. As both species are nocturnal and no searching was carried out in suitable habitats after sunset this is understandable. The terrapin reports were very interesting and I would be very grateful if anyone reading this account, who has more knowledge of its occurrence on Mallorca, would let me know. Perhaps the most pleasing aspect of the trip was that the island, apart from the S.W. corner, was not a haven for tourists only but largely unspoilt and a haven for nature and naturalists of all categories.

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A PRELIMINARY ESTIMATE OF THE POPULATION AND BIOMASS DENSITY OF THE GLASS LIZARD *OPHISAURUS APODUS* IN YUGOSLAVIA.

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INTRODUCTION

Despite its apparent common occurrence within some areas of its range, little is known of the biology and ecology of the glass lizard *Ophisaurus apodus*, a large (>400g) legless anguid found from central and southern Europe to central Asia (Obst, 1981). In a laboratory study Hailey (1984) investigated thermoregulation and activity metabolism whilst Meek (1986) measured body temperatures of animals in the field. However, for an understanding of a species ecology estimates of population and biomass densities are essential particularly in indicating how successful a species is in exploiting its habitat. Density estimates in reptiles have largely concerned lizards, the majority dealing with smaller species (Turner, 1977); this paper gives details of a preliminary survey of the densities of a population of *Ophisaurus apodus* in Yugoslavia.

METHOD

The field work was carried out in a scrub area in Croatia, Yugoslavia in 1986. Lizards were initially captured over a two day period and marked using Tippex fluid applied to the area between the lateral body folds after which the animals were released. A further two day sampling period was then carried out and the numbers of new and recaptures noted.

An estimate of the population density in a 1.8ha area was calculated using Baileys (1952) method regarded as suitable when the number of recaptures re low (i.e. less than 20). This has the form

$$d = a\,(n+1)/r+1$$

where the density estimated 'd' is derived from the total number of marked anaimals 'a', the total captures in the second sample 'n' and the number of recaptures 'r'. A 95% confidence interval based on Bailey's (1952) method for calculating the variance of the data has been obtained using

$$1.96 \times \sqrt{\frac{a^2\,(n+1)\,(n-r)}{(r+1)^2\,(r+2)}}$$

This is the method frequently employed for sampling lizards that are difficult to catch (Turner, 1977). Among the assumptions that should be taken into account with this method are 1) there is no appreciable recruitment during the study period, 2) mortality between marked and unmarked animals does not differ, 3) animals do not lose their marks, and 4) marked and unmarked animals have an equal chance of being captured. These are believed to be satisfied for this survey.

RESULTS

Initially, 17 lizards were marked with 21 lizards captured in the second sampling phase, 5 of which were recaptured. This gives a population density estimate of 34.6 ± 21.8 ha^{-1}. The mean body mass of the total number of captured lizards on th study area (n = 44) was 283g thus a biomass density estimate of 9,799g ha^{-1} was obtained. Figure 1 shows the biomass frequency distribution of the sample including lizards not included in the density estimates.

DISCUSSION

The small sample size and wide spread of the confidence interval show that the estimates can only be regarded as tentative. Nevertheless the population density value is close to the geometric mean density of lizards calculated by Turner (1977) of 51 ha^{-1} although often the densities of lizards are very much higher than this (>1000ha ^{1}) in productive environments (Turner, 1977). However, more instructive in indicating habitat productivity is biomass density which for *Ophisaurus* is probably above average for lizards but apparently lower than calculated for the sympatric *Testudo hermanni* of at least 24,183g ha^{-1} (Meek, 1985).

ACKNOWLEDGEMENT

The field work was carried out whilst working under a Grant from The British Ecological Society (no. 252).

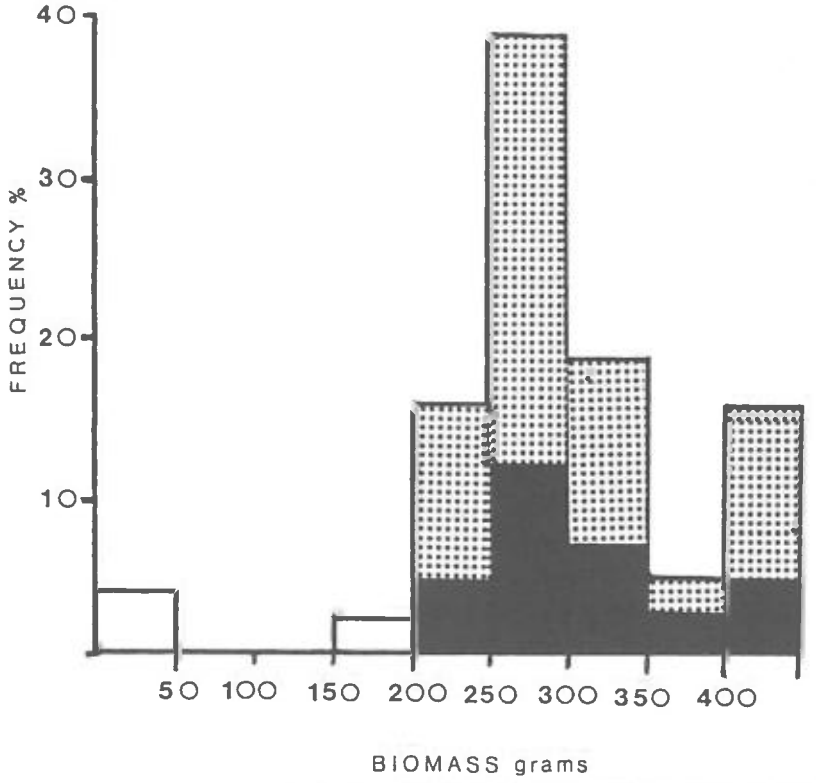

Figure 1. Biomass frequency distribution (%) of *Ophisaurus apodus* (n = 44). Solid histograms indicate males, stipple histograms females and open histograms hatchlings and juveniles. Based on this sample the male-female ratio is 1:2.15 and adult-juvenile ratio 13.7:1.

