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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.

**Meetings**

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

**Subscriptions**

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**John Pickett and Simon Townson**

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Front Cover:
Male Sand Lizard *(Lacerta agilis)* in spring breeding colours. This animal was rescued from a doomed Dorset heathland site and transferred to a BHS Conservation Committee vivarium for captive breeding purposes. See *Conservation Matters*, page 32. Photo: Paul Edgar

## LONDON MEETINGS 1989

Meetings are held either in the Lecture Theatre of the Linnean Society of London, Burlington House, Piccadilly, London W1 (*), or in the Lecture Theatre of the Zoo Studies Centre, Zoological Society of London, Prince Albert Road (opposite Ormonde Terrace), London NW1 (**) and start at 7.00 pm, ending at 9.00 pm, unless indicated otherwise.

| | |
|---|---|
| FEBRUARY 28th* | Dr Peter Evans (Department of Zoology, University of Oxford): Herpetofauna of the Commonwealth of Dominica (Windward I., Lesser Antilles), West Indies. |
| MARCH 7th * | A.G.M. (see separate Agenda) followed by Dr S.M. Halpern (BHS Council): Snake bite. |
| APRIL 25th * | Mr Daniel Bennett (Glossop, Derbyshire): Goannas, monitors and other varanid lizards in the world. |
| MAY 23rd * | Dr Christopher Raxworthy (Biology Department, Open University): Herpetofauna of the threatened rain forests of Madagascar – a unique habitat. |
| JULY 4th ** | *Amphibians and Reptiles worldwide: their care and breeding.* A discussion organised by the Captive Breeding Committee (Chairman: Mike Linley). Members are encouraged to bring live animals, preserved specimens, amphibian voice recordings and 35mm colour slides for display and to illustrate discussions. |
| AUGUST 30th ** | Dr William Branch (Port Elizabeth Museum, South Africa): Herpetofauna of southern Africa. |
| SEPTEMBER 2nd ** | *Care and Breeding of amphibians and reptiles: an open meeting.* Contributions from members – live animals and photographic display. There will be the opportunity for the sale and exchange of members' private home-bred stock. A special Saturday afternoon meeting from 2.00 to 5.30. |
| OCTOBER 10th ** | Dr David Corke (Department of Biology and Biochemistry, North-East London Polytechnic): Lizards in paradise – conservation on St. Lucia (Windward I., Lesser Antilles), West Indies. |
| NOVEMBER 29th ** | Dr Clive Cummins (Monks Wood Experimental Station, Abbots Ripton): Effects of acid rain on amphibians. |

## TRITURUS III – A REPORT ON THE THIRD MEETING ON THE BIOLOGY OF EUROPEAN NEWTS, CALABRIA, ITALY, SEPTEMBER 20-23 1988

In 1984 a number of biologists with one thing in common – an interest in European newts – got together at Leicester University to discuss their work. The meeting coincided with the publication by Tim Halliday of a directory of all people researching on members of the genus *Triturus*. The meeting drew together scientists from a diversity of disciplines, including behaviour, ecology, genetics, evolution, physiology and biogeography. The meeting was highly successful, and it was decided to hold regular meetings at intervals of two years. The second meeting was held at Ambleteuse, France in 1986, and in September of this year about thirty or so *Triturus* biologists gathered at a hotel situated in the beautiful mountains of Southern Italy for TRITURUS III.

The event was organised by Cristina Giacoma and her colleagues from the Universities of Turin and Calabria with sponsorship by the Communita Montana Media Valle Crati. The meeting was attended by delegates from all over Europe, with the UK being represented by Tim Halliday (BHS) and his students from the Open University, Simon Tonge from Jersey Wildlife Preservation Trust, and Richard Griffiths (BHS). The hotel for the meeting was

delightfully located in the "Parco Naturale". This area of thickly wooded mountain slopes is of considerable herpetological interest, with wall lizards *(Podarcis muralis)* and green lizards *(Lacerta viridis)* sunning themselves in the environs of the hotel itself. Despite a rainy night which had cagoule-clad herpetologists searching the mountain roads by torchlight, the reputedly common Italian fire salamander *(Salamandra salamandra giglioli)* failed to reveal itself.

On the first day members of the Communita Montana Media Valle Crati formally welcomed delegates, and expressed the hope that the meeting would result in some sound conservation measures for the park, and instill a greater awareness of the various amphibian species it contains. There were four main sessions covering conservation, reproductive behaviour, ecology, ecological physiology and newt phylogenesis. As in all such meetings, however, the most important periods were the informal discussions, over lunch, coffee or a glass of beer. Several topics resulted in particularly enthusiastic discussion. Pim Arntzen's paper on "How many *Triturus* species?" described his extensive work across Europe on hybrid zones and phylogeny. He confirmed that three former subspecies of *Triturus cristatus* - *carnifex*, *dobrogicus* and *karelinii* should now be regarded as full species, thus increasing the total number of *Triturus* species to twelve. Much discussion followed on the usefulness of the subspecies as a level of classification. Also debated was the number of newts that could be removed from a pond without endangering the population. There seems no easy answer to this one, as population sizes and population regulation mechanisms vary both within and between geographical areas. A display of traditional Italian folk dancing at a local village rounded off the second day of the proceedings.

The final day was devoted to a field trip. A coach collected delegates from the hotel and wound its way up the thickly wooded slopes to a small lake. The lake was where Cristina Giacoma and Alain Dubois from Paris had carried out field work on the Italian newt *(Triturus italicus),* and it was not long before several specimens of this animal had been netted out for inspection. Rather similar to the smooth newt in appearance, the Italian newt has an orange throat and lacks a crest. Also found here was the Italian crested newt *(Triturus carnifex).* Again, similar to our British *Triturus cristatus* but with rather more rounded black blotches on the belly and no white stippling on the flanks. We then all boarded smaller overland vehicles which proceeded to bump along at an alarming pace up narrow mountain tracks. We came to a halt at the highest point in the park at 1200m. Despite some clouds swirling just below us, it was still surprisingly warm at this altitude, and lizards were seen basking on sunny slopes just below the summit. Before returning to the hotel we investigated another woodland pond. Here several yellow-bellied toads *(Bombina variegata)* were found together with a stream frog *(Rana graeca)* which obligingly posed for photographs. Less obliging were the numerous lizards which scampered in and out of rocks along the shoreline in the warm sunshine. Not far from the hotel was a woodland stream in the vicinity of which the uncommon spectacled salamander *(Salamandrina terdigitata)* had been recorded. A few of us set out that evening to try and track down this elusive beast under the bright Mediterranean moon. Despite much stone-turning and leaf-litter sifting, however, all that was found were a couple of yellow-bellied toads.

Before leaving for home, every delegate was presented with a parcel comprising two bottles of local wine and other souvenirs of the area. Everyone was touched by the generosity and support of the Communita Montana Media Valle Crati, and thanks must also go to Cristina Giacoma, Emilio Balletto and their colleagues for organising the meeting so efficiently and in such delightful surroundings.

Richard Griffiths

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# WHAT IS THE STATUS OF THE MEXICAN AXOLOTL?

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The Mexican Axolotl *Ambystoma mexicanum* Shaw 1789, is most certainly the most widely used research species of the urodela, having generated in excess of 3300 publications by 1971 alone (Smith and Smith, 1971). Despite this the natural history of the Axolotl and of the other Mexican members of the Ambystomatidae is almost totally unknown. Brandon (1970) undertook a short field study of *A. dumerilli* at Lake Patzcuaro in the mountains of Michoacan, but other than this field data for most species appears to consist of little more than records of captures made by Feder, Lynch, Shaffer and Wake (1982).

The situation for *A. mexicanum* is surprisingly little better. The species has been recorded from only two localities (Lake Xochimilco and Lake Chalco in the Valley of Mexico) though it may also have been previously present in the channels joining Lake Zumpango and Lake Texcoco (Frost, 1985; Fig. 1). First hand accounts of the species habitat are few and far between. Velasco made a series of observations at the site in October 1879 (Kranz, Smith and Smith, 1971) and interestingly recorded that the species did metamorphose at Lake Xochimilco in late October/early November. Hans Gadow also visited the site (Gadow, 1903) but his account, though giving a little information about Lake Xochimilco, falls short of real field observation. Feder et al. (1982) also visited Chalco, but have published only the ambient water temperature at the time of capture of some thirteen individuals.

Further observations are elusive. Lake Xochimilco lies near Mexico City at an altitude of 2240 metres and Palermo (1973) describes a wet season from May to October, followed by a cold period through until March with ground temperatures reaching freezing. No details of water conditions or of the lakes' ecology are available.

Lake Xochimilco forms part of a complex of five lakes (see Fig. 1). Lake Zumpango lies to the north, Xaltocan and Texcoco centrally, with Chalco and Xochimilco to the south (the latter two in reality being one lake divided by an Aztec causeway). In former days this complex would flood in the rainy season to form a single body known as the "Lake of the Moon" (Coe, 1964; Deevey, 1955). Velascos' field observations of metamorphosis would appear to correspond to the period of pond-drying subsequent to the rainy season, a situation fairly common in amphibian metamorphosis (Wilbur and Collins, 1972).

The lakes themselves are known to have been highly productive originally. Deevey, (1955) drawing heavily on archive sources such as the Codex Florentino, describes a variety of atheriniid and goodeid fishes, frogs and a rich invertebrate fauna of crayfish, dytiscid water beetles, ephydrid flies and corixid bugs, and points out that the egg masses of the corixids were formerly an important food resource for the local amer-indians. The Axolotl itself was once much prized for its soft flesh and eaten boiled and diced with chilies (Smith, 1969). Palermo (1973) further comments on an abundance of water snakes and "fowls" – indeed the egret was the symbol of the Aztec regional capital, formerly situated on the island of Telochtitlan-Tlatelolco in the west of Lake Texcoco (Coe, 1964).

Lake Xochimilco has long been famous for its "floating gardens" or chinampas, large-scale gardens produced by land reclamation through drainage. The land between the drainage channels would be buttressed, piled high with waterweed and mud and planted with maize, beans, chilies, tomatoes, vegetables and flowers for market. The channels themselves are rich in carp and other fishes and are also where the Axolotl was formerly taken (Coe, 1964).

The chinampas of western Texcoco and of Chalco and Xochimilco were protected from seasonal flooding with saline water from Lake Texcoco by the construction of enormous stone dykes by the Aztecs in the fifteenth century to form a freshwater system maintained by a number of springs to the south (Bradbury, 1971).


**Figure 1.** The state of the lakes in the sixteenth century. Coe (1964) shows the area to the west of the broken line as part of Mexico City

Modern times have entailed great changes for the Axolotl, however, principally through land drainage and the growth of Mexico City. The need to protect the chinampas from flooding and to dispose of sewage has led to attempts at draining the lake complex in the seventeenth century, in 1900, and most recently in 1945 with the construction of the Terquisquiae tunnel. These measures have apparently been fairly effective and have resulted in substantial diminution of Lake Texcoco and the loss of Lake Chalco (Deevey, 1955; Bradbury, 1971). Further habitat pressures stem from the drying of the valley through the digging of wells and tapping of springs. Coe (1964) estimated that of six billion cubic metres of water available in the valley each year, 744 million cubic metres were consumed by the population and industries of Mexico City and that much of the remainder evaporated off so that only "isolated puddles" remained of parts of Texcoco and Xochimilco. Presumably the situation has improved little in recent years.

*A. mexicanum* is only one of four urodele species currently protected under schedules 1 and 2 of the C.I.T.E.S. agreement, (C.I.T.E.S., 1987) though C.I.T.E.S. themselves have no details of the current status of the species in the wild and list the species at the request of the Mexican government (C.I.T.E.S. – pers. comm., 1987). However despite the recent comments of Mrosovsky (1988) on the listing of *Dendrobates* spp. in the absence of appropriate population status data, it does appear that the listing for the Axolotl is legitimate. In a recent report, Lazcano-Barrero and Gongora-Arones (1988) describe *A. mexicanum* as in immediate danger of extinction through over-exploitation and habitat destruction. It is unfortunate that our attempts to contact workers in Mexico have failed to yield any information on the species. However it would seem clear that there is a pressing need to examine the status of the animal in the field, to document its natural history and possibly to institute some form of conservation programme. Though a great many individuals do indeed exist in laboratory cultures throughout the world, the exact genetic make-up of these populations is open to question and probably very few represent the "wild-type" Axolotl.

All this would seem to bode ill for the Mexican Axolotl, a species that in having given so much to science would seem to merit a little attention in return.

## ACKNOWLEDGEMENTS

We would like to thank Mrs. L. Barrientos for her help with Spanish literature and an anonymous reviewer for their comments.

