ISSN 0260-5805

THE BRITISH HERPETOLOGICAL SOCIETY

BULLETIN

No. 62
Winter 1998

THE BRITISH HERPETOLOGICAL SOCIETY

c/o Zoological Society of London
Regent's Park, London NW1 4RY
Registered Charity No. 205666

The British Herpetological Society was founded in 1947 by a group of well-known naturalists, with the broad aim of catering for all interests in reptiles and amphibians. Four particular areas of activity have developed within the Society:

The Captive Breeding Committee is actively involved in promoting the captive breeding and responsible husbandry of reptiles and amphibians. It also advises on aspects of national and international legislation affecting the keeping, breeding, farming and substainable utilisation of reptiles and amphibians. Special meetings are held and publications produced to fulfil these aims.

The Conservation Committee is actively engaged in field study, conservation management and political lobbying with a view to improving the status and future prospects of our native British species. It is the accepted authority on reptile and amphibian conservation in the UK, works in close collaboration with the Herpetological Conservation Trust and has an advisory role to Nature Conservancy Councils (the statutory government bodies). A number of nature reserves are owned or leased, and all Society Members are encouraged to become involved in habitat management.

The Education Committee promotes all aspects of the Society through the media, schools, lectures, field trips and displays. It also runs the junior section of the Society - THE YOUNG HERPETOLOGISTS CLUB (YHC). YHC Members receive their own newsletter.

The Research Committee includes professional scientists within the ranks of the Society, organises scientific meetings on amphibian and reptile biology and promotes *The Herpetological Journal*, the Society's scientific publication.

Meetings
A number of meetings and events take place throughout the year, covering a wide range of interests.

Publications
The BHS Bulletin, Herpetological Journal and *YHC Newsletter* are all produced quarterly, and *The Natterjack* Newsletter is produced monthly. There are in addition a number of specialised publications available to Members and produced by the various Committees, such as notes on the care of species in captivity, books and conservation leaflets.

Subscriptions
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Correspondence, Membership applications, subscription renewals and purchase orders for publications should be addressed to the Secretary (address as at page top) PLEASE INCLUDE A STAMP-ADDRESSED ENVELOPE WHEN WRITING TO THE SOCIETY.

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

The Bulletin is edited and produced by
John Pickett and John Spence.
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FRONT COVER
Eleutherodactylus gollmeri. Pitilla, Volcán Orosi, Costa Rica.
See *Amphibians and Reptiles of the Cordillera de Guanacaste, Costa Rica*, by Peter Stafford, p.9.

BHS CONSERVATION MEETING, JUNE 1998

The Conservation Committee is organising a meeting on Sunday June 28th, at the University of Sussex, **to which all BHS members are invited**. The morning session will run from 11 a.m. to 1 p.m., and include short talks by Conservation Committee members on their work over the past year. Tea/coffee and biscuits will be provided, and there will be time for informal discussions and a general chat.

There is a local pub which provides snack meals for anyone wishing to stay after 1 p.m., and there will therefore be opportunities for further chinwags over lunch. The Conservation Committee has a formal business meeting between 2-4 p.m., in the course of which next year's Committee and Support Group will be elected. Any members with a strong interest in conservation, and who might like to become associated with either of the above, are encouraged to attend as observers.

Finally, at 4 p.m. there will be a field trip (weather permitting) to the nearby Castle Hill National Nature Reserve. This is situated on the South Downs and has been the beneficiary of a grant from the BHS Land Fund for the installation of a new dewpond for Great Crested Newts. The round trip (mostly walking) is likely to take about an hour.

So all BHS members are welcome; the University is situated about halfway between Brighton and Lewes, and is easily reached by rail or road. The meeting will be in the Terrace Room, on the third floor of the Refectory building. Anyone requiring further details can contact me:

- by telephone at home, 01273 305634 (evenings/weekends)
- by telephone at work, 01273 606755 extension 2690
- by email: t.j.c.beebee@sussex.ac.uk
- by post: 434 Falmer Rd, Woodingdean, Brighton BN2 6LG.

Do come!

Trevor Beebee

BRITISH HERPETOLOGICAL SOCIETY CONSERVATION COMMITTEE

TERMS OF REFERENCE

REVISED 1997

(1) **Outline arrangements.** The British Herpetological Society Conservation Committee (BHSCC) shall consist of a Chairperson and in indefinite number of other members (officers) with specific responsibilities.

There will also be a Support Group (SG) constituted by members without specific responsibilities but with an obligation to assist members of the BHSCC as appropriate.