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TERRITORIALITY IN *PACHYTRITON BREVIPES*

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During 1986, large numbers of the aquatic urodele *Pachytriton brevipes* were imported into Britain from China under the rather ambiguous names of 'water salamander' or 'giant fire-bellied newt'. Many enthusiasts encountered problems in keeping these animals alive as they are, essentially, a cool mountain stream species, similar to *Euproctus asper* in general appearance, having a flattened head and body, though unlike *Euproctus* the skin is very smooth and slimy and the limbs short.

The coloration is unusually variable, the upperparts being either wholly brownish black or dark brown sometimes with gold spots or occasionally banded gold and mid-brown. The ventral surface is yellow through to brick red or pale blue with irregular darker markings. The tail is long, wide and paddle-shaped, being at its widest near the end. Its colour is also variable, sometimes having red on the underside while the sides are mottled of freckled, occasionally bearing large, pale blue spots. The differences between the sexes are difficult to detect.

My own specimens are housed in large tanks with 10cm depth of water and large numbers of rocks under which the animals spend part of the day, though they do occasionally leave the water. One interesting feature of their behaviour is tail-waving, the animals bending their tails around and gently waving them against the sides of their bodies. This behaviour may be sexual but is exhibited by all animals and it also lacks the vigour of the tail-fanning performed by, for example, the male Smooth Newt, *Triturus vulgaris* in sexual display.

Tail waving may serve to increase the flow of water over the body, thus ensuring a good supply of oxygenated water. This may be important when the animal is lurking beneath rocks where the environment might become stagnant, tail-waving serving much the same function as pulsating the body as seen in certain tube-dwelling marine worms.

Since tail-waving is also performed in open water it may serve another function, that of signalling territory in much the same way as a male Fiddler Crab announces his territory by waving his enlarged claw. Certainly the animals appear to space themselves out into territories, usually centred upon a large half-submerged rock, within the tank. Further evidence of territoriality is the attack response elicited by another animal approaching a tail-waver near to its 'favourite' rock. The occupant lunges at the newcomer grabbing and biting at the base of the latter's tail often holding on for several seconds and occasionally tearing the skin.

It is interesting to note that *Paramesotriton caudomaculatus,* another Chinese newt in which territorial behaviour has been noted, has a similar paddle-shaped tail.

SUBSTRATE AND TADPOLE SURVIVAL IN *EUPROCTUS A. ASPER*

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The importance of substrate quality to young aquatic urodeles was illustrated during the 1986 breeding season by an unintentional experiment and confirmed earlier observations and suspicions. A batch of sixteen eggs from one pair of Pyrenean Brook Salamander, *Euproctus asper asper* were divided into two shallow plastic containers 22 x 16 x 8cm deep with a 4cm depth of water, constantly and vigorously aerated. A thin layer of medium-sized gravel was scattered on the floor of one container whilst the second contained no gravel. The eggs subsequently hatched but none of the tadpoles in the bare chamber survived beyond one week despite scrupulous cleanliness. In the second container, which was treated in an identical fashion, seven out of the eight young survived and have now metamorphosed.

The reasons for this can only be guessed. Newly hatched *Euproctus* larvae are rather like trout fry in behaviour. When gravel is provided they tend to wedge themselves between the stones, thus keeping their dorsal surfaces upright, facing the water surface. In the absence of gravel the larvae fall over on their sides and continue to do this until the front limbs develop. Possibly this inhibits the functioning of the gill upon which the larvae is lying, resulting in physiological stress, whilst the wedged tadpole has both gills exposed to the water current.

Whatever the cause, the effect of substrate on survivorship seems to have been dramatically demonstrated.

YES, WE HAVE NO BANANA FROGS!

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Banks (1985) reported on the occasional arrival of *Hyla rubra* into Britain via crates of bananas. Several of these frogs have also been forwarded to me over the years from fruit importers, in Southampton and Sheffield, all originating in Surinam (Dutch Guiana). In fact, this species has a much wider range than suggested by Banks, having been recorded from Trinidad, Panama, Venezuela, Colombia and Ecuador as well as the Guianas and Brazil, although it is possible that more than one species is at present known under this name (Duellman, 1970). In the West Indies it is known only from St. Lucia — its presence here could be the result of an accidental introduction bearing in mind its obvious talents as a stowaway.

Although I have no first hand experience of this species on the mainland, in Trinidad it is common in lowland areas, where it breeds in road-side ditches and other fairly small bodies of water. Breeding activities (calling, amplexus) appeared to be stimulated by rain, and always after dark.