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# NOTES ON THE GENUS *BOMBINA* OKEN (Anura: Bombinatoridae): I. RECOGNIZED SPECIES, DISTRIBUTION, CHARACTERISTICS AND USE IN LABORATORY

A series of three papers on the biology of *Bombina*

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## INTRODUCTION

This paper is the first portion of a three-part series of papers summarizing pertinent information available on *Bombina*. Overall the series synthesizes information on distribution, external characteristics of recognized species of *Bombina*, together with aspects of external appearances, morphology, life history, systematics, fossil record and biogeography. This work is intended to facilitate further research on this taxon and should also be quite useful for individuals wishing to breed and maintain *Bombina*. This paper focusses on the distribution and characteristics of this genus.

## RECOGNIZED SPECIES, SUBSPECIES AND DISTRIBUTION

*Bombina* Oken, 1816, Lehrb. Naturgesch., 3 (Zool.):207; type species *Rana bombina* Linnaeus, 1761. *Distribution:* Southern Sweden, Gulf of Finland south through Europe (exclusive of Iberian peninsula), Turkey, western USSR, eastern USSR, China, Korea, and northern Vietnam (Frost, 1985) (Fig. 1).

*Bombina bombina* (Linnaeus, 1761). Fauna. Svec., Ed. 2:101. *Distribution:* Central and eastern Europe from Denmark and western Germany east to the Ural Mountains and south to the Caucasus Mountains and Turkey; in the north to the Gulf of Finland, southern Sweden (Frost, 1985) (Fig. 1).

*Bombina fortinuptialis* Tian and Wu, 1981. Acta Herpetol. Sinica, 5(17):111. *Distribution:* Yaoshan and Longsheng, Guangxi, China (Fig. 2).

*Bombina maxima* (Boulenger, 1905). Ann. Mag. Nat. Hist., (7)15:188. *Distribution:* Yunnan, Guangxi, ?Guizhou, and Sichuan (Yunkwei Plateau) China; northern Vietnam (Fig. 2).

*Bombina microdeladigitora* Liu, Hu and Yang, 1960. Acta Zool. Sinica, 12(2):157. *Distribution:* Yunnan and Hubei, China (Fig. 2).

*Bombina orientalis* (Boulenger, 1890). Ann. Mag. Nat. Hist., (6)5:143. *Distribution:* Southern part of Soviet far east (Primorsky Kraj [=Maritime Territory]); northeastern China (south to Jiangsu) and Korea (Frost, 1985) (Fig. 1).

*Bombina variegata. Distribution:* Southern Belgium and France, southward through all of Italy, Sicily, Yugoslavia, the Balkan Peninsula to the Black Sea, northward through Bulgaria, Romania, southeastern USSR, central CSSR, eastern and western Germany. Populations occur within range of *Bombina bombina* in Hungary (Herrmann *et al.*, 1987) (Fig. 1).

*B. v. variegata* (Linnaeus, 1758). Syst. Nat., Ed. 10, 1:211. *Distribution:* Southern Belgium, eastern and western Germany, central CSSR and northern Italy.

*B. v. kolombatovici* (Bedriaga, 1890), Bull. Soc. Natural, Moscou, (n. S) 3:568. *Distribution:* Middle and southern Dalmatia to western Montenegro (Herrmann *et al.*, 1987).

*B. v. pachypus*[1]. (Bonaparte, 1838). Iconogr. Faun. ital., 2:23. *Distribution:* Appenninian Peninsula south of Poebene and Sicily (Herrmann *et al.*, 1987).

*B. v. scabra* (Küster, 1843), Isis (Oken), Leipzig, 1843:656. *Distribution:* Romania, Bulgaria, Greece, southern Yugoslavia and southern Turkey.

[1] Nascetti *et al.*, (1982) indicate the possibility of this taxon being a valid species.

**Figure 3. TOP:** *Bombina bombina* showing dorsal colouration and morphology (photo Max Sparreboom). **MIDDLE:** Dorsal colouration pattern *Bombina maxima* (female) (photo Max Sparreboom). **BOTTOM:** Dorsal view of *Bombina orientalis* (photo Wolfgang Böhme).

## CHARACTERISTICS

### SIZE

The two European species, *bombina* and *variegata*, attain snout-vent lengths of 56mm. *Bombina orientalis* reaches a snout-vent lenth of 45mm. Average snout-vent length of *Bombina maxima* is 60mm, with maximal size being 75mm.

## OVERALL APPEARANCES

The body of *Bombina* is fairly robust, with the head only slightly differentiated and slightly depressed. The tongue is round, and almost entirely attached to the floor of the mouth. Upper part of head is entirely flat, and snout is rounded. There is no canthus rostralis. Pupils are more or less triangular, with apex directed downward. The tympanum is absent. Venter nearly smooth with a gular fold. *Bombina* retains lateral line organs after metamorphosis.

The dorsum of *bombina* has warts, whereas *variegata* and *orientalis* have strongly developed warts covered with horny hooks (Berger and Michalowski, 1971; Kawamura *et al;* Kawamura *et al.*, 1972) (Fig. 3). These warts are intermixed with strongly developed glands studded with pores. In *maxima*, glands lie behind the eyes (true parotid glands), on the tibia, on the tarsus and on the back where they form a pair of curved or angular chains behind the head, with the convexity turned inwards (Fig. 3). In the other species the parotid glands are not distinct. In *variegata* the dorsal papillae are surrounded by a large number of concentrically arranged tiny papillae whereas in *bombina* the dorsal papillae are single. In *fortinuptialis* the flank region and dorsal part of limbs are rather smooth with several flattened tubercles. Fingers are short, obtusely pointed, with the first being shortest, third finger the longest, and fourth a little longer than the second. There are no subarticular tubercles. Two round palmar tubercles are present, with the inner one longer and more prominent. *Bombina microdeladigitora* and *B. fortinuptialis* have slightly webbed toes.

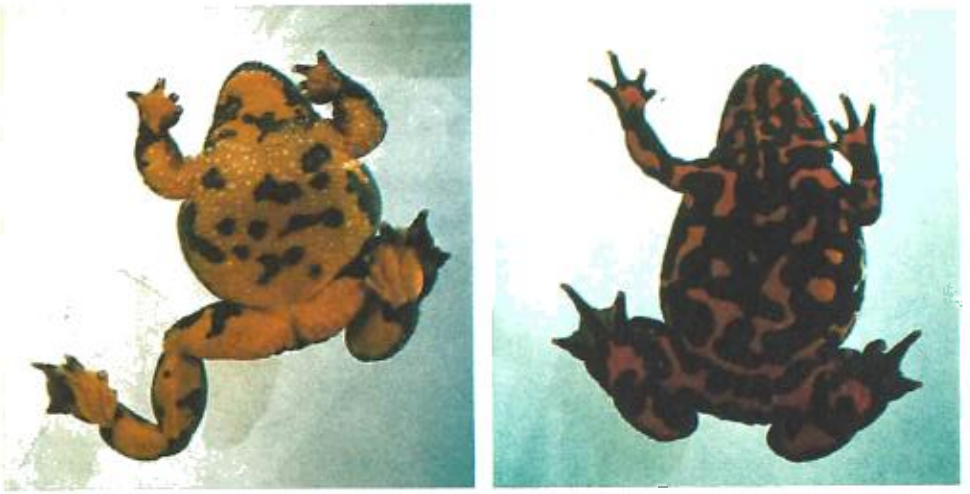

**Figure 4: LEFT:** Ventral colouration pattern of *Bombina maxima* (female) **RIGHT:** Ventral pattern of *Bombina orientalis* (photos Max Sparreboom).

### COLOURATION

The dorsal colouration of *bombina* varies from a grayish-black to a brown- or green-gray on a green background (Fig. 3). Populations of *bombina* with 10% of the individuals possessing a bright green dorsal colouration and yellowish venter were reported from Hungary (Marian, 1959; Hagedoorn, 1985). The dorsal colouration of *variegata* is a rather inconspicuous grey-black or green, sometimes spotted. The venter in *variegata* is a bright yellow to orange on grey-black, in *bombina* has a bluish-gray to blue-black background with yellow to vermillion

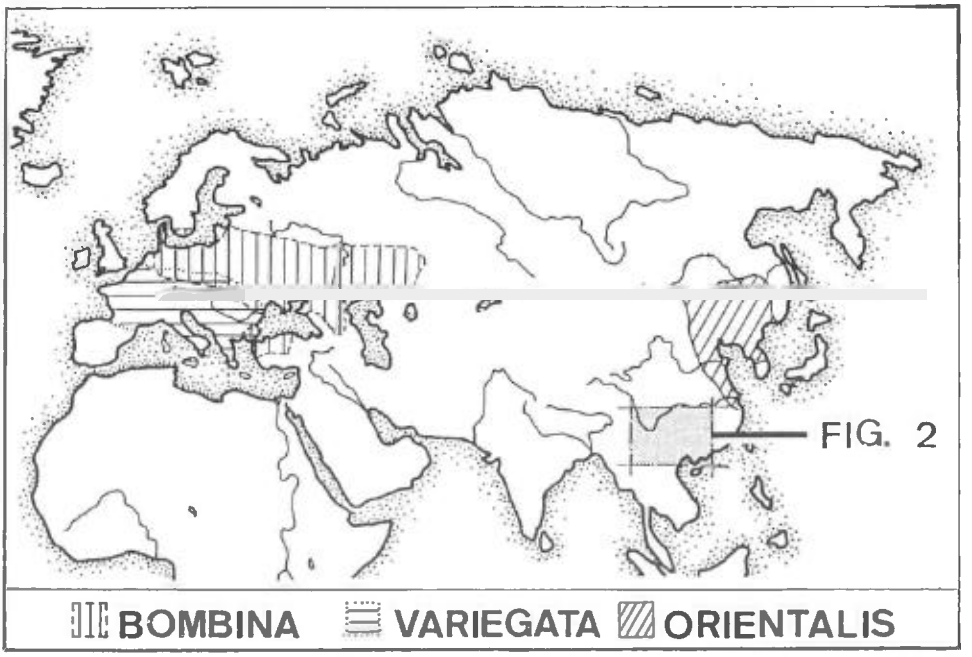


**Figure 1:** Distribution of *Bombina bombina*, *B. variegata* and *B. orientalis*. Shaded section is enlarged in Fig. 2 and contains the distributional ranges of the remaining 3 species of *Bombina*.

contrasting spots[2]. The anterior portion of the venter is usually lighter than the posterior aspect. Additional colouration characteristics distinguishing the two European species are: the occurrence of two yellow patches on the breast of *variegata* that are connected to yellow patches on the ventral side of the arms, whereas in *bombina* there are two isolated orange patches on the breast. In addition, *bombina* has numerous white spots on the flanks in contrast to *variegata* which either lacks or has very few white spots on the flanks (Madej, 1964; Michalowski and Madej, 1969).

The dorsum of *orientalis* is brown or brilliant green with black spots (Fig. 3). The venter is red to red-orange with black spots (Fig. 4). The presence of carotenes in the epidermis of this species accounts for the ventral bright red-orange colours. These pigments are also present on the dorsum, but to a lesser degree and are in conjunction with coloured (yellow) and colourless pteridines (Frost and Robinson, 1984). The venter in young is white and the finger tips lack colouration.

*Bombina maxima* has a cinnamon brown ground colour. A green pigmented area is present on the dorso-median part of the shoulder region (Fig. 3). The throat, venter and inferior side of the limbs are black or dark grey variegated with scarlet, orange or orange-yellow (Fig. 4). Additional descriptions of *maxima* can be found in Bourret (1942).

Colouration patterns of *fortinuptialis* and *microdeladigitora* are not reported other than in the original type description.

## SEXUAL DIMORPHISM

*Bombina maxima* exhibits sexual size dimorphism, with females being larger than males. In males a large diffuse nuptial pad covers the inner side of the arm, extending from the distal portion of the upper arm, and covering the inner face of the forearm, and 2/3 of the inner metacarpal tubercle (Liu, 1950, Fig. 16b). Nuptial pads are also found on the thorax near the base of each arm (Liu, 1950 Fig. 16a).

[2] These patterns are highly variable. Variation of *bombina* is described in Stugren (1980), patterns of *variegata* illustrated in Stugren and Vancea (1968).