There will be a Conservation Committee bank account, and the Committee will be supported by financial contributions from the Society at levels determined annually by the Council of the Society.

(2) **Eligibility for membership.** BHSCC members will also be members of the British Herpetological Society (BHS), SG members need not be BHS members.

(3) **Election principles.** The BHSCC will be elected by BHSCC and SG members, subject to ratification by BHS Council.

(4) **Length of service.** Members of both the BHSCC and SG can serve indefinitely, but the Chair of the BHSCC will normally serve for only 1 year. The intention is to cycle membership and thus recruit new members as frequently as possible.

(5) **Meeting arrangements.** There will be a single meeting each year, and this will normally be held in June. This will include:

(i) An initial informal session to which BHSCC, SG and other BHS (including YHC) members will be invited, and which will be advertised in the BHS Bulletin.

(ii) A formal business meeting to include the BHSCC and any SG members who wish to attend. This meeting will include the election of BHSCC and SG members for the following year.

Only BHSCC members will have voting rights on all issues except that of elections. With respect to the latter, both BHSCC and SG members will have voting rights for membership of the BHSCC. SG membership is open to general application, subject to approval by the BHSCC.

A quorum for the formal business meeting shall be three full BHSCC members. Agenda items may be submitted by any member of the BHSCC, the SG or wider BHS membership (including the YHC) and should reach the Chairman before May 1st in the year of the meeting.

(6) **Reporting to the BHS Membership.** Minutes of the formal meeting will be published in the BHS Bulletin.

BHSCC Officers:

(i) To take primary responsibility and initiatives (i.e. to be proactive) in the specific area of their appointment.

(ii) To liaise with, and seek advice from, other BHSCC and SG members as appropriate.

(iii) To ensure that their actions comply with the democratic processes listed under item (7) above.

(iv) To report back on their achievements over the previous year at the June meeting.

SG Members:

(i) To offer unsolicited advice and support to the various BHSCC activities (i.e. to take proactive roles) as far as opportunities and individual expertise permit.

(ii) To respond to specific requests for assistance from BHSCC members.

SUSTAINING ENDOTHERMY ON A DIET OF COLD JELLY: ENERGETICS OF THE LEATHERBACK TURTLE *DERMOCHELYS CORIACEA*

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INTRODUCTION

The Leatherback Turtle *Dermochelys coriacea* (Vandelli, 1761) is geographically the most widely distributed living reptile species, being found from the tropics to beyond the Arctic Circle in the north and to the waters around New Zealand in the South (Nishimura, 1964; Bleakney, 1965; Davenport, 1991). It has been reported from all oceans except the Southern Ocean. Leatherbacks dive to 1000+m where they also encounter low temperatures (Eckert *et. al.,* 1984, 1986; Mrosovsky, 1987). There is much direct and indirect evidence to show that Leatherback Turtles are endothermic, being able to sustain a core temperature of around 25°C in water temperatures of about 5-15°C (Pritchard, 1969; Frair, Ackman & Mrosovsky, 1972; Greer, Lazell & Wright, 1973; Mrosovsky, 1980; Davenport, Holland & East, 1990). Whether they are facultative endotherms, reverting to ectothermy in tropical waters is unclear (Sapsford & Hughes, 1978; Davenport, 1991). Paladino, O'Connor & Spotila (1990) derived a model from Leatherback data to support the concept of 'gigantothermy' (endothermy without the enhanced metabolic rate of birds and mammals), calculating that Leatherbacks could sustain resting metabolic rates (RMR) when in cold water solely because of the species' large size (>900 kg), good insulation and control of peripheral circulation. They also stated that actively swimming Leatherbacks could sustain a 10°C difference between core and ambient temperatures on a metabolic rate of 0.8 W Kg^{-1}. Calculations are presented here to show that this model substantially underestimates the cost of life for *Dermochelys* in cold sea water, because of the wholly gelatinous diet of Leatherbacks. They also indicate why a gelatinous diet is unusual in endothermic vertebrates, though commonplace amongst ectothermic fish.