Recently I investigated yet another incidence of banana travel and was surprised to find that the animal involved was not *H. rubra* but a small *Eleutherodactylus.* This particular shipment of fruit apparently originated in the Windward Islands (Guadaloupe, Dominica, Martinique, St. Lucia, St. Vincent and Grenada) where a total of five species belonging to this genus are known. These are *E. barlagnei, E. johnstonei, E. martinicensis, E. pinchoni* and *E. urichi.* Apart from eliminating the latter, I have so far been unable to positively identify the frog, but note that it seems to be strongly arboreal (well-developed toe-pads and preference for resting well above the substrate), and appears to be female.

The frog is at present being maintained alive in the hope that I can obtain a mate for it, perhaps from the same greengrocer.

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OBSERVATIONS ON THE DISPERSAL OF COMMON FROG TADPOLES *RANA TEMPORARIA* FROM THE SPAWN SITE

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INTRODUCTION

The common frog, *Rana temporaria,* is a typical 'explosive' breeder, and usually selects a single communal spawn site within a pond for mating and egg-laying activities. Such sites are often situated in warm, sunny areas of water (Smith, 1973; Frazer, 1983), which may provide optimum conditions for egg development. For the first few days after hatching the mouth is closed and tadpoles cling to the spawn jelly with an oral sucker and feed on yolk. Later, the tadpoles become free-swimming and are observed over a much wider area of the pond (Savage, 1935, 1961). Previous studies of the overall distribution of common frog tadpoles in Llysdinam pond, mid-Wales, suggest that even at their most widespread, tadpoles are not evenly distributed within the pond and tend to stay in the general vicinity of the spawning area (Harrison, 1985). This paper describes the progressive dispersal of tadpoles from the spawn site in 1986 and relates the pattern to the stage of development of the tadpoles.

MATERIALS AND METHODS

The main spawn site in Llysdinam pond is on the shoreline edge of a *Glyceria maxima* reed-swamp which occupies about two-thirds of the surface area of the pond. This shoreline faces south and is the warmest part of the pond (Harrison, 1985). In 1986 spawning was first observed on 19 March, and was completed by 31 March when about 50 clumps were counted at the spawn site. These clumps formed a dense mat approximately $3m^2$ in area, the centre of which was marked using a cane driven through the spawn into the pond bottom. By 11 April hatching was almost complete, with large numbers of immobile tadpoles clinging to the remains of the jelly at the spawn site. Observations on tadpole distribution commenced 10 days after this date and were repeated at intervals of 10 days until 50 days after hatching.

On each observation day, funnel traps (Griffiths, 1985a) were positioned at distances of 1m, 2m, 4m and 6m from the centre of the original spawn mass. Traps were positioned at intervals of about 1.6m, such that they lay on the pond bottom facing towards the centre of the spawn site in a series of concentric arcs. The depth at which traps were placed varied between 10 and 50cm, according to the depth of the pond. The total number of traps used within each arc varied between observation days as some parts of the shoreline and swamp dried out during the course of the study. Maximum numbers used were 4 traps at 1m, 7 traps at 2m, 10 traps at 4m, and 13 traps at 6m. A single trap was placed at the centre of the original spawn mass. As *Rana temporaria* tadpoles are mainly day-active (Griffiths 1985b), traps were placed in position at 1000 hrs and emptied at 1700 hrs on the same day. Temperatures were taken at each trap site using a mercury thermometer graduated at 0.1°C intervals. Access to the traps was gained by wading in the swamp, using duckboard walk-ways in the deeper areas. On each observation day, trapped tadpoles were counted and a sample of 10 was taken to the nearby laboratory to be measured and staged. These animals were anaesthetized using benzocaine, measured (snout to tail-tip) to the nearest 0.1mm using a binocular microscope equipped with an eyepiece graticule, and staged using the table described by Gosner (1960).

RESULTS AND DISCUSSION

The total number of tadpoles captured every 10 days declined rapidly over the study period, and the study was discontinued after 50 days as only 4 tadpoles were captured on this date. This decline may well be associated with dispersal from the spawn site, but predation of tadpoles by invertebrates in the pond is severe (Harrison, 1985), and the decline therefore almost certainly reflects mortality.