**Figure 2:** Map of SW China with known localities of *Bombina maxima, B. microdeladigitora* and *B. fortinuptialis. Bombina maxima (solid circles)* is known from the following localities: 1) near Dongchuan (= type locality, Boulenger 1905), 2) Kunming (Schmidt 1927), 3) Xundian (Schmidt 1927), 4) Wuding (Schmidt 1927), 5) Lijiang (Schmidt 1927), 6) Dali (Mell 1922), 7) Chapa (Bouret 1939), 8) Zhaoqiao (Liu 1950), 9) Xichang (Liu 1950), 10) Yanyuan (Liu 1950), 11) Leibo (Bourret 1942), 12) Pingnan (Bourret 1942). *Bombina microdeladigitora (cross)* is known from 13) Jingdong (= type locality, Liu, Hu & Yang 1960), 14) Lichuan (Annon. 1977). *Bombina fortinuptialis (open circle)* has been recorded only from the type locality 15) Yangliuchong, Jin Xiu, Yaoshan Mts. (Tian & Wu 1981) (Locality data provided courtesy of Max Sparreboom).

Male *orientalis* are rougher than females and have fuller webbing, but shorter fingers, while the black dorsal markings are less distinct than in females. In *orientalis* the fore and hind legs of males are comparatively longer than those of the female (Kawamura *et al.*, 1972), but there is no overall size dimorphism.

The inner side of the fore-arm and the inner three fingers of male *fortinuptialis* have scattered cone-shaped black spines. The chest of the males also has a band-like area with many small spiny tubercles, each of which has 2-10 small black spines (Tian and Wu, 1981).

## PHOTOGRAPHS AND SONOGRAPHS

Colour photographs of adults and tadpoles are numerous. Some can be found in Engelmann *et al.*, 1985; Grzimek, 1974; Obst *et al.*, 1984; Pracht, 1987; Schulte, 1980; Sparreboom, 1977; van den Elzen, 1979; Guyétant, 1986. Drawings of tadpoles, and tadpole mouth parts can be found in Berger and Michalowski (1971).

Sonographs of *B. variegata* are illustrated in Zweifel (1959) and in Schneider *et al.*, (1986); those of *B. orientalis* in Akef and Schneider (1985). In addition, sonograms of *bombina, variegata* and *orientalis* are illustrated in van den Elzen (1979).

## LABORATORY USE AND TERRARIUM

*Bombina* has been regarded as an outstanding laboratory and terrarium amphibian (Nace and Ryuzaki, 1971; Kawamaura *et al.*, 1972; Carlson and Ellinger, 1980). Important information on maintenance and breeding is given by Mudrack (1972), Sparreboom (1977), Gassel (1979),

Rogner (1981), Sparreboom and van den Elzen (1982), Obst *et al.* (1984), Herrmann *et al.*, 1987 and literature cited therein.

Following is a summary of pertinent information concerning the maintenance of *Bombina* in captivity. *Bombina bombina*, *B. variegata* and *B. orientalis* have approximate physiological requirements. These *Bombina* species are easily maintained and reproduce several times a year at a normal Day-Night cycle after a short hibernation at 4 degrees C.

The terrarium can be relatively simple and small. Recommended is a larger portion of water (water level from 4 to 7cm) in a terrarium not larger than 20 by 30cm for three pairs. The terrarium itself can consist of a few rocks projecting above the water line or a floating foam islet. Water plants with broad floating leaves are also recommended.

These animals feed readily in captivity. Suggested food items are: tenebrionid larvae, various Diptera and Lepidopterans as well as *Periplaneta*, *Nauphoreta* and *Schistocerca*. *Bombina variegata* also feeds on pieces of meat and liver.

The three pairs of animals are recommended because of mutual stimulation. Breeding can be initiated by changes in moisture and temperature gradients. Optimal breeding temperature is between 22-26 degrees C (Birkmeyer, 1954). Herrmann *et al.*, (1987) indicate that reproduction is stimulated after injections of 120 IE of Human-Choriongonadotrophin per animal in the musculature of the forelimbs. Females are stimulated 4 to 6 hours later than males. Shubravy *et al.*, (1985) experimented with success with synthetic releasing factors to promote reproduction.

Egg deposition usually occurs at night. Tadpoles emerge from eggs at temperatures of 20 degrees C after approximately 7 days. Tadpoles can be fed with dry fish food. Sexual maturity is reached after about 1 year (see sections on reproduction).

To maintain the bright ventral colouration, it is suggested to add beta-karotenes in conjunction with other karotenes to the food items when feeding or to the food medium of the insects themselves.

The larger *Bombina maxima* should be maintained in a correspondingly larger terrarium, also with the greater part containing water. A water level of up to 10cm is recommended. Again, a float, stone islet or water plants are suitable. Temperatures of 10 to 18 degrees C have proven to reduce mortality.

The adults feed well on larger insects, worms and newborn mice. Tadpoles can be fed with dry fish food. *Drosophila* and small insect larvae with a supplement of karotenes are suitable foods for juveniles.

After a short hibernation at approximately 5 degrees C, breeding can be stimulated by temperatures of up to 18 degrees C. Injections of Human-Choriongonadotropins have also proven to be highly successful in this species to stimulate reproduction. In open-air terraria the reproductive season of *B. maxima* is from March to October. Copulation is with inguinal amplexus. In this species both males and females vocalize. Sparreboom and van den Elzen (1982) further describe the mating behaviour of this species.

At temperatures of 16-20 degrees tadpoles emerge from the eggs after 8 to 12 days (Herrmann *et al.*, 1987). Metamorphosis starts at 6 to 10 weeks according to temperature (Bech, 1980) and sexual maturity is attained at circa 3.5cm.

No information on maintenance of either *B. microdeladigitora* or *fortinuptialis* is available.

## ACKNOWLEDGEMENTS

I wish to thank to thank Wolfgang Böhme and Max Sparreboom for comments and information on references. Max Sparreboom is thanked for the use of the distribution map of the Chinese *Bombina* and colour slides. William E. Duellman and Linda Trueb reviewed an early draft of the manuscript. This study was supported by a stipend from the Deutscher Akademischer Austausch Dienst.

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# FURTHER NOTES ON REPTILES AND AMPHIBIANS OF THE PELOPONNESE

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## INTRODUCTION

Following two earlier visits to the Peloponnese peninsula of southern Greece during which twenty five species of reptiles and amphibians were recorded at eleven localities (Buttle, 1987), a further trip was made, again with the intention of surveying the region's herpetofauna. On this latest trip from the 22nd of April to the 28th of May, 1988, twenty eight species were observed. The present paper is a further contribution to the known distribution of Peloponnesian species with brief notes on their ecology and behaviour. After being photographed all captured animals were released where found. For further information the checklist by Bringsøe (1985), which includes a comprehensive list of references, is recommended.

## PRINCIPLE SITES

A total of fourteen areas were investigated, their locations are shown in Figure 1.

AREA 1 Kokonion. 22-24 April. Grassy fields with olive trees, orchards.
AREA 2 Diakopton. 25-27 April, Agricultural areas, railway banks and small river.
AREA 3 Kato Achäa. 28 April. Fields with long grass near coast.
AREA 4 Katakolon. 29 April-1 May. Coastal scrub covered rocky hills.
AREA 5 Tropäa. 2-4 May. Stony fields on steep slopes with dry stone walls, also Ladonas river valley W. of reservoir.
AREA 6 Megalopolis. 6-7 May. Well vegetated areas beside Ellison river, also ancient ruins.
AREA 7 Kyparissia. 8-10 May. Coastal scrub covered rocky hills, inland hills with olive trees.
AREA 8 Methoni. 11-13 May. Dry rocky scrub covered hills. Coastal scrub. Small dry riverbed.
AREA 9 Messini. 14-15 May. Banks of Pamisos river.
AREA 10 Gythion. 16-17 May. Small seasonal river and surrounding hills.
AREA 11 Monemvassia. 18-19 May. Rocky scrub covered hills.
AREA 12 Kastrion. 21-22 May. 940m altitude. Steep rocky roadside banks. Small grassy fields and vineyards.
AREA 13 Paralia Tyru. 23-26 May. Lower reaches of Parnon mountains. Rocky with dry stone walls, well vegetated.
AREA 14 Vivari. 27-28 May. Well vegetated rocky hillsides, cultivated areas.

## SPECIES LIST

RANIDAE

*Rana graeca* Boulenger 1891. Stream Frog

Several 6cm approx. adults seen in area 5 on large rocks in fast running stream into which they dived when closely approached.

*Rana ridibunda ridibunda* Pallas 1771. Marsh Frog

Very common in areas 2, 6, 9 and 10. Several in areas 7 and 8. Many tadpoles (also area 1) and juveniles seen. Found in still or slow moving water. At area 8 thousands of tadpoles found dead in dried up pools of small riverbed. It should be noted that a new species, *Rana epeirotica*, has recently been described (Schneider, Sofianidou & Kyriakopoulou-Sklavounou, 1984). Sympatric and closely related to *R. r. ridibunda*, hybrids of the two forms occur. At sites so far investigated in the Peloponnese *R. epeirotica* was found to be the dominant species (Schneider & Sofianidou, 1986). Difficult to distinguish from *R. r. ridibunda* by morphological means and further investigations of the Greek population of green frogs will be required for definitive identification (Bringsøe, 1985).

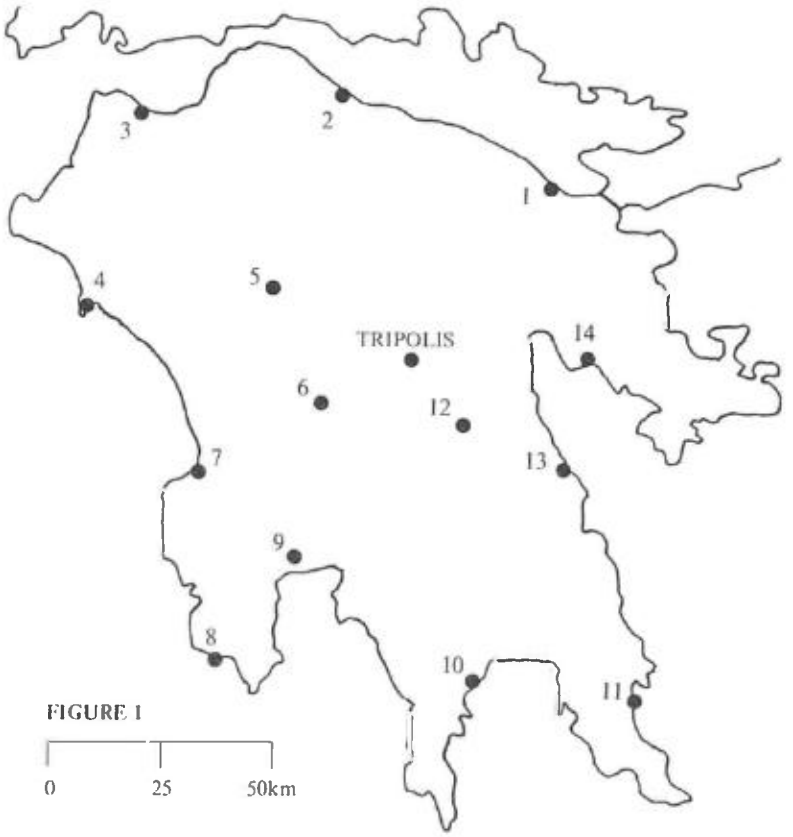


FIGURE 1

BUFONIDAE

*Bufo viridis viridis* Laurenti 1768. Green Toad

One adult seen at area 6 after being disturbed in its retreat by a *Coluber najadum* escaping into a hole in a low wall of the ruins.

HYLIDAE

*Hyla arborea* Linnaeus 1758. Common Tree Frog

In area 10 a recently metamorphosed 12mm specimen found on rocks in small pool between river and tall reeds. Several fast swimming tadpoles also seen.

EMYDIDAE

*Emys orbicularis* Linnaeus 1758. European Pond Terrapin

As there are few records of this terrapin in the Peloponnese the opportunity was taken to check on the population found at Tripolis last year (Buttle, 1987). In the small slow moving stream with thick aquatic vegetation, ten adults and one hatchling were seen (20.v.88).

*Mauremys caspica rivulata* Valenciennes 1833. Stripe-necked Terrapin

In area 10 seventeen adults seen in shallow water of drying river and the deeper water of nearby irrigation ditches. Average carapace length of five captured specimens was 19.6 cm.

TESTUDINIDAE

*Testudo hermanni hermanni* Gmelin 1789. Hermann's Tortoise

Ten found at area 6, eight at area 4, six at area 7, three at area 12, one at each of areas 3 and 8. The occurence at area 12 is of interest as it is generally considered rare at altitudes above 700m (e.g. Hellmich, 1956). Of the many specimens I have found in the Peloponnese none have exceeded 20cm.