CALCULATIONS AND DISCUSSION

It is well established that Leatherbacks are specialised medusivores when foraging in cool surface waters of the north Atlantic (Bleakney, 1965; Brongersma, 1969; Hartog & van Nierop, 1984); particular prey items are *Rhizostoma, Cyanea, Aurelia* and *Chrysaora.* Individual jelly fish can be very large, with *Rhizostoma* reaching masses exceeding 30 kg. In UK, Irish and French waters, summers when large numbers of Leatherbacks are seen coincide with years when swarms of jellyfish are numerous. Leatherbacks also eat large pyrosomas (Davenport & Balazs, 1991) both in shallow and deep water, and the fatty acid signature of the blubber of Leatherbacks is consistent with a wholly gelatinous diet (Holland, Davenport & East, 1990; Davenport & Balazs, 1991). Leatherbacks are specialists on gelatinous organisms throughout their life; Lutcavage & Lutz (1986) noted that recently-hatched Leatherbacks (almost certainly too small for endothermy) consumed jellyfish equivalent to their body weight each day, simply to

support routine metabolism. Bjorndal (1996) has recently summarized findings for the species' foraging ecology, and extends the list of gelatinous prey to include salps and siphonophores, often eaten at great depth (where ambient temperatures, and hence prey temperatures, are below 5°C throughout the world; Raymont, 1963). Other endothermic marine carnivores (e.g. lamnid sharks, seabirds, marine mammals) eat high-quality, lipid/protein rich diets; *Dermochelys* is unique in consuming food with an extremely low lipid and energy content, more than an order of magnitude less than the content of an equivalent mass of fish flesh (Table 1). The small amount of organic material in gelatinous prey is also of poor nutritional quality; 70% carbohydrate, 27% protein and 3% lipid (Davenport & Balazs, 1991); a typical diet of fish or molluscan flesh contains about 47% carbohydrate, 45% protein and 8% lipid. The caloric content (about 12 joules mg dry organic wt^{-1}) is also very low, lower than that of all organisms listed by Crisp (1971).

Turtles (*Chelonia mydas*) eating high quality diets exhibit high assimilation rates (87%) for energy, but show significantly lower assimilation rates (68%) on poor quality diets (Davenport, Antipas & Blake, 1989). It is probable that high prey water content, poor nutritional quality and low assimilation efficiency will act synergistically in *Dermochelys* so that very little energy and nutrient is extracted from a given mass of prey.

Leatherbacks consequently have to consume great quantities of food for such large carnivores, at least 50% body mass d^{-1} (equivalent in energetic [but not protein/lipid] terms to eating only 4% body mass d^{-1} of fish). Seals and birds eat 10-20% body weight per day of fish - but sustain higher body temperatures and levels of activity. Duron (1978) confirmed that large Leatherbacks (*ca* 400 kg body mass) foraging off the coast of France each ate about 200 kg *Rhizostoma* d^{-1}. This was a conservative estimate since observation was limited to daylight hours. Leatherbacks browse almost continually when in jellyfish swarms; recent kinematic study (Bels, Davenport & Renous, in press) shows that Leatherbacks can capture additional prey whilst continuing to transport food to the oesophagus, a conveyor-belt-like process not found in other sea turtles.

Eating large quantities of ectothermic gelatinous animals poses a thermal problem for a Leatherback. Part of the oesophagus, the whole of the stomach and most of the intestine are inside the blubber capsule of the body, so are presumably within the warm core. The throat of the Leatherback is covered by a thick adipose pad, which insulates the great vessels, trachea and oesophagus in the neck region. Food must therefore be heated from abient (t_a) to core (t_c) temperature. Gelatinous animals are mostly water (Table 1), so can be considered to have a heat capacity of 4.2×10^3 J Kg^{-1} $^oC^{-1}$. Assuming that a 400 Kg turtle eats 200 Kg food d^{-1}, then the energetic cost of heating the food will be 8.4×10^6 J d^{-1} where $t_c - t_a = 10°C$ or 16.8×10^6 J d^{-1} where $t_c - t_a = 20°C$. How significant are these costs in terms of the metabolism of adult *Dermochelys*? Paladino *et al.* (1990), working on tropical beaches, measured RMR at a mean of 0.39 W Kg^{-1}, minimum active metabolism at about 0.8 W Kg^{-1} and maximum active metabolism at around 1.8 W Kg^{-1}. For a 400 Kg turtle these values translate to 13.5×10^6 J d^{-1}, 27.6×10^6 J d^{-1} and 62.2×10^6 J d^{-1} respectively. Evidently the cost of heating up food to core temperature can be a large fraction of metabolic rate. If a turtle eats 200 Kg of medusae per day where $t_c - t_a = 20°C$, then the cost of heating exceeds RMR and a combination of RMR and heating costs would be greater than the minimum active metabolism recorded by Paladino *et al.* (1990).

In addition, Leatherbacks feeding in cold water will use much of the energy gained from eating medusae or pyrosomas simply in heating them before digestion. 200 kg *Pyrosoma*

atlantica (Davenport & Balazs, 1991) contains 5 kg dry organic matter with an energy content of about 62 x 10^6 J. Heating such pyrosomas by 10°C or 20°C will use up 13.5% or 27% (respectively) of the available energy (much of which may not be readily available, being derived from indigestible mucopolysaccharides). Heating costs for a fish diet would be trivial by comparison.