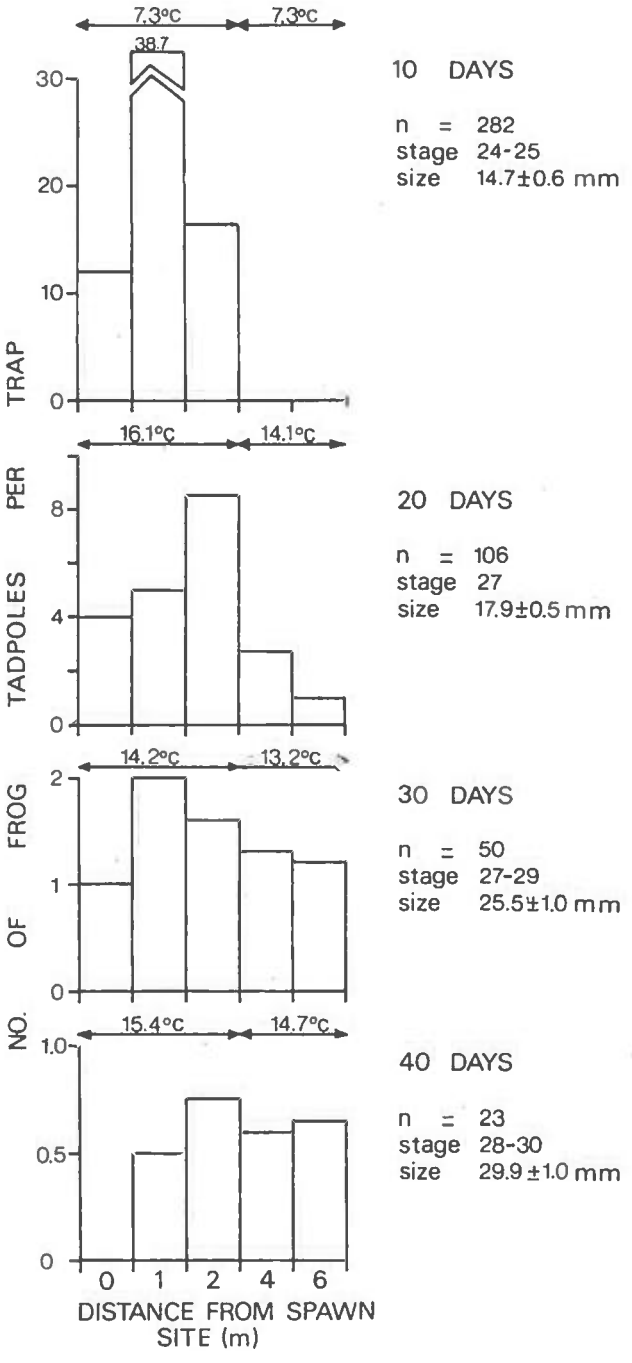

Figure 1. The progressive dispersal of frog tadpoles from the spawn site. Median temperatures 0-2m and 4-6m from the spawn site are shown at the top of each histogram. Stages are based on Gosner's (1960) table; sizes are means of 10 tadpoles ± SE.

Ten days after hatching the tadpoles had become free-swimming and the external gills had largely disappeared. At this stage the tadpoles had yet to disperse beyond 2m from the spawn site, and most individuals were in fact still confined to the area originally occupied by the spawn mass (Fig. 1). By 20 days the hind limb buds had commenced development and some tadpoles had now dispersed to a distance of 6m, although the majority had still moved less than 2m. As the hind limbs continued to develop, the tadpoles moved out from the spawn site and were relatively evenly distributed across the trapping area by 30-40 days. Traps placed elsewhere in the pond (i.e. about 20m from the spawn site) succeeded in capturing tadpoles 30 days after hatching, suggesting that dispersal was almost complete by this time. Forty days after hatching tadpoles were twice the size observed at 10 days, but the toes on the developing hind limbs had yet to differentiate.

Direct comparisons between the present data and Savage's (1961) extensive field notes on frog tadpole life history are difficult due to differences in methodology. However, at most of Savage's ponds tadpoles were first captured away from the spawn site during the first two weeks of May, but the size of the tadpoles at this time varied between ponds and between years

The temperature of Llysdinam pond 4-6m from the spawn site was significantly lower than 0-2m from the spawn site, 20-40 days after hatching (Mann-Whitney *U*-tests, P 0.05). Tadpoles therefore appeared to be moving from warmer to cooler water during dispersal. This behaviour appears to be rather different from that observed in dispersed, free-swimming tadpoles which frequently orient towards warmer areas of water where they may form aggregations (e.g. Beiswenger, 1977; Griffiths, 1985b).

Although newly-hatched tadpoles are capable of swimming (Savage, 1935), dispersal from the spawn site clearly does not occur until the external gills are lost and a mouth is developed to facilitate independent feeding. Dispersal appears to be largely completed, however, before the hind-limbs are half-grown.

ACKNOWLEDGEMENTS

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THE REARING AND BREEDING OF *DENDROBATES AURATUS* IN CAPTIVITY

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Two specimens of *Dendrobates auratus* were obtained in the Spring of 1984. They were housed in a 90cm x 50cm x 30cm all glass vivarium. This was furnished with a layer of charcoal, a layer of John Innes No. 1 potting compost and a layer of gravel. Pieces of cork bark were placed upright against the back and the following plants allowed to grow profusely:- *Scindapsus aureus, Philodendron scandens, Peperomia, Cordyline terminalis,* and parts of the floor were covered with growing sphagnum moss.

The substrate was kept sodden and the vivarium sprayed twice daily with tepid water. Heat was provided by two 60 watt spot bulbs thermostatically controlled and extra light given by means of a 30 watt fluorescent tube. Daytime temperatures were 28°—29°C, lowered at night to 22°C. In Spring and early Autumn the vivarium receives direct sunlight for aproximately thirty minutes in early morning and again in late afternoon. Food consisted of fruit flies (*Drosophila*), tiny crickets, tiny mealworms and "buffalo" worms (*Alphitobius diaperinus*). White-worm (*Enchytrae*) were given occasionally by placing them on leaves and allowing them to crawl downwards.

Both specimens were discovered to be males as they were observed calling throughout most of 1985 (very little calling having taken place during 1984). On 27th April 1986, a new male and female were introduced. Almost immediately the frequency and intensity of calling increased, and the males were observed dashing about the vivarium with the female in pursuit. She seemed to pay more attention to the new male. On 8th June 1986, mating behaviour between the female and new male had been intensive for most of the day with much foreleg movement resembling beckoning by the female and both sexes frequently entered un upturned piece of coconut shell. This had been introduced after reading the article by Wagner and Slavens in the BHS publication "Reptiles — Breeding, Behaviour and Veterinary Aspects". The coconut shell was placed on a large watch glass on which was a leaf-shaped piece of green plastic sheet partly covered by a piece of well-soaked paper towel.