*Testudo marginata* Schoepff 1792. Marginated Tortoise

At areas 8 and 14 four found, three at area 10, two at areas 7 and 11, one at area 4. Ranged

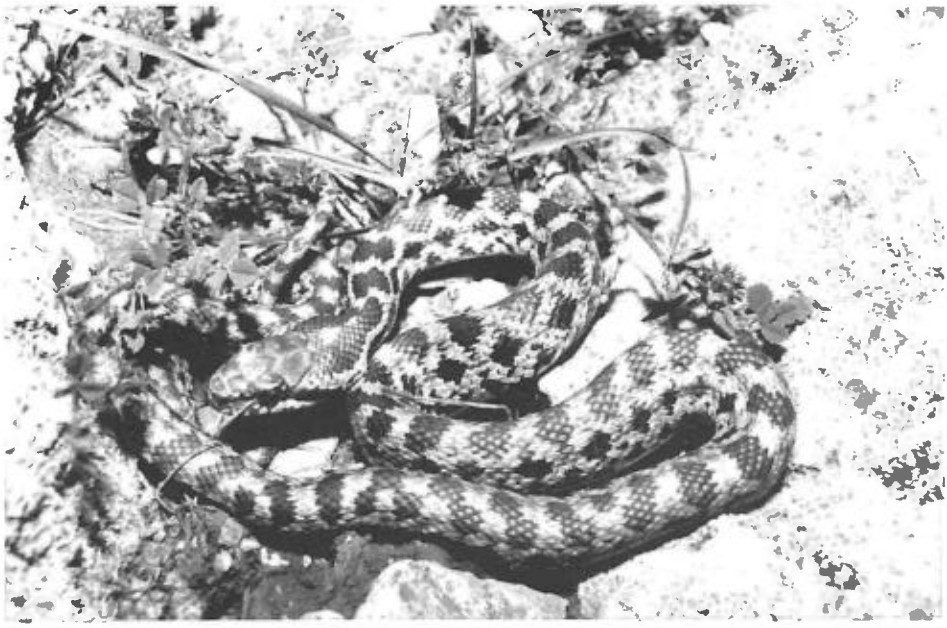

**Plate 1.** Juvenile *Elaphe q. quatuorlineata* found in area 4, a scarcely recorded snake in the Peloponnese.

in size from two animals of 5 cm, presumably hatched the previous year, at areas 8 and 14, to a very dark old male of 31 cm at area 10. Both species of tortoise found to be less active between 13.00 and 16.00 hours.

GEKKONIDAE

*Cyrtodactylus kotschyi bibroni* Beutler & Gruber 1977. Kotschy's Gecko

Apparently common at area 1 where thirteen were found. Two found at area 8 and one at area 5. Often found in association with concrete, e.g. agricultural outbuildings, on which this gecko is well camouflaged.

*Hemidactylus turcicus turcicus* Linnaeus 1758. Turkish Gecko

Of the seven specimens found, six at area 13 and one at area 8, all but one were seen on the walls of human habitations, the other being found in a dry stone wall. Unlike *C. k. bibroni* not found active during daylight hours.

ANGUIDAE

*Anguis fragilis peloponnesiacus* Stepánek 1937. Slow Worm

Two adults found together at area 2 under piece of cardboard on grassy railway bank. At area 13 two found killed, presumably due to their superficial resemblance to snakes.

*Ophisaurus apodus thracius* Obst 1978. European Glass Lizard

A large speicmen seen crossing a track at area 8 showed surprisingly agility in escaping by scaling a dry stone wall and dissapearing into bushes.

LACERTIDAE

*Algyroides moreoticus* Bibron & Bory 1833. Greek Algyroides

Inconspicuous lizard found at nine of the localities searched. Fourteen seen at area 1, twelve at area 2 and from two to six specimens at areas 3, 4, 5, 6, 7, 12 and 13. Most commonly found in coastal regions, inland seldom seen at low altitudes.

*Lacerta graeca* Bedriaga 1881. Greek Rock Lizard

Numerous at areas 5 and 12, quite common at area 13. Found together with *Podarcis peloponnesiaca* on dry stone walls, rocky hillsides and roadsides stony banks. In all three areas it was noted that *L. graeca* occupied positions that offered more shade. Also frequently found in humid habitats where *P. peloponnesiaca* was absent.

*Lacerta trilineata trilineata* Bedriaga 1886. Balkan Green Lizard
Found in all of the areas investigated apart from area 10. Especially abundant at localities 1, 2 and 6 where from fifteen to twenty five individuals were seen. Both uniform and striped juveniles found.

*Podarcis peloponnesiaca* Bibron & Bory 1833. Peloponnese Wall Lizard
Common in areas 5, 6, 7, 8 and 12, quite common at area 13 and a few seen in areas 10 and 11. Recently recorded in the north-western part of the peninsula (Buttle, 1987) where it was believed absent (Bringsøe, 1986).

*Pondarcis taurica ionica* Lehrs 1902. Balkan Wall Lizard
Found to be common in areas 1, 2 and 9. Also found at areas 3, 6 and 12. Often seen in low roadside vegetation. The basic dorsal colour of this lizard is subject to seasonal change (Chondropoulos & Lykakis, 1983).

SCINCIDAE
*Ablepharus kitaibelii kitaibelii* Bibron & Bory 1833. Snake-eyed Skink
The most common of the three Peloponnesian skinks. Six found in area 1, four in area 6, two in areas 7, 12 and 14, one in areas 8 and 9. Although I have usually found this skink in relatively dry areas, one was observed on a vegetated refuse pile in the centre of a riverside pool at area 6. Unaware of my presence it entered the water and swam comfortably on the surface for 1.5 metres to the waters edge, another seen dead on the bottom of same pool. Clark (1967) often found this species in damp localities or after rain.

*Ophiomorus punctatissimus* Bibron & Bory 1833. Greek Legless Skink
At area 2 one escaped when seen active in open field at 12.45 hours, temp. 20°C, cloudy, another found under half buried rock on rocky hillside with short grass. At area 8 one found on similar hillside under half buried rock in a nest of ants. One found at area 7 under rock in fine sand in rocky scrub adjoining the sandy beach, another found dead nearby under corrugated iron. Two captured specimens shed conspicuously striped tail almost immediately on being touched. Clark & Clark (1970), who collected extensively in the Peloponnese, only found this secretive skink at Akrokorinthos; recent lists (Bringsøe 1985, Chondropoulos 1986) show it to be widely dispersed.

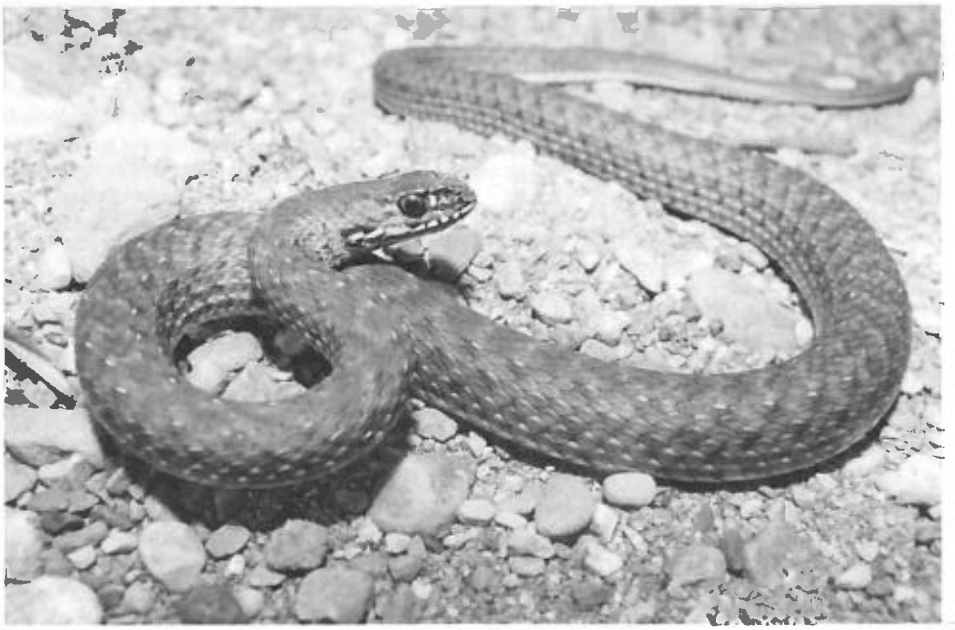

Plate 2. Sub-adult *Malpolon monspessulanus insignitus* from area 9, a common and widespread Peloponnesian snake.

TYPHLOPIDAE

*Typhlops vermicularis* Merrem 1820. Worm Snake

One found in area 2 under a half buried large rock on grassy railway bank; on returning two days later it was again found under the same rock. At area 13 one rapidly disappeared down a small worm-like burrow when a large rock was turned on dry grassy slope at 18.15 hours. On a grassy slope in area 14 another adult found also under half buried rock.

COLUBRIDAE

*Coluber gemonensis gemonensis* Laurenti 1768. Balkan Whip Snake

An adult seen in a grassy stony field at area 5 evaded capture and swiftly escaped into a large rockpile. At area 6 a 76 cm specimen was caught with some difficulty when seen basking on roadside grassy bank. Very aggressive.

*Coluber najadum dahli* Schinz 1826. Dahl's Whip Snake

A total of twenty two adults seen. Six at areas 4 and 6, three at areas 13 and 14, two at areas 7 and 8. Although not definitely recorded by the author on previous trips, several of the briefly seen, fast disappearing 'unidentified' snakes were probably of this species. Very alert, fast moving and difficult to approach closely. Found mainly in dry stony places with bushes.

*Elaphe quatuorlineata quatuorlineata* Lacépède 1789. Four-lined Snake

A very large specimen over 2m in length found basking on grassy bank with thick bushes next to the small river in area 2. Although grasped as it slowly retreated it was released, to avoid injuring the snake, as the forepart of the powerful muscular body was securely entwined in thick vegetation. At area 4 a 48cm juvenile was found an open rocky ground adjoining dense scrub eighteen metres from the sea. When seen, at 15.40 hours, temp. 18°C, breezy, it was in the act of swallowing a small bird, a Siskin *(Carduelis spinus),* which it regurtitated on being picked up. At area 5 a 137cm male was caught when seen moving in grassy stony field next to dry stone wall, large boulders, thick bushes and trees near small pond. Active at 15.30 hours, temp. 25°C, clear and sunny. Hen houses were present at both places where the adults were found. The most notable finds of the trip as apart from a single recent sighting the previous latest published records are from the 1930's (Bringsøe, 1985). Phlegmatic and docile, made no attempt to bite when captured.

*Elaphe situla* Linnaeus 1758. Leopard Snake

Single 76cm female of the spotted form found dead on road between olive grove and citrus orchard at area 2.

*Malpolon monspessulanus insignitus* Geoffroy 1827

Two found in areas 2 and 7, single specimens found at areas 6, 8, 9 and 14, two sloughed skins at area 11. An adult of 110cm approx. at area 6 was observed swallowing a large *Lacerta trilineata,* apparently already dead from the snake's venom.

*Natrix natrix persa* Pallas 1814. Grass Snake

Two adults found beside the river in area 9, a single juvenile found swimming in riverbed pool in area 10. All had the two light dorsolateral stripes typical of the subspecies.

*Natrix tessellata* Laurenti 1768. Dice Snake

Three adults found in the fast running valley stream in area 5. Two adults and three juveniles found under rocks beside the river at area 6.

VIPERIDAE

*Vipera ammodytes meridionalis* Boulenger 1903. Nose-horned Viper

Found at three coast localities. Adult female seen basking at 11.15 hours, temp. 21°C, in thick coastal rocky scrub at area 4. At area 7 a 45cm approx. male seen active in same habitat type at 09.25 hours, temp. 21°C. A 50cm female was caught in area 14 while active at 16.40 hours, temp. 23° on W. facing stony bank with scattered bushes. Slow moving; apart from occasional hissing remained calm while being photographed. All typically marked as shown on plate 40 in Arnold, Burton & Ovenden (1978).

## DISCUSSION

In addition to the above, *Bufo bufo, Tarentola mauritanica* and *Chalcides ocellatus* have been

recorded by the author during earlier trips (Buttle, 1987). Among the thirteen remaining species known to occur in the Peloponnese that I have failed to find during two months intensive searching are: *Telescopus fallax,* which is believed to be widespread, and *Podarcis erhardii,* limited to the north-east. *Salamandra salamandra, Rana dalmatina* and *Pordarcis muralis* are found at high altitudes where very little searching was carried out, and two other montane species, *Triturus vulgaris* and *Coronella austriaca,* are known from only a few records. *Pelobates syriacus* has a limited distribution, *Eryx jaculus* has been recorded at five localities. Known from single localities are *Triturus alpestris* and *Elaphe longissima. Testudo graeca* has been reported from one locality, where it may have been introduced. Finally *Caretta caretta* has been found on the western and southern beaches. (Bringsøe, 1985).