There are other possible sources of heat loss beyond simple loss across the body surface in cold water; the above analysis takes no account of faecal heat losses (unknown), or of the costs involved in warming and humidifying inspired air (insufficient environmental data are available to permit calculation). Leatherbacks also incur a substantial salt and water regulation problem by eating a diet so rich in both salts (cnidarians and tunicates are osmoconformers) and water. Other than their known ability to secrete salts from the lachrymal glands (Hudson & Lutz, 1986), Leatherback osmotic physiology is unstudied, so the means by which they remove the enormous salt/water load associated with a gelatinous diet are obscure; mechanisms to strip heat from that water before release might be predicted. However, even if these extra potential routes of heat loss are ignored, the information presented here indicates that Leatherbacks foraging in cold waters must have a much higher routine metabolic rate (requiring consumption of even more jellyfish) than that recorded in the tropics by Paladina *et al.* (1990). In addition, the poor quality diet suggests that Leatherbacks will not be able to sustain vigorous activity in cold water for long; 200 Kg of gelatinous material contains about the same amount of energy that a turtle would expend in maintaining the maximum metabolism recorded by Paladino *et al.* (1990) for 24 h (not allowing for warming, losses during assimilation, etc.). Relying on a cold, energy-poor diet must result in a greatly limited scope for activity, particularly if it is assumed that high-latitude foraging is adaptive, and should result in capture of surplus energy for somatic growth or gonadal development. Fortunately, gelatinous prey are themselves slow-moving, so prey capture near the sea surface should involve minimal activity.

The interplay of endothermy and a gelatinous diet may involve the unusual anatomy of the oesophagus of the leatherback. I took part in the dissection of the largest Leatherback so far reported (Eckert & Luginbuhl, 1988). The animal, mass 916 kg, was about 2.5 m long and 2.5 m in flipper span. The capacious oesophagus (muscular, well vascularized and lined with hundreds of semirigid cornified conical processes that probably shred the prey (Davenport & Balazs, 1991), was more than 2m long and ran not from the back of the throat directly to the stomach as in other sea turtle species, but to the centre of the visceral cavity (i.e. posterior to the midpoint of the turtle), before looping anteriorly and leftwards to join the stomach. The exceptional length and volume of the oesophagus is probably primarily required to allow Leatherbacks to take up and store more food than could be stored in the stomach alone, but should also provide the opportunity for food to warm and break up relatively slowly before reaching the stomach; slow movement of food through the oesophagus is known from other sea turtle species with much shorter gullets (Birse & Davenport, 1987; Davenport & Kjørsvik, 1985; Davenport *et al.*, 1989).

In all of the above analysis, the author has only considered Leatherbacks foraging at the surface in cool temperate waters where they cannot afford to allow the core temperature to fall. In the tropics, Leatherbacks forage at great depth (see Bjorndal, 1996 for review) in cold water, but return to warm surface waters (25+°C) at the end of a dive. It is not known whether Leatherbacks forage at depth when in temperate waters, nor are data yet available concerning the thermal biology of diving Leatherbacks in the tropics – if they allow the core temperature to drop during such excursions, then they may subsequently allow themselves and their prey to re-warm with environmental heat.

Table 1.
Comparison of composition of fish and gelatinous animals

	Water as % wet mass	Organic mass as % wet mass	Energy content (J x 10^3 Kg wet mass^{-1})	Lipid content (g lipid mass Kg wet mass^{-1})
Medusae	9-97	0.5-2.5	–	0.3-1.2
Pyrosomas	94	2.5	313	0.7
Fish (plaice)	82	15.8	3890	14.0

Data sources: Tessier, 1926; Davenport & Kjørsvik, 1986; Holland *et al.*, 1990; Davenport & Balazs, 1991;

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British Herpetological Society Bulletin, No. 62, 1998

AMPHIBIANS AND REPTILES OF THE CORDILLERA DE GUANACASTE, COSTA RICA; A FIELD LIST WITH NOTES ON COLOUR PATTERNS AND OTHER OBSERVATIONS

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INTRODUCTION

The herpetofauna of Central America is perhaps nowhere more diverse or speciose than in Costa Rica. A voluminous record of literature has also established the amphibian and reptile life of this country as amongst the most well documented of any in the Neotropics, although further work will undoubtedly shed more light on the local distribution patterns and ecology of species. Probably the best known individual area is the lowland wet forest site of La Selva in the province of Heredia, where a variety of herpetological research has been undertaken since the late 1950s (reviewed by Donnelly, 1994 and Guyer, 1994).