About 8.30 pm on the 8th June five eggs were discovered on the paper towel. Both towel and eggs were removed to a small styrofoam tub with perforated platic lid. Water was added until just lapping the base of the eggs, and then the tub left in the vivarium. Two of the eggs developed fungus within two days. By 15th June a third egg developed fungus, but the remaining two were showing signs of development. By 26th June one tadpole had wriggled out of the jelly and two days later both were free swimming so they were removed to individual plastic margarine tubs containing 2cm of water. The tubs were then placed in a wooden vivarium with a temperature range similar to that of the adults. A small piece of freeze-dried brine shrimp was given each morning, the tadpoles being transferred to clean containers of aged water each evening. By 26th July the rear legs were well developed and the front limb buds visible. By 2nd August the green colouration was beginning to show and a day later one specimen had all four legs. The following day both were transferred to a small aquarium with half land, half water. Metamorphosis of one specimen was complete by 7th August and it had left the water. The second specimen completed metamorphosis on 8th August. Fruit flies were supplied but the froglets were not actually observed feeding until five days later.

Meanwhile, in the adult vivarium, the males were heard calling on 2nd August and during the next few days there was increased activity. On 8th August the female laid twelve eggs, which were probably not fertilised since they all developed fungus.

At the time of writing (August 31st 1986), the two froglets are thriving, measuring 14mm and 16mm on a diet similar to that of the adults.

ZOO NEWS

It is hoped to include regular items of zoos within Britain and Overseas.

TWYCROSS ZOO

Atherstone, Warwickshire

Curator of Reptiles and Birds: Dennis Wheatley

1. Breeding successes:
   Physignathus cocincinus — Chinese Water Dragon, 67 hatched and 60 reared.
   Eublepharis macularius — Leopard Gecko, 24 hatched and all reared.
   Phelsuma madagascarensis grandis — Giant Day Gecko, 10 hatched and 6 reared.
   Chrysemys scripta elegans — Red-Eared Terrapin, 12 hatched and all reared.
   Geochelone carbonaria — Red Footed Tortoise, 9 hatched and all reared.
   Tiliqua gigas — Blue Tongued Snake, 5 hatched and all reared.

2. Recent stock additions:
   Boiga dendrophila — Male Mangrove Snake
   Boa constrictor — Female Common Boa
   Psamnophis subtaeniatus subtaeniatus — Male and Female Western Stripe Bellied Sand Snake
   Thamnophis sirtalis — 5 Red Sided Garter Snakes. Donated.
   Tupinambis teguixin — Male and Female Tegu
   Eublepharis macularius — Male and Female Leopard Gecko. Donated.
   Leiocephalus personatus — Male and Female Curly Tailed Lizard
   Tiliqua gigas — Male and 2 Female Blue-Tongued Skinks.
   Kinixys erosa — Male and Female Eroded Kinixys
   Geochelone carbonaria — Male Red Footed Tortoise
   Chrysemys scripta elegans — 37 Red-Eared Terrapins. Donated.
   Salamandra salamandra — 1 Fire Salamander
   Hyla cinerea — 12 Green Tree Frogs
   Bombina orientalis — 3 Oriental Fire-Bellied Toads

   Note: The Red-Eared Terrapins are housed in a new outdoor colony. No more donations of this species are required!

3. Loans:
   Alligator mississipiensis — 6 Juvenile Mississipi Alligators to Chester Zoo.

REPORT OF THE 1986 JOINT MEETING OF S.S.A.R. AND H.L., WITH PARTICULAR REFERENCE TO A SYMPOSIUM ON SALAMANDER BEHAVIOURAL ECOLOGY.

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Held at Southwestern Missouri State University, Springfield, U.S.A., from 10-15th July, this Joint Meeting of the Society for the Study of Amphibians and Reptiles (S.S.A.R.) and the Herpetologists' League (H.L.) was well-attended by herpetologists, the great majority of which were affiliated with universities and other institutions in North America. This representation was reflected in the fact that approximately 75% of all papers given at the Meeting were concerned with the biology of North American herptiles (a little over half of these papers were on amphibians). This Meeting marked no special occasion other than the fiftieth anniversary of the first publication of the journal *Herpetologica* by H L.

The academic content of the Meeting was divided into two parts: general paper sessions and specific symposia. The former were very varied in scope, and included the following:

1) *Caiman* diet
2) Herptile distribution and biogeography
3) Phylogeny of West Indian herptiles
4) Turtle biology
5) Lizard biology
6) Hellbender (*Cryptobranchus*) biology
7) Frog biology
8) Tuatara (*Sphenodon*) biology
9) Snake biology
10) Salamander biology

Salamander biology was particularly well-covered during this Meeting. Aside from the general session, a whole symposium was devoted to salamander behavioural ecology (the other symposium in the Meeting was concerned with snake-bite in zoos). I shall report on the salamander symposium in some detail for three reasons. First, this was, for me, the most interesting part of the Meeting. Secondly, the symposium provided a fine opportunity to discuss this exciting research area from a number of different approaches. And finally, no other written record of what was said is available elsewhere (except for the volume of abstracts available to Meeting participants).

The symposium was organized by Robert Jaeger (University of Southwestern Louisiana) and Kiisa Nishikawa (University of California at Berkeley). As stated by Jaeger at the start of the symposium, the principal aim was to summarize the "state of the art", determine the extent to which current data can be used to test specific hypotheses about behavioural ecology (as has been done extensively with data from studies of insects, fishes, birds and mammals) and suggest fruitful directions for future research.