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**TABLE 1. Summary of species observed in the Peloponnese, April-May, 1988 and their localities**

| | SITES | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SPECIES** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** |
| *Rana graeca* | | | | | x | | | | | | | | | |
| *Rana ridibunda* | x | x | | | | x | x | x | x | x | | | | |
| *Bufo viridis* | | | | | | x | | | | | | | | |
| *Hyla arborea* | | | | | | | | | | x | | | | |
| *Emys orbicularis* | Tripolis | | | | | | | | | | | | | |
| *Mauremys caspica* | | | | | | | | | | x | | | | |
| *Testudo hermanni* | | | x | x | | x | x | x | | | | x | | |
| *Testudo marginata* | | | | x | | | x | x | | x | x | | | x |
| *Cyrtodactylus kotschyi* | x | | | | x | | | x | | | | | | |
| *Hemidactylus turcicus* | | | | | | | | x | | | | | x | |
| *Anguis fragilis* | | x | | | | | | | | | | | x | |
| *Ophisaurus apodus* | | | | | | | | x | | | | | | |
| *Algyroides moreoticus* | x | x | x | x | x | x | x | | | | | x | x | |
| *Lacerta graeca* | | | | | x | | | | | | | x | x | |
| *Lacerta trilineata* | x | x | x | x | x | x | x | x | x | | x | x | x | x |
| *Podarcis peloponnesiaca* | | | | | x | x | x | x | | x | x | x | x | |
| *Podarcis taurica* | x | x | x | | | x | | | x | | | x | | |
| *Ablepharus kitaibelii* | x | | | | | x | x | x | x | | | x | | x |
| *Ophiomorus punctatissimus* | | x | | | | | x | x | | | | | | |
| *Typhlops vermicularis* | | x | | | | | | | | | | | x | x |
| *Coluber gemonensis* | | | | | x | x | | | | | | | | |
| *Coluber najadum* | | | | x | | x | x | x | | | | | x | x |
| *Elaphe quatuorlineata* | | x | | x | x | | | | | | | | | |
| *Elaphe situla* | | x | | | | | | | | | | | | |
| *Malpolon monspessulanus* | | x | | | | x | x | x | x | | x | | | x |
| *Natrix natrix* | | | | | | | | | x | x | | | | |
| *Natrix tessellata* | | | | | x | x | | | | | | | | |
| *Vipera ammodytes* | | | | x | | | x | | | | | | | x |

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# A SHORT NOTE ON THE HERPETOFAUNA OF GOZO

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## INTRODUCTION

The only direct reference to Gozo that we have been able to find in herpetological literature is that pertaining to *Podarcis filfolensis*. It would seem that this little neighbour of Malta is under-recorded, and we therefore decided to visit it this summer. We stayed in an old farm house in the west of the isle outside St. Lawrenz for the three weeks from 29 June to 20 July 1988, and, because of the small size of the place, were able to explore several individual habitats on foot during the cooler parts of the day.

## GEOGRAPHY

Gozo, separated from the north-west coast of Malta by five miles of sea, is roughly leaf shaped; nine miles long and five miles broad. Except for a few sandy beaches in the north, the coast is rocky and precipitous. The chief characteristics of the countryside are the truncated conical hills formed by layers of different types of limestone. The population of 30,000, who for the most part inhabit relatively large but well confined villages, cultivate the countryside by meticulously terracing these uplands for growing tomatoes, melons and a few vines.

The climate is southern Mediterranean, and during the time that we were there was extremely hot with temperatures frequently climbing to over 40 degrees C.

## PRINCIPAL SITES

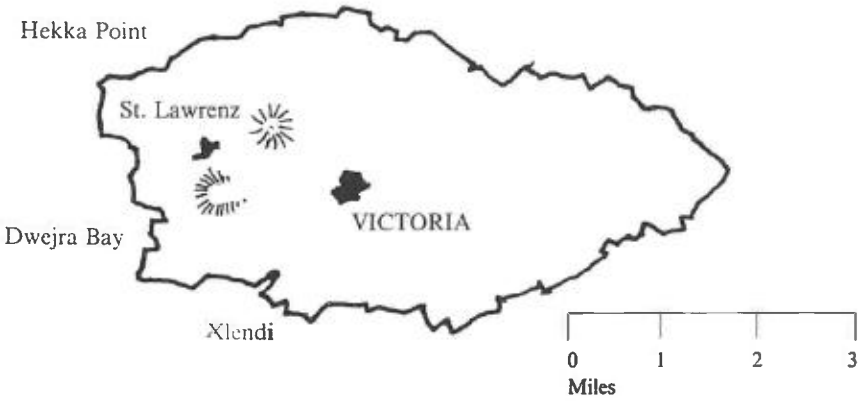
1. House and gardens in and around the village of St. Lawrenz.
2. Field edges and roadsides between St. Lawrenz and Victoria, Xlendi, Dwejra Bay and Hekka Point.
3. Limestone hills and plateaux including Ghasri Hill and the plateau of Ghajn Abdul, with its Neolithic cave dwellings.

## SPECIES LIST

GEKKONIDAE
*Hemidactylus turcicus*
Common inside and outside of most of the older limestone houses. There were nine 'residents' of our house, including three half grown pinky-white transluscent specimens about 7cm long which prowled around the inside of the mosquito mesh on the kitchen window. On the outside walls one very large gecko (which we first thought was a *Tarentola mauritanica* because it was well over 13cm long) stalked moths and crane flies that were attracted to the light on the corner of the house. A smaller animal who often invaded the vicinity was frequently robbed of its catch.

LACERTIDAE
*Podarcis filfolensis*
Very abundant everywhere in all habitats. Several would come into the house and stalk flies and small crustaceans on the floor. These lizards and those in the immediate vicinity resembled the illustration in Arnold & Burton "A Field Guide to the Reptiles and Amphibians of Britain and Europe". However up on the Ghajn Abdul plateau we found several large males which were black in colour speckled with large round lime-green spots. We wondered whether they were similar to those described in Arnold inhabiting Filfola Rock off the Maltese mainland.

SCINCIDAE
*Chalcides ocellatus*
Five sightings on or under stones on road sides and field edges. One particularly good sighting




was rudely interrupted by the sudden appearance of a very vigorous full-grown *Coluber viridiflavus.* In colour and size they resembled Sicilian animals.

COLUBRIDAE

*Coluber viridiflavus*

Twenty-three sightings of this most abundant snake, including three just outside the kitchen door. They were of the balck race and ranged from the house to high up the hillsides on rocky ground denuded of vegetation by the heat of the sun. Half-grown specimens were a dark bronze colour. The largest snake we saw exceeded 140cm in length. Skin castings were to be found everywhere, the nearest to the house being only 45cm from the kitchen door.

## DISCUSSION

Although Gozo is highly cultivated and supports a relatively large population, the four reptile species that we had identified were very plentiful. Like many small islands Gozo demonstrated only one representative species of each family, lack of variety being compensated for by abundance. We searched intently for the other three snakes found on the Maltese mainland: *Telescopus fallax,* the rare *Coluber algirus* and the very scarce *Elaphe situla,* but to no avail. The large number of *Coluber viridiflavus* would probably have exterminated them, even if they had ever been present in Gozo.

We also looked for amphibians: *Discoglossus pictus* and the endangered *Bufo viridis,* both recorded in Malta. However the almost complete lack of water and the very high temperatures that occurred at that time of the year would have caused them to aestivate, even if they had been present.

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# THE PUFF ADDER *(BITIS ARIETANS)*

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The Puff Adder *(Bitis arietans)* is one of the largest of the African vipers and probably the species most frequently seen by travellers in that continent. It receives its English name from the habit of inflating its body and hissing loudly when disturbed. The sound is produced both when the breath is inhaled as well as during exhalation. This behaviour is characteristic of all true vipers, but is particularly evident in the case of the Puff Adder.

Unlike the Gaboon Viper *(Bitis gabonica)*, which is a forest snake, the Puff Adder inhabits subdeserts and savannas, and is also to be found in mountainous regions. Except in rain forests, Puff Adders are widespread southward to the Cape from Morocco in the west and the Sudan in the east. They occur as near to Khartoum as Jebel Aulia. This is their northernmost limit in Sudan, but they range also into western and southern Arabia.

Puff Adders may exceed 1.4m in length, and have a girth of 25cm. Although they do not attain the weight of a full-grown Gaboon Viper they are, nevertheless, formidable snakes.

There may be considerable variation in the coloration of Puff Adders. In some specimens, the chevrons are sooty black and the crescents cream coloured while, in others, the chevrons are dark brown or grey and the crescents dull buff. The blotched pattern of dark chevrons separated by yellow crescents (Plate 1) is cryptic. This, coupled with a lethargic disposition and reluctance to move when disturbed, probably accounts for the comparatively large number of people who get bitten through inadvertently treading on Puff Adders. Although an average of 130mg dried venom are yielded, up to 750mg have been extracted from a single snake. This must be compared with averages of 200mg per snake from Russell's Viper *Vipera russelli)* and only 10mg from the common European Adder *(Vipera berus).*

**Plate I.** A dull coloured Puff Adder, possibly due to moult. (Photographed at Nimuli, southern Sudan, December 1961).

**Plate II.** The fangs of a Puff Adder from Jebel Aulia. (Photographed in the Reptiliary of the Sudan Natural History Museum, Khartoum, December 1981).

The LD50 (ug/g mouse) is 2.00 when injected intravenously, and 7.75 when administered subcutaneously. These figures compare with 0.08 and 4.75 for the venom of Russell's Viper; and 0.55 and 6.45 for that of the Common Adder. The Puff Adder, nevertheless, is among those species of poisonous snake that are chiefly responsible for human deaths in Africa. At the same time, it should be remembered that, of the hundreds of people bitten annually by Puff Adders, the majority are treated only by tribal witch doctors, and most of them recover.

Although the venom of Puff Adders lacks the neurological components found in the poison of the Gaboon Viper, their bites are followed by severe pain and swelling of the tissues in the neighbourhood of the injury. The blood vessels are usually also damaged, and blood stained serum may ooze from the fang marks. Large areas of flesh become gangrenous and, if the victim does not die, are later sloughed away. The necrotizing effect of the venom of the Puff Adder was known to the Greeks and Romans over 2000 years ago. This species was probably the one called 'Spectaficus' – the snake whose bite was reputed to consume the entire body with swelling and putrefaction!

According to Egyptian mythology, the first snake bite must have pre-dated creation because, while Ra the sun god was still making the earth, he stepped on a snake which had been sent by the goddess Isis. The symptoms that he experienced, as listed in the Ebers Papyrus (*c* 1700 B.C.), suggest that the venom was neurotoxic, and therefore probably that of the Egyptian Cobra *(Naja haje).*

Legends about snakes are widespread throughout Africa. Not surprisingly, most cults centre around pythons (*Python sebae* etc.). Smaller snakes are seldom identified although, in Senegal, according to A. Villiers, the Puff Adder is believed to carry a ball of grease, with magic properties, at the base of its tail. The Wolof believe that snakes of this species have a particular aversion to human faeces. They are said to leap over ten houses to avoid contact with it.

If it is touched with a stick that has been smeared with excrement, the Puff Adder becomes so enraged that it will pursue its tormentor for hours. Even if he flees on horseback or in a motor car, the snake will eventually catch him and strike him to death!

The poison fangs of vipers are large. Unlike those of cobras, they are attached to moveable bones so that they fold backwards when the jaws are closed. The fangs of the Puff Adder are relatively huge (Plate II). They are partly retracted during the process of engulfing food. The palatine teeth are lowered and the large triangular head is forced over the prey by alternating movements of the two sides of the upper jaw.

Puff Adders inhabit dry and sub-arid environments, hiding in half-burned grass during the day, or actually burying themselves in the sand. Their prey consists chiefly of small mammals which are hunted mainly at night. These vipers usually lie in wait, the anterior part of the body doubled into an S-shaped loop. They strike rapidly, their venom quickly sealing the fate of the victim – which seldom utters as much as an agonised squeal!

Like Gaboon Vipers, Puff Adders often move by rectilinear locomotion, sliding in straight lines like caterpillars. This may enable them to approach their prey unobserved. I think it probable, however, that the function of their cryptic coloration is probably more defensive than offensive, since these snakes are mainly nocturnal in habit and make themselves very conspicuous when disturbed – as do Saw-Scaled Vipers *(Echis carinatus).*

Adaptive coloration may function in several different ways in the same species. Many poisonous snakes rely upon aposematic (warning) colours for protection. In the case of Puff Adders, however, it may be more beneficial to escape notice when sunning themselves, unless disturbed. The first specimen I ever saw in the wild was at a picnic near Pretoria, in October 1942. One of the girls in the party, wearing only a bathing dress and sandals, was walking in front of me when she stepped clean over a small Puff Adder without even noticing it!