The first part of the symposium dealt with the role of chemical communication in salamander social behaviour, mainly in the context of reproduction. David Sever (St Mary's College, Notre Dame, Indiana) began by reviewing what we know about skin glands, especially those which occur only in breeding males and are thought to produce courtship pheromones. Sever stressed that although salamander skin is richly supplied with glands, we know little about their function in the vast majority of species; the time seems to be ripe for some functional histological studies. Ellen Dawley (Cornell University, New York) then considered the fate of olfactory stimuli when they reach the nostrils of a plethodontid salamander. By chemically labelling faecal pellets (which are actively explored by salamanders with their snouts), she showed that the olfactory timulus is transported to the vomeronasal sensory epithelium. Dawley also presented data which suggest that the vomeronasal epithelium is most highly developed in terrestrial salamanders. The next two papers reported empirical evidence for the importance of olfaction in salamander reproduction. Paul Watson (Cornell University) demonstrated that secretions from glands on the cheeks of male red-spotted newts, which are applied to the female's nostrils during courtship, are responsible for rendering the female sufficiently responsive for proper mating. Watson has

also tried, unsuccessfully, to identify chemically the courtship pheromone involved. Don Forester (Towson State University, Maryland) then reviewed a series of experiments which demonstrate that female *Desmognathus ochrophaeus* salamanders recognize their own clutches of eggs simply by their smell; this ability is most important, because if a female is forced to abandon her clutch, the chances of the embryos surviving are very low.

Reproductive behaviour was considered in further detail in the next four symposium papers. Steven Arnold (University of Chicago) and Stephen Tilley (Smith College, Massachusetts) presented the results of some preliminary experiments on behavioural reproductive isolation in *D. ochrophaeus*. By staging courtship encounters between individuals from different populations, they found that courtship was less likely to occur in between-population pairings than in within-population pairings. This continuing work addresses the issue of how the evolution of behavioural isolation is related to genetic divergence within a species. Staying with the same species of salamander, Lynne Houck (University of Chicago) presented information on the determinants of male mating success in within-population pairings. Her laboratory work shoes that males vary in their ability to inseminate females and that when two males are present together with a female, it is usually the larger male which mates. In the field, Houck has found that males on a rock-face temporarily defend refuges, perhaps for the purpose of mating. In his talk, Tim Halliday (Open University, England) showed how the mating effort invested by male newts (*Triturus vulgaris*) might limit their future mating opportunities. He identified several types of constraints, some working on a short time-scale (e.g. oxygen supply) and others working over longer spans (e.g. body size, which may limit lifetime fecundity). Paul Verrell (University of Chicago) suggested that it is often difficult, and sometimes nearly impossible, to observe directly salamander behaviour in the field. He presented an alternative approach to understanding mating systems in "unobservable" species, in which data from studies of population dynamics and ecology, sexual behaviour and reproductive physiology are integrated to produce specific hypotheses which can be directly tested by observation or even experimentation.

Constraints on behavioural performance were discussed further by Martin Feder (University of Chicago), who warned behavioural ecologists that gas exchange frequently limits the duration and intensity of salamander behaviour; this holds for all taxa, but is especially true for the lungless plethodontids. In addition, Feder warned physiologists that they should pay heed to an animal's ecology when designing experiments to measure the energetic costs of behavior.

The next four papers were concerned with behavioural aspects of salamander habitat selection and distribution. Hubert Keen (State University of New York at Cortland) demonstrated that *Desmognathus* salamanders defend refuges and that owner-intruder conflicts can often result in serious injury. Keen proposed the hypothesis that such refuges are vital to maximal growth and successful reproduction. Aggressive behaviour is also shown by male *Plethodon vehiculum* salamanders, but not in the context of territorial defense. Kristiina Ovaska (University of Victoria, British Columbia) found that competitive encounters between these salamanders are not over food, but are over mates; fighting is most intense between males during the mating season. Kiisa Nishikawa examined determinants of home range size in *Plethodon* salamanders in the eastern states, and found a very complex situation. In brief, her data indicated that small salamanders are excluded from good quality ranges by larger salamanders; quality is defined in terms of exclusivity and availability of burrows. Small salamanders may compensate for their low quality ranges by taking larger ranges. Territorial defense in the salamander *Aneides aeneus* was discussed by Paul Cupp, Jr (Eastern Kentucky University), who showed that both males and gravid females defend rock crevices. However, males will tolerate intrusions by females (presumably for mating) and non-reproductive juveniles (which presumably pose no threat in terms of competition for mates). Aggressive behaviour in the genus *Aneides* is very ferocious and, as described by Nancy Staub (University of California at Berkeley), the heads of these animals are very solid and muscular, and their jaws are armed with large, sharp teeth. Staub does not think that these large heads and sharp teeth are direct adaptations for aggression, and calls for more information concerning the behaviour and way of life of these salamanders.

The last paper in the symposium was presented by Robert Jaeger, who discussed the relationships between territoriality and mate choice in plethodontid salamanders. Starting with the hypothesis that territorial defense and mate choice might interfere with one anothers' effective expressions, Jaeger outlined some possible models for balanced interactions between the two. Whilst some of his models seem a little far-fetched, all of them are at least testable in the

field (at least in theory), although practical problems associated with such testing could be great.