Puff Adders are ovoviviparous. In southern Africa, courtship usually takes place between October and December; and the young are born between March and May; while, in eastern Africa mating takes place in August and birth during November and December. The usual number of young is probably 25-50; but a specimen in Dvur Kralove Zoo (Czechoslovakia), 1.10m long, produced 157 living young, which is possibly a world record.

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# PLEISTOCENE INTERGLACIAL HERPETOFAUNA OF THE GREENLANDS PIT, PURFLEET, ESSEX

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## INTRODUCTION

The Greenlands Pit Quarry (TQ 568785) is a Pleistocene interglacial fluvial deposit that has yielded fossil bivalves, aquatic gastropods, land snails, fishes and mammals (Snelling, 1975; Allen, 1977; Wheeler, 1984), but the herpetofauna has not been recorded. Herpetological remains were collected by John D. Clayden from the Greenlands Pit in 1971, and these fossils form the basis of the present report.

The herpetological fossils came from 0.4m above the base of the laminated sandy silt stratum reported by Allen (1977, p. 2). The amphibians and reptiles came from a shelly seam, 7.5-15cm thick. This seam also yielded fishes (sturgeon, *Acipenser sturio;* eel, *Anguilla anguilla;* pike, *Esox lucius;* rudd, *Rutilus erythrophthalmus;* roach, *R. rutilus;* silver bream, *Abramis bjoerkna;* and dace, *Leuciscus leuciscus* (Wheeler, A., 1984, letter to J.D. Clayden, 11 December). The sturgeon and the eel indicate that this Pleistocene site was connected to the sea. The other fishes are found in freshwater rivers; the rudd, roach and silver bream in slow-flowing rivers, the dace in cooler streams and rivers (Newdick, 1979).

The exact age of the deposit is in doubt. Hollin (1977) took pollen samples from the laminated sandy silt bed reported on by Allen (1977), but the results were not conclusive enough to assign the bed to either the Ipswichian or the Hoxnian interglacial stage with any degree of certainty. Allen (1977) has pointed out that it is possible that the deposit was laid down during another interglacial stage between the Hoxnian and the Ipswichian. Despite the lack of an agreed upon date which we hope will be forthcoming in the future, it is important to put this fossil herpetofauna on record with the other faunal elements from Greenlands Pit.

## SYSTEMATIC PALAEONTOLOGY

Numbers are from the John D. Clayden Collection (abbreviated JC), Sunnyholme, East Runton Cromer, Norfolk NR27 9PG.

*Bufo bufo* (Linnaeus). Material: a scapula (JC-GP883) from a large adult and a sacrum (JC-GP889). The scapula was identified using characters given in Hallock, Holman and Warren (1989). The sacrum was identified using characters of Böhme (1977). The species occurs in the area today (Frazer, 1983).

*Rana arvalis arvalis* Nilsson. Material: a right ilium (JC-GR8816). The ilium of this form is diagnostic to the subspecific level (Böhme 1977; Holman, 1987a,b). This form has previously been reported from Cromerian interglacial sites at Sugworth near Oxford (Holman, 1987b) and West Runton, Norfolk (Holman, Clayden and Stuart, 1988), and from the Ipswichian interglacial site at Swanton Morley, Norfolk (Holman, 1987a). *Rana arvalis* does not occur naturally in Britain today, but occurs in the low countries of the European Continent (Arnold and Burton, 1985, p.258, map 37).

*Rana temporaria* Linnaeus. Material: right ilium (JC-GP8817). The ilium of *Rana temporaria* is quite diagnostic at the specific level (Böhme, 1977; Holman, 1985). The species occurs in the area today (Frazer, 1983).

*Rana* sp. indet. Material: humerus (JC-GP887), sacrum (JC-GP8817), and right ilium (JC-GP881). These elements are too fragmentary to be diagnostic at the specific level.

*Anguis fragilis* Linnaeus. Material: five vertebrae (JC-GP884-8). Holman (1985) discusses the

fact that many slow worm bones are diagnostic at the specific level, especially vertebrae. *Anguis fragilis* occurs in the area today (Frazer, 1983).

*Natrix* cf. *Natrix natrix* (Linnaeus). Material: six vertebrae JC-GP8810-15. These vertebrae appear inseparable from those of modern *Natrix natrix* even though the fossils are somewhat fragmentary. The species has been recorded in the general vicinity of the area today, but not in the immediate area (Frazer, 1983, fig. 43).

## COMMENT

The herpetofauna species of the Greenland Pit fauna would be typical of the marshy and other low areas near the slow-flowing river suggested by the fish fauna. The present report provides the fourth record of *Rana arvalis arvalis,* a continental form that does not occur naturally in Britain today, from Pleistocene interglacial sites in England.

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# JUST A BIT MORE ABOUT RARE HERP HISTORY IN BRITAIN

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It was good to see, in David Wilkinson's article of a recent Bulletin, that interest in this topic has surfaced again. Subjects of this kind are fun because proof, one way or another, is so unlikely to appear that speculation is as valuable as the scant scientific information that bears upon the matter. At least that's my excuse for pontificating about it.

I agree with Wilkinson that Holman's papers shed interesting new light on one of the critical periods, notably just after the last glaciation. As a matter of fact I have never disagreed that this was a probable time of initial colonisation by all our native herps, and I think Wilkinson has misunderstood the previous debate by suggesting that Yalden and myself were seriously at odds over this part of the story. The fossils from Ightham and Cow Cave imply that at least two of our present rare species were widespread in southern Britain very soon after the ice retreated, but that was not the main point of contention. Of greater interest to me is the relatively recent past, especially the last 1-2000 years. Wilkinson says little of relevance to this period, except to point out the work of Bush & Flenley which suggests that some types of habitat other than heathland (notably chalk grassland) may have been kept open for much longer continuous periods, in some parts of Britain at least, than was previously thought. One possible consequence of this is that other land, apart from heathland, of a kind suitable for the rare herps may have existed and facilitated movements along my postulated "midland corridor" in relatively recent times. It was always clear that there could never have been anything like continuous heath along this corridor – the geology just wouldn't wear it.

The Cow Cave natterjack remains are also interesting in the more modern context. There are no records of natterjacks from Devon (or Cornwall) within historical times that I consider reliable, and scarcely any of any kind. One from north Cornwall was on the basis of tracks in sand! So natterjacks reached Devon but failed to persist in the south-west, despite the presence of substantial sand dune systems (Braunton Burrows is only a few miles from Cow Cave) and an equable climate. Why aren't natterjacks still there? Could it be just too far from the recent connective corridors? If so, populations isolated in the west country as climate deteriorated could have died out by chance effects (eg prolonged droughts, or periods of dune erosion) without any chance of later repopulation. In other words, the Cow Cave fossils can be interpreted to support recent population fluidity elsewhere.

But I would say that wouldn't I.

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# MORTALITY OF TOADS *(Bufo bufo)* ON ROADS NEAR A CAMBRIDGESHIRE BREEDING SITE

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During the Springs of 1987 and 1988, "toad-lifters" from the Beds and Hunts Wildlife Trust helped hundreds of toads safely across the roads of Ramsey, Cambridgeshire. There are three main breeding ponds in Ramsey with the largest population breeding in a pond beside Field Road in the north of the Town. In 1987, 136 toads were moved by the lifters across the roads near the pond, while in 1988 the total was 343.

Since 1974, I have counted the number of toads squashed on the roads in the vicinity of Field Road following peak migration (see Table 1). The aims of this exercise have been to determine migration routes and to indicate whether long term changes may have occurred in the population level. However, by utilising numbers of toads moved by the Trust Team and my own data it now becomes possible to derive an estimate both for the observed mortality rate of toads crossing the road and for the number making the crossing.

Central to the calculation is the question of how many toads would have been recorded as squashed had there been no intervention? This can be answered in two stages: first, by estimating, based on previous casualty totals and second, by refining the estimates by comparing calculated mortality rates for 1987 and 1988.

Between 1974 and 1986 numbers recorded killed ranged from 28 to 204. As 77 were killed in 1987 and 69 in 1988, these were not among the years with particularly low totals (despite the efforts of the Trust Team). In 1987 and 1988, casualties were low on the main St Mary's Road, although it was not patrolled by the Trust team, and it is reasonable to assume that total casualties without intervention would not have been excessively high. (Numbers on the St Mary's Road were particularly high in 1979 and 1985 and these coincided with high counts elsewhere in the Field Road area – see Table 1).

The overall mean number of casualties recorded for 1974-1986 was 93. However, numbers were rather lower in the early years, so it might be more appropriate to take as the "norm" the mean for the five year period 1982-1986 : 112. While it is appreciated that each of these means has a high variance let us at this stage assume that between 93 and 112 toads might have been recorded as squashed at peak migration during each of the last two years had there been no intervention.

For 1987 this means that the number of toads saved might have ranged from (93 minus 77) to (112 minus 66) = 16 to 35. As 136 were helped across the roads, the percentage that would have been recorded as being killed might have ranged from (16/136)100 to (35/136)100 = 12-26%. For 1988, this observed mortality rate was 7-13%.

There is no reason to suppose that this statistic should vary markedly between 1987 and 1988. If there is no overlap in estimated mortality rate between the two years, it suggests that there was something wrong with the estimate for the numbers that would have been killed for one or both years. However, there is overlap between the two years : in the range 12-13%. The fact that there is overlap does not entirely preclude the possibility that estimates of numbers killed were wrong for both years and that the overlap was fortuitous.

In this context, it is relevant to compare these figures with those from road mortality observations elsewhere. They agree well with unpublished data of my own for St Neots Common, Cambridgeshire. Just after peak migration in 1980, I estimated by mark – recapture 730 toads to be present in the main breeding pool, while the cumulative mortality on the B road across the Common during the migration was 76 (9.4%). Moore (1954) studied a toad population breeding beside the A350 at Iwerne Minster in Dorset and considered that road mortality might have killed 40% of the toads attempting to cross. Van Gelder (1973), studying a Dutch

colony, estimated that 29% of female toads were killed by traffic during a single breeding season. On the other hand, Gittins (1983) and his co-workers systematically caught toads for marking as they crossed the road around a breeding lake in Llandrindod Wells, thereby reducing the estimated mortality to 4% per annum. Thus 12-13% for the Field Road site seems a reasonable figure for observed mortality on relatively quiet residential roads, several of which are cul de sacs; the St Mary's Road is a B road. It should be appreciated that this is the percentage recorded as killed; it probably underestimates the actual percentage killed as (many) casualties may be removed from roads by the action of traffic and by scavengers and therefore go unrecorded.

The figure of 12-13% suggests that for every eight toads helped at the Field Road site, one was saved from death (equivalent to 17 in 1987 and 43 in 1988). One can then use the final estimates of numbers that would have been killed without intervention (94 in 1987, 112 in 1988) to derive rough estimates of the overall numbers making the crossing (750 in 1987, 900 in 1988).

While this exercise is no substitute for a detailed scientific study, it is an example of how fairly superficial observations can indicate the size of a toad population and the danger it faces from road traffic.

My thanks are due to John Stott for the toad-lift data, and to Dr Rob Oldham and Tom Langton for helpful comments on a draft of the manuscript.

**TABLE 1**

Mortality of toads on roads around the Field Road pond, Ramsey. Casualties were counted on a single occasion after peak migration. (A daily check was made on the roads to determine the optimum time for counting).

| Year | Field Road | Star Lane | St Marys Road | Other Roads | Total |
|---|---|---|---|---|---|
| 1974 | 27 | 9 | NC | 9 | 45 |
| 1974 | 47 | 19 | 2 | 8 | 75 |
| 1976 | 19 | 20 | NC | 7 | 46 |
| 1977 | 15 | 17 | NC | 0 | 32 |
| 1978 | 24 | 26 | NC | 7 | 57 |
| 1979 | 93 | 43 | 45 | 8 | 189 |
| 1980 | 42 | 43 | 7 | 13 | 105 |
| 1981 | 45 | 34 | 9 | 14 | 102 |
| 1982 | 64 | 28 | 8 | 18 | 118 |
| 1983 | 44 | 73 | 9 | 10 | 136 |
| 1984 | 10 | 14 | 1 | 3 | 28 |
| 1985 | 84 | 58 | 28 | 34 | 204 |
| 1986 | 34 | 9 | 25 | 8 | 76 |
| 1987 | 44 | 11 | 8 | 14 | 77 |
| 1988 | 39 | 21 | 3 | 6 | 69 |

NC = Not counted

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# BEAM BROOK AQUATIC NURSERIES: AN UPDATE

LEIGH GILLETT
*1 Fleets Lane, Tyler Hill, Canterbury, Kent CT2 9LY*

The introduced herptiles of the Beam Brook Aquatic Nurseries have been discussed on previous occasions. Sir Christopher Lever, in his excellent book "The Naturalized Animals of the British Isles" (Hutchinson, 1977), mentions Edible Frogs, Alpine Newts, Italian Crested Newts, European Tree Frogs, Fire-Bellied Toads and Wall Lizards as having been introduced since about 1900, by T.B. Rothwell. He regards only the first two mentioned as having etablished breeding colonies up to the present time. Further observations by Sir Christopher were made in BHS Bulletin No. 1, June, 1980. I should now like to add the results of two visits, in April and June, 1988, to what has already been published on the subject.

The Nurseries, established in 1903, are in Newdigate, Surrey, and supply high quality aquatic plants and fish to trade and public. Having been part of Gerrard & Haig Ltd and, later, Griffin & George, they are now under the control of Bert and Debbie Black. This couple took them over about three years ago, in a rather run-down state, just as the site was about to be bulldozed to make way for "Christmas trees". What would have been lost are 15 acres of excellent habitat including over 100 ponds, from the size of a domestic water tank upwards. The Blacks are determined to put conservation before commercial considerations and are to some extent assisted by the law preventing sale of the non-native species.

During my visits, the second of which was in the company of Dr. J.F.D. Frazer, I was able to confirm the presence of Edible Frogs. These were extremely abundant and a circuit of any well-vegetated pond produced at least a couple of "plops" every metre. Alpine Newts were more obvious in smaller, shallower, frog-free ponds and Italian Crested Newts could be found by netting deeper, weedier ponds. Three-spined sticklebacks were in many ponds and some larger ponds had goldfish and other carp, to the apparent indifference of the Edible Frogs. Italian Crested Newts were distinguished from the native Crested Newts by their more brownish dorsal coloration and orange undersides with large brown spots. A yellow dorsal stripe was indistinct in most females, represented only in the gap between dorsal and tail crests in some males, but has since proved to be vivid in newly-metamorphosed specimens.

Other herptiles present were Smooth Newts, Common Frogs, Common Toads and Grass Snakes. Terrapins (Red-Eared Sliders) and Common Lizards are said also to be present. No Palmate Newts were seen, but there is some evidence of the presence of Marbled Newts. A solitary male Tree Frog was apparently seen some years ago. Of particular interest on my first visit was a male Smooth Newt/Alpine Newt hybrid. This had the appearance, when viewed from above, of a very pale (almost yellow) Smooth Newt, with particularly distinct dark spots on the back and sides. Closer observation revealed a typical Alpine Newt crest and Smooth Newt belly. The specimen was in full breeding condition, with swollen cloacal region. The Grass Snakes seen were possibly different from typical British specimens. Dr. Frazer suggested some similarities with those from Spain. Native Crested Newts, if present, are thought to have been swamped by the Italian species.

In conclusion, then, there are flourishing and, at least for the time being, secure breeding colonies of Edible Frogs, Alpine Newts and Italian Crested Newts at the nurseries, where it is believed that they were introduced 60 or more years ago. Opinions will vary as to the desirability of such introductions but, from my own observations, the presence of Edible Frogs and Alpine Newts does not seem to have had any detrimental effect on the native species present.

# CONSERVATION MATTERS: A REVIEW OF HERP CONSERVATION ISSUES IN THE NEWS DURING THE PERIOD JULY TO NOVEMBER 1988

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**Controversy over Canford Heath Development has serious implications for reptile conservation in Britain**

The BHS is one of the main protagonists in a fierce, and increasingly bitter, dispute over the controversial development of Canford Heath in Dorset. Formerly the largest single lowland heath in Britain, some 60% of its 2000 acres (over 800ha) has already been destroyed by the building of more than 7000 houses, together with the roads, roundabouts and superstores that serve them. This is the result of Poole Borough Council's local development plan which has now been in progress for 15 years. Since the beginning of the 19th century the amount of heathland in Dorset has been reduced from over 75000 acres (30400ha) to less than 14000 acres (5660ha). Most now survives as scattered fragments, more vulnerable and less able to support viable populations of rare species than large heathland blocks, hence the national importance of Canford Heath as a wildlife habitat. It is estimated that Dorset heathland is home to 90% of the Sand Lizards *(Lacerta agilis)* and 80% of the Smooth Snakes *(Coronella austriaca)* remaining in Britain, although less than a fifth is protected as nature reserves.

The destruction of heathland in Europe has been even greater than in this country and it is now regarded as an internationally rare habitat type. This is recognised in the provisions of the Berne Convention and the 1979 EC Birds Directive, as well as our own Wildlife and Countryside Act, 1981. The latter also provides "full" protection for the Sand Lizard and Smooth Snake, whose British populations are without doubt highly endangered. That the development of Canford Heath, based on 15 year old local planning decisions, has been allowed to continue entirely legally has highlighted inadequacies in current British Wildlife legislation.

More than 85% of the heathland remaining in Dorset has been notified by the Nature Conservancy Council as Sites of Special Scientific Interest (SSSIs). Legal loopholes exist in this protection, however, and appropriate management agreements cannot be forced onto land owners who, if hostile to conservation, can let heathland degenerate to the extent that it loses its scientific value and must be denotified. Planning permission for a site effectively overrides the Wildlife and Countryside Act and it is also permissible to kill rare reptiles and other species unknowingly, e.g. with a bulldozer. Dorset now has the dubious distinction of being the county with the largest number of SSSIs damaged in the last three years.

In addition, conservationists have been strongly critical of the NCC for never even having notified large areas of Canford Heath as an SSSI for purely political reasons. The boundaries of the present SSSI on north Canford Heath, not drawn until 1985 when much development had already occurred, do not include land earmarked by Poole Borough Council for development. This is despite the confirmed scientific value (i.e. of SSSI quality) of parts of the heath which are now legally unprotected. NCC say they have drawn the boundaries realistically since SSSI status will not protect such sites from existing planning permission (which in some cases has been granted by Poole Borough Council to itself).

The BHS Conservation Officer, Keith Corbett, has been primarily concerned with trying to save two key reptile sites, of 23 acres (9.3ha) and 3.9 acres (1.6ha), outside the SSSI boundary. Both are on the south facing scarp of Canford Heath and are therefore of far greater value to reptiles than the north side, which has received SSSI notification. Poole Borough Council refuse to come to a compromise over these sites, which even the developers, Clarke Homes, are willing to do. Legal action in the European Court aside, the only option left open to the BHS could eventually be to rescue the doomed animals, if time for this is allowed, and move them to safer sites. This practice, a very poor alternative to actually conserving heathland,

**Plate 2.** Juvenile Smooth Snake *(Coronella austriaca)* photographed on Dorset heathland during the BHS Conservation Committee's four year C.A.T. survey.

Photo: Paul Edgar

has already taken place at a number of Canford Heath sites in 1988. One volunteer alone, Doug Mills, rescued 3460 reptiles and amphibians from 15 doomed sites (not all were on Canford Heath since this is by no means the only Dorset heath being developed). This total included 91 sand lizards, an estimated 2% of the entire British population. His efforts were well publicised by the local and national media and served to draw attention to the plight of Dorset's heathlands. Many other conservation bodies have also expressed their concern publicly, notably groups like the World Wide Fund for Nature (WWF) who recognise the international importance of heathland.

Poole Borough Council and the developers have responded angrily in the media to attacks by conservationists and local residents who they say are "misinformed". People already living on Canford Heath, who have protested about continued development, have been branded hypocrites for trying to stop people living on the heath (since everyone in Britain lives on former wildlife habitats this presumably means that nobody has the right to be concerned about conservation). Councillors claim that the north of Canford Heath SSSI, an area of some 800 acres (324ha), only survives because of protectionist policies contained in the original development plan. The Council recently failed to acquire this land for itself and it is now owned by developers and gravel extractors W.H. White & Co. Ltd. The latter have established a wardened reserve on the site but conservationists claim that development is still planned for parts of the remaining heath, and say that nothing at all will be left to the south of the main ridge.

Perhaps, though, it is not surprising that the local council and developers have taken offence to the furore of criticism about the development of Canford Heath. They are providing houses and jobs, as well as making a lot of money, in one of the fastest growing conurbations in Britain. Poole now has a population of about 126,000 with a 16000 increase in the past 14 years. The fact that some of the country's most precious wildlife habitat, home to several of our rarest species (a source of surprise to some of the developers) is destroyed in the process, is considered to be a necessary sacrifice to progress. After all the development has been entirely legal in British Law, and the council and developers have been able to exploit the lack of

real protection for heathland to their advantage. The controversy created has been treated largely as a local issue – along the lines of "Conservationists Battle to Save Village Green". Heathland development in Dorset *is* affecting the local countryside and quality of life for residents, destroying the very thing many people move to the area to enjoy, but, more importantly, it is a prime example of Britain ignoring its international conservation responsibilities.

Legal action in the European Court, brought by the BHS and other conservation groups, seems likely if Poole Borough Council refuse to compromise over key wildlife sites targeted for development on Canford Heath. This action will challenge the effectiveness of the Wildlife and Countryside Act, alleging breaches of EC directives which the Act was designed to enforce. Although the present government is trying to win the green vote it is also blocking new European directives which, among other things, would close the damaging loopholes in the Wildlife and Countryside Act and guarantee absolute, legally enforceable protection for the remaining heathland, and its assemblage of rare species, which is still being destroyed in Britain and if things do not improve soon the future of the Sand Lizard and Smooth Snake as British species will start to look very grim indeed.

**Natterjack research project**

The NCC are funding a 3 year research project to investigate the behaviour and ecology of adult and juvenile Natterjack Toads *(Bufo calamita),* following previous work on tadpole ecology. The research is based at Sussex University and from here Trevor Beebee and Jonathan Denton aim to study the toads on inland heathland sites, coastal dunes and saltmarshes.

**Marwell Zoo rare herps breeding and release project**

The BHS Conservation Committee are expending their captive breeding facilities for Sand Lizards and Natterjack Toads by establishing two large outdoor vivaria at Marwell Zoological Park near Winchester. These vivaria are off-exhibit and will be operational in 1989, augmenting the stock already bred by Conservation Committee members. Captive bred animals will be released, following NCC guidelines, on suitably managed heathland sites in southern England.

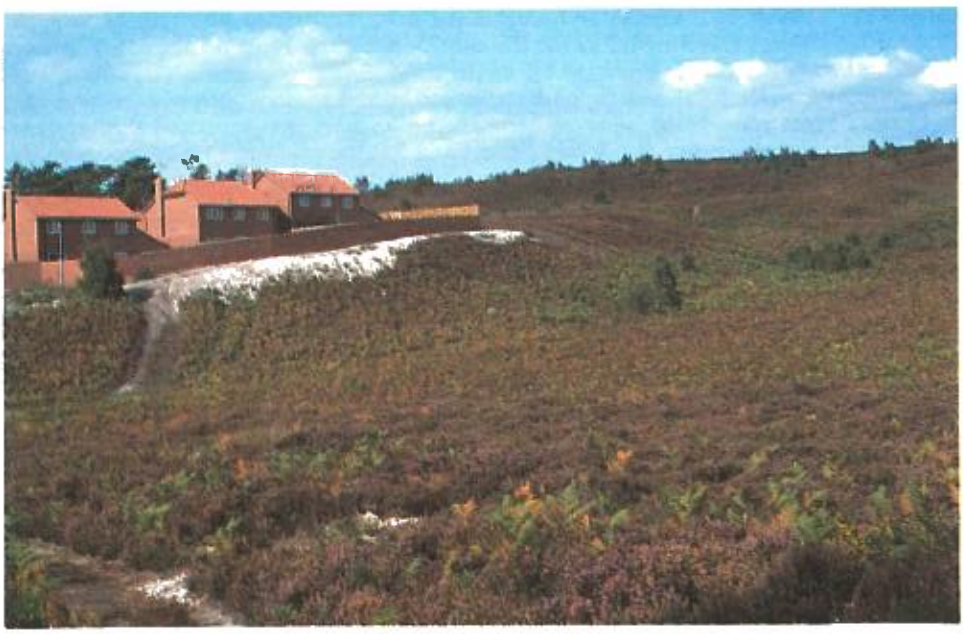

**Plate 3.** Canford Heath, Poole, Dorset. Taken near Culliford Crescent looking north west towards the scarp. This photograph shows the northern limits of building on Canford Heath in September 1988. The small valley to the right of the houses, which are in Marchwood Avenue, is under threat from further development. Readers are invited to find this site in 1989 and compare the view then to this photograph.
Photo: Paul Edgar

In particular the Forestry Commission is being extremely co-operative in preparing sites in the New Forest for the release of Sand Lizards bred at Marwell, in addition to those bred by Commission personnel. Vivarium construction has been funded by the Marwell Oryx Club and the Marwell Preservation Trust Ltd. The project will be self-financing in the future, with a public display planned to explain herp conservation to the 250,000 visitors Marwell Zoo receives annually. For more information about the project please contact the author of this article.