The symposium ended with a few remarks by Kisa Nishikawa and was followed by a round-table discussion chaired by Richard Bruce (Western Carolina University). It must be said that no great conclusions were reached during this discussion. Some participants felt that a tightening of definitions is needed: do we really mean pheromones, do we really mean territoriality? What did emerge with great vigour was the feeling that all of the observational data now available is leading to the testing of specific predictions and hypotheses by empirical means, a situation with a much longer history for studies of other groups of animals. In addition, it was recognized that the study of salamander behavioural ecology will profit greatly from input from other biological disciplines; we should listen to what histologists, physiologists and "pure" ecologists are telling us. All in all, salamander behavioural ecology seems to be in good shape, and the signs are that it can only get better.

WORLD CONGRESS OF HERPETOLOGY

In 1989, the First World Congress of Herpetology will be held at the University of Kent in Canterbury, England. This truly monumental undertaking will enable people from all over the world to discuss their work; it is quite likely that attendance at such a Congress is the only way herpetologists from certain countries will ever get to meet one another. Thus, aside from its academic/intellectual aspect, the Congress should be a very "social" event. Ian Swingland was present at the S.S.A.R.-H.L. Meeting, and gave a brief overview of what the Congress is all about and of what it will consist. In addition to this oral presentation, a profusion of literature was available to those interested. Potential Congress participants were asked to express their interest by completing questionnaire forms and, from personal discussion with people, I believe that the response on this side of the Atlantic is enthusiastic.

Ed. Note. Dr Verrell is on a two-year research fellowship with the University of Chicago, U.S.A., and at a meeting on April 24th 1986 talked to the BHS about his work on the smooth newt which he carried out at the Open University, Milton Keynes.

BOOK REVIEW

A GUIDE TO THE IDENTIFICATION OF THE AMPHIBIANS AND REPTILES OF THE WEST INDIES EXCLUSIVE OF HISPANIOLA.

By Albert Schwartz and Robert W. Henderson

(1985) 8 + 165 pages, including 2 maps, 19 colour plates and 87 black and white drawing and photographic figures.

Milwaukee: Milwaukee Public Museum, Wisconsin. ISBN 0-89326-112-2.

The 1985 guide by Schwartz & Henderson follows earlier works by Schwartz & Thomas (1975), with its supplement (Schwartz, Thomas & Ober, 1978) and Henderson & Schwartz (1984). The former is a check list with distributions, the latter another guide to the identification of the West Indian herpetofauna, but confining itself to Hispaniola (Haiti and the Dominican Republic). As indicated by the authors in their Introduction, the 1975/1978 check list did not include keys to the taxa and many more have been named since. The 1984 identification guide confined itself to the Hispaniolan herpetofauna for more species are known to be harboured there than on any other Antillean island (it ranks only after Cuba, another Greater Antillean island, in size) and the "West Indian" guide obviated the need to do separate ones for Cuba-Bahamas, Jamaica-Cayman Islands and Puerto Rico-Virgin Islands-Lesser Antilles. The authors, perhaps slightly cannily, also indicate that the "West Indian" and Hispaniolan guides should be used in addition to, not as a replacement for, the 1975/78 check list! And in these convolutions, I have my main criticism of the 1985 guide. Although arguably still early days and a pioneering stage in West Indian herpetology, there is enough confusion in the literature already without compounding it. One still has to look forward to field guides like the Arnold-Burton-Ovenden (1978) one for Europe and the Conant (1975) and Stebbins (1985) ones for eastern and western North America, respectively. Judging by the works listed in the Bibliography on the West Indian herpetofauna, there is probably just about enough information, when pooled, for a first edition. Returning to the 1985 guide, one of the several good things about it is the Bibliography, which is truly comprehensive, even virtually complete. There are also David C. Leber's splendid and well executed watercolours to illustrate the differences between the large number of *Anolis* species, which is an important genus in the Caribbean, and to my mind the guide's main selling point. The head, complete with erect throat fan, gular sac or dewlap (whichever term you would like to use — the guide uses dewlap), and forepart of the body are included for 104 colour morpha and forms (also including a *Chamaeleolis* and *Chamaelinorops*) in eleven plates (pages 50-71). Four of the Jamaican and Caymanian *Anolis* (Plate V, 7-10) are used for the shiny-paper front title cover and six of the Bahamian *Anolis* (Plate I, 1-6) are used for the back cover of the guide. Note the island groups used for these have a big tourist industry and hopefully your herpetologically-inclined visitor uninitiated in the natural history will be able to make full use of the guide (if a copy can be come across easily) to identify the herpetofauna. The active little *Anolis* lizards that scuttle over the balustrades of hotel balconies and other residences, and on ornamental garden trees and shrubs, can scarcely be missed even by the unobservant.

The guide also includes nine plates (XII-XIX, pages 72 and 73) of the seven species of West Indian boa (genus *Epicrates*) and one of the twelve species of the snake genus *Tropidophis* – *T.m. malunurus* of Cuba and the Cuban Isla de la Juventud (Isle de Pinos) is shown. The eleven black and white habitat photographs (Figs 51-61, pages 94-100) are of Cuba, Jamaica and some Lesser Antillean islands, and 26 (Figs 62-87, pages 101-112) of various species, including three *Peltaphryne* frogs, two *Sphaerodactylus* "wood slave" geckos, two *Chamaeleolis* iguanids, an iguana (*Cyclura pinguis* of Anegada, British Virgin Islands), three *Leiocephalus* iguana, a teiid (*Ameiva auberi denticola* of Pinar del Rio Prov., Cuba) a galliwasp (*Diploglossus d. delasagra* of Camaguey Prov., Cuba) and eleven snakes. The snakes comprise a *Typhlops*, four *Tropidophis* and two *Arrhyton* (family Colubridae) amongst others.

The work's introduction is followed by sketch maps, showing the position and abbreviations alphabetically of the many islands mentioned under the different species in the text, and then keys to the taxa (orders, genera and species). I have not yet used the keys, but there's no reason to doubt whether they will do their job effectively and identify the various species. After each genus key, species are listed in turn (subspecies, if any, also being indicated) and each is given key literature references and island distribution. The whistling frogs, *Eleutherodactylus* (family Leptodactylidae), comprise a large number of species in the West Indies. Many are carefully depicted by line drawings (Figs 1-47, pages 15-18) to show the difference between closely related

forms. Separate identification keys are given for Cuban-Bahamian, Jamaican-Caymanian, Greater Puerto Rican and Lesser Antillean forms; likewise for the *Sphaerodactylus* geckos and *Anolis* iguanids. Curiously, amongst the attractive water colours of the various species of the latter, those, and *Chamaelinorops*, of Hispaniola are included (Plates VI, 1-10, and VII, 1-8), but not mentioned in the text! This means, although published earlier (1984), that the Hispaniolan guide has to be used as a compendium to the "West Indian" one, making it seem that the *Anolis* watercolours were excluded in error and therefore included with the later guide. Should further editions of these guides be published in the future, I would suggest that the information for Hispaniola (notwithstanding the large number of species) should be pooled, together with updated distribution information from the 1975/78 check list to produce a truly comprehensive field guide for the whole of the West Indies.

The Appendices usefully include lists of the herpetofauna of the West Indian islands under 1. Bahama, Turks and Caicos Islands, 2. Cuba, 3. Jamaica, 4. Cayman Islands, 5. Hispaniola (!), 6. Puerto Rico, Isla Mona, Virgin Islands and 7. Lesser Antilles. There is a Glossary of Terms used in the keys (useful for the novice), Bibliography and Index to illustrations. For the last, I would have preferred an index to all of the species giving textual page numbers as well as of the illustrations. There are also what I suppose were typographical errors, e.g. *Tropidophis haetianus* on page 86 includes Jamaica in its range (as also do Maclean, Kellner & Davies, 1977), but it is excluded from the Jamaican list (page 115), and the Commonwealth of Dominca is abbreviated as D but is given as both Do and D in the text. These are just two examples that come to mind immediately, but there are others, and assuming that the original manuscript was on a word processor or computer, it should have been possible to have ironed out more of these then.

Nevertheless, I think the guide, and compendial one for Hispaniola (U.S. $6.95), will be useful and indeed a must for the herpetologically-inclined visitor to the West Indian islands. It is worth buying at U.S. $29.95 (the useful watercolours of *Anolis* and coloured plates of *Epicrates* have presumably raised the price) and I do approve of the authors' dedication "to the hope that the future survival of the West Indian herpetofauna is brighter than the present would indicate". At least being able to identify the various species should go some way towards conserving them! Let us hope that the sons of the now independent islands themselves (some in the Commonwealth) will have the opportunity to see the guide and develop an interest in their own herpetofauna. It should therefore be on the shelves of local book shops amongst the other works of travel or touristic interest on the islands that at present only otherwise include works on butterflies, birds and sometimes flowering plants. The publisher's sales might be increased in this way, incidentally, which is all important in seeing further such works in herpetology produced for relatively undeveloped or remote parts of the world. Perhaps Houghton Mifflin of Boston or Collins of London will be the publisher of a full field guide in the future, if outside the terms of reference of the Milwaukee Public Museum, whom should be congratulated, nonetheless, for taking the initiative.

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M.R.K. Lambert

PICKETT'S PIECE

An irregular column of personal observations, notes, commentary.

Practical Conservation down on the Fish Farm

Quietly and unnoticed, an old colleague has, in effect, created an excellent private nature reserve on the premises of H. Tisbury & Sons, an ornamental fish breeder of Noak Hill, Essex. George Malenoir, previously responsible for surveying the reptiles and amphibians of Essex, and in particular Epping Forest, and a BHS member of some years past, on his retirement took an interest in the wildlife living around Tisbury's fish farm. Mr Tisbury encouraged this interest, and gave George Malenoir a free hand to take care of the animal life on his property; this, as a consequence, is thriving.

There are over thirty ponds on the property, of varying size and character, used for breeding and rearing a variety of ornamental coldwater fish, such as Orfe, Rudd and various Carp. This, however, does not drastically conflict with the use of the ponds by amphibians. George Malenoir has introduced Common Frogs, which have established themselves successfully in large numbers. Apart from the usual common species, all of the ponds are used for breeding by Crested Newts, and one pond has been set aside specifically for them, without fish. Another notable feature is the abundance of Grass Snakes, which, because of the enlightened and interested views of the owners, are not persecuted for their fish eating habits, which are regarded as being insignificant.

George, in the obscurity of his retirement and new role as conservator of this pleasant piece of Essex, is enjoying himself immensely. He is busy through the year, managing and maintaining ponds, clearing scrub, putting up nesting boxes for birds, encouraging various wild plants. All this has enhanced the character of the farm, and is in no way in conflict with its management as a commercial enterprise.

More than any law, the quiet efforts of George Malenoir are an example of real, constructive, practical conservation.

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