**Conservation Committee Land Fund**

The Conservation Committee Land Fund (see BHS Bulletin No. 20, Summer 1987) now stands at £3070, enough to cover all existing BHS heathland leases from the interest alone. Further donations to increase the capital will enable important sites to be purchased. BHS members wishing to donate money to the Land Fund should make cheques payable to "B. Banks (re BHS)" and send them to Brian Banks, Nature Conservancy Council, The Old Candlemakers, West Street, Lewes, Sussex. Any fund-raising ideas would also be very welcome.

We should like to thank the following people for their donations to the Land Fund:- BHS Education Committee, BHS North West England Group, BTCV South East Region, Dr. Baksh, B. Banks, D. Bird, J. Buckley, K. Corbett, P. Edgar, C. Fitzsimmons, R. Griffiths, Hastings Natural History Society, G.A.D. and E.H. Haslewood, M. Langford, Mrs. C. Palmer, Portsmouth Reptile and Amphibian Society, R. Stevens, RSPB Potters Bar, P. Reynolds, J. Rudge, W. Whitaker and the late Mrs. Cynthia Ruxton.

## LETTERS TO THE EDITORS

***The Saw-Scaled Viper***

Dear Sirs,

I read with amusement Cloudsley-Thompson's "The saw-scaled viper *(Echis carinatus)*" in Bulletin 24. It contains a nice mix of suggestions and ideas.

However, taxonomically it is entirely wrong. *Echis carinatus* is a catch-all name. The range "from the Sahara ... to India and Sri Lanka" is really occupied by an assemblage of at least six species of *Echis* which differ profoundly. In India, there is the large northern form and a much smaller southern species that reaches Sri Lanka. (Consequently, if Kipling had encountered the southern form, his size would have been correct).

More important is that the species misassembled under the name *carinatus* seem to differ profoundly in toxicity. This generated quite a series of unhappy arguments when it was found that "*Echis carinatus*" antiserum produced in Iran was ineffective in western Africa. Hence, members encountering this genus in parts of its range or involved with specimens in zoos should take the precaution of considering the source of antiserum in case of bites.

Sincerely yours,

Carl Gans
Professor of Biology
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***Lizard theft***

Dear Sirs,

I recently experienced a burglary at my property and had stolen a number of the rarer lizards I keep.

The purpose of the break-in was specifically to steal lizards of the rarer species, which leads me to believe that the person or persons involved knew exactly what they were looking for.

The lizards taken were as follows:–

1 Adult Pair Plumed Basilisks
1 Juvenile Plumed Basilisk
3 Water Dragons
1 Sail Fin Hydrosaurus
1 Casque Head

Perhaps other members of the Society would be on guard as these days collections become more and more valuable.

For your information the police have been informed and are pursuing the matter. Anon.

**Ed. Note:** Any response to this letter should be made to the Secretary, British Herpetological Society, c/o Zoological Society of London, Regent's Park, London NW1 4RY.

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## MEMBERS' ADVERTISEMENTS

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

- **Wanted:** Eggshells from hatched, dead-in-shell or infertile eggs from any species of gekkonid lizard. Will form part of a study on eggshell structure in these lizards. Rigid-shelled eggs would be preferable. Tel. Charles Deeming 061-275 6775 daytime.
- **For Sale:** Captive bred baby Boa Constrictors and Californian Kings, born/hatched July 1988. Nicely marked and feeding well. Simon Townson, tel. 01-531 1378.
- **Galapagos September 1989.** Specialist reptile tour on luxury private motor yacht. Full itinerary/ details contact Andy Highfield on (0249) 720114 or write c/o The Tortoise Trust, BM Tortoise, London WC1N 3XX.
- **Correspondence wanted** with keepers of rare terrestrial tortoises, eg *Geochelone* spp., *Gopherus* spp., *Psammobates* spp., *Homopus* spp., and especially anyone captive breeding *G. elegans.* Andy Highfield, c/o BM Tortoise, London WC1N 3XX.
- I am publishing a small A5 format newsletter devoted entirely to Royal Pythons *(Python regius).* It will be a quarterly newsletter and the first issue will come out in early January 1989. Its aim will be to keep Royal Python enthusiasts in touch and to provide information and enjoyable reading. The first issue will be published in January and the cost will be £5.00 per annum post paid anywhere in the UK. If you wish to subscribe please contact me at the address provided. Lee Bowler, "Royal News", 28 Honor Road, Prestwood, Great Missenden, Bucks., England.
- **For Sale:** Alpine Newts *(Triturus alpestris)* captive bred juveniles available at £7.50 per pair (hatched April/May 1987). Tel. (0223) 263845 evenings, weekends. D.J. Palmer, 7 Woottens Close, Comberton, Cambridge CB3 7DA.

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*Program Announcement*

# FIRST WORLD CONGRESS OF HERPETOLOGY

## Canterbury, United Kingdom – 11-19 September 1989

THE CONGRESS will be held at University of Kent and in Canterbury. H.R.H. Prince Philip, President of the World Wildlife Fund, will serve as Patron of our Congress and Professor Angus d'A. Bellairs as Honorary President. The Congress will also serve as the official 1989 meetings of Societas Europaea Herpetologica, Herpetologists' League, and Society for the Study of Amphibians and Reptiles. It will be co-hosted by the Zoological Society of London, Fauna and Flora Preservation Society, Societas Europaea Herpetologica, and the British Herpetological Society.

The Scientific Program, subject to modification is listed below. Plenary speakers and Convenors are now being invited. *Persons who wish to participate in events should contact the Convenors,* whose names and addresses may be obtained from the Secretariat (see below). There will be poster sessions open to all persons but no oral contributed papers. All presentations will be in English, but discussions can be in other languages.

### PLENARY LECTURES

THE STATE OF HERPETOLOGY - EVOLUTION AND ECOLOGY OF PARTHENOGENSIS - BIOGEOGRAPHY OF SOUTH AMERICA - INTERNATIONAL CONSERVATION - SEXUAL SELECTION - SYSTEMATICS AND PHYLOGENY - PALEOHERPETOLOGY - ECOLOGICAL PHYSIOLOGY - COMMUNITY ECOLOGY - BIOLOGY OF SALAMANDERS

### SYMPOSIA (S), WORKSHOPS (W) and ROUNDTABLES (R)

*Conservation*

S.1. CONSERVATION AND MANAGEMENT OF SPECIES
S.2. EFFECTS OF POLLUTION ON HERPETOFAUNA
S.3. CAPTIVE MANAGEMENT
S.4 HEALTH AND DISEASE
R.1. IUCN HERPETOLOGY SPECIALIST GROUPS
R.2. CONSERVATION PROBLEMS

*Behavior*

S.5. SEXUAL SELECTION AND COMMUNICATION
S.6. ENVIRONMENTAL SEX DETERMINATION
S.7. ORIENTATION, NERVOUS SYSTEM AND SENSES
R.3. OPTIMAL SIZES OF EGGS AND CLUTCHES
R.4. MIMICRY AND PREDATOR-PREY BEHAVIOR

*Ecology*

S.8. LONG-TERM STUDIES
S.9. SNAKE ECOLOGY AND BEHAVIOR
S.10. ADAPTATIONS TO EXTREME ENVIRONMENTS
S.11. AMPHIBIAN COMMUNITY ECOLOGY
S.12. HERPETOFAUNAS: EXPLORATIONS & STUDIES
R.5. THE ECOLOGY OF THE TUATARA
W.1. SKELETOCHRONOLOGY
W.2. FIELD METHODS AND BIOTELEMETRY

*Evolution*

S.13. EVOLUTION AND PHYLOGENY OF FROGS
S.14. ORIGIN OF AMPHIBIA AND REPTILIA
S.15. PALEOHERPETOLOGY
S.16. ISLAND HERPETOFAUNAS
S.17. LIFE HISTORY EVOLUTION OF TURTLES
R.6. BIOGEOGRAPHIC REVIEW OF THE CONTINENTS
R.7. CAECILIAN BIOLOGY AND EVOLUTION

*Systematics and Genetics*

S.18. MOLECULAR SYSTEMATICS
S.19. CYTOGENETICS
S.20. PARTHENOGENESIS AND HYBRIDOGENESIS
S.21. SYSTEMATICS AND PHYLOGENY
S.22. BIOLOGY AND GENETICS OF PIPIDAE
R.8. PHYLOGENY AND CLASSIFICATION OF LIZARDS
W.3. MOLECULAR TECHNIQUES
W.4. AMPHIBIAN LARVAE
W.5. PHYLOGENETIC ANALYSIS

*Physiology and Development*

S.23. ENERGETICS
S.24. ECOLOGICAL PHYSIOLOGY
S.25. FUNCTIONAL MORPHOLOGY
S.26. REPRODUCTIVE PHYSIOLOGY
S.27. DEVELOPMENTAL PROCESSES

*General Topics*

R.9. FIELD RESEARCH & NATIONAL REGULATIONS
R.10. AMATEUR CONTRIBUTIONS TO HERPETOLOGY
R.11. MEDICAL AND RESEARCH ASPECTS OF VENOMS
W.6. PHOTOGRAPHIC TECHNIQUES

**EXCURSIONS:** Pre- and post-Congress trips are planned to Europe, Russia, the Mediterranean, Belize, Honduras, the Amazon, Ecuador, various sites in Africa, Indian Ocean, Malaysia, China and Australia, each led by professional herpetologists. Day or half-day trips to Darwin's home, London, Cambridge, Oxford and Paris are also planned.

**FIRST CIRCULAR:** The complete program and full details of excursions, including prices, are given in the First Circular, available from the Secretariat. This includes a Provisional Registration Form. Registration begins January 1988; £90 fee covers abstract book and program, refreshments, and costs of hiring meeting rooms and equipment. *Advance registration is strongly encouraged* for planning purposes and to insure that you receive all other announcements promptly.

**SECRETARIAT:** Address all inquiries to: First World Congress of Herpetology, Ecology Research Group, Rutherford College, University of Kent, Canterbury, Kent CT2 7NY, U.K. *Telephone: (0277) 76400, ext. 3501. Telex: 965449.*

# ARRANGEMENTS FOR WORLD CONGRESS OF HERPETOLOGY (FOR OTHER DETAILS SEE SEPARATE ANNOUNCEMENT)

+ Registration fee is £90 if paid before 31 December 1988, increasing to £100 after this date.

* These fees must be paid now, if they are applicable to you.

| FEES | Number of persons | Fee per person | Number of days | Total | Fee due now |
|---|---|---|---|---|---|
| REGISTRATION | | | | | |
| *Delegate Registration fee | 1 | 90.00 | ... | 90.00 | 90.00+ |
| *Accompanying person/s | ___ | 25.00 | ... | ___ | ___ |
| ACCOMMODATION & MEALS PER DAY | | | | | |
| Campus accom. (3 meals, tea, coffee) | ___ | 27.00 | ___ | ___ | ..... |
| Meals only (coffee, lunch, tea, dinner) | ___ | 13.00 | ___ | ___ | |
| B & B | 16.00 | | | | |
| Park Wood shared apartments: | | | | | |
| With all meals | 27.00 | | | | |
| Without meals | 11.00 | | | | |
| SOCIAL EVENTS | | | | | |
| *Banquet | | 5.00 | ... | | |
| (refundable deposit) | ___ | | | ___ | ___ |
| *Barbecue Party | ___ | 5.00 | ... | ___ | ___ |
| PLEASE FILL IN TOTAL | | | A £ | | |
| DEPOSITS | | | | | |
| * Campus accommodation deposit | ___ | 50.00 | ... | ... | ___ |
| PLEASE FILL IN TOTAL DUE NOW | | | | B £ | |

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| **Legal Officer:** | Mr P. Curry | Centre for Life Studies, Zoological Society of London, Regent's Park, London NW1 4RY<br>Tel: 01-586 3910 |
| **British Museum (Natural History) Representative:** | Dr C.J. McCarthy | Reptile and Amphibian Section, Department of Zoology, British Museum (Natural History), Cromwell Road, London SW7 5BD. Tel: 01-589 6323, Ext. 292 |

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