The most recent and comprehensive checklist available is that by Savage and Villa (1986), which lists 362 species and includes detailed identification keys and general distribution information. Many of those found at higher elevations are also featured in a regional guide to the herpetofauna of the Monteverde area by Hayes et al. (1989). Among other indispensable references for the field biologist is a classic series of papers published by E.H. Taylor during the 1950s (list appended), which provides descriptions of most of the caecilians, salamanders, anurans, lizards and snakes, although a considerable number of others have since been added, and the nomenclature of many superseded. The venomous snakes of the country are treated in an illustrated guide by Picado (1931, reprinted 1976).

Costa Rica is divided medially by a spine of volcanic highlands that extend in the north as the Cordillera de Guanacaste. The section of this range nearest the Nicaraguan border is dominated by the peaks of Volcàn Orosi, which rises to an elevation of 1487 metres, and Volcàn Cacao (1659 m), followed to the south by Volcàn Roncón de la Vieja (1895 m) and Volcàn Santa María (1916 m). These mountains and the surrounding lowlands of Guanacaste embrace a rich diversity of vegetation types, ranging from tropical dry forest on the Pacific coastal plain, through a number of wetter, montane variants, to elfin cloud forest. Information on the herpetofauna of the area is limited. Sasa & Solórzano (1995) provide an account of species composition in the dry Pacific lowlands, listing 18 amphibians and 59 reptiles from Parque Nacional Santa Rosa, but the herpetofauna of the adjacent Cordillera highlands is relatively unknown.

Some 36,000 hectares surrounding the volcanoes of Orosi and Cacao are designated as a protected area (Parque Nacional Guanacaste), within which five biological field stations are operated by the Area de Conservación Guanacaste (A.C.G.). The highest of these is Estación Cacao, which lies at an elevation of some 1000 metres. Two other facilities are located on on the slopes of Volcán Santa Maria and Volcán Rincón de la Vieja (Parque Nacional Rincón de la Vieja). The following is a list of the amphibians and reptiles

observed while the author was conducting botanical fieldwork from four of these stations (Pitilla and Maritza on Volcán Orosi, Cacao on Volcán Cacao, and Santa Maria on Volcàn Santa Maria) between 30th May and 23rd June 1996. The information is tendered in the form of an event-based record with notes on prevailing weather conditions, microhabitat, dates of observation and, in some cases, times of day that specimens were found; brief colour descriptions and other notes are also included for some of the more variable and little known species. With the exception of one lizard observed but not captured (*Ameiva festiva*), only those animals that were examined in the hand are listed. Voucher photographs of most species were taken as a means of verifying identification (specimens were not collected), copies of which have been deposited with the Picture Library at the Natural History Museum, London (reference numbers cited where applicable).

CLIMATE AND LOCALITY INFORMATION

Detailed records of rainfall for the Cordillera de Guanacaste area are few, although the Pacific (leeward) versant is known to be characteristically drier, and the Atlantic much wetter, with maximum precipitation falling at middle elevations. Annual rainfall varies from approximately 1500 mm on the Pacific side to some 5000 mm on the Atlantic (Coen, 1983). The rainy season begins in late April or May, extending through to as late as February on the Atlantic versant. Seasonality is more pronounced on the Pacific side, and is especially severe in the lowlands. Average temperatures for the monthly maximum are higher on the Pacific coast than on the Atlantic at the same elevations; for the Pacific, the mean value at sea level is approximately 32.6°C, and on the Atlantic, 29.9°C (Coen, 1983). The warmest month may be March, April or May, and the coolest November, December or January.

Little has been published with respect to the classification of ecological formations in the Guanacaste highlands, although certain forest types are perhaps comparable with those of La Selva described by Hartshorn & Hammel (1994), and possibly the lower slopes of the Monteverde area (Lawton & Dryer, 1980); the categories used here follow the life-zone system of Holdridge (1967).

Localities

Estación Biológica Pitilla. Volcán Orosi, Atlantic versant; 10°59'26"N, 85°25'40"W, elevation 600 m. Vegetation in the immediate vicinity of the field station is characterised largely by tall grasses and shrubs of the family Melastomataceae. Above this it changes to closed canopy, semi-evergreen (Tropical wet forest) and evergreen (Tropical premontane rain forest) vegetation, with an abundance of epiphytes, woody vines, and herbaceous climbers. The lower trunks and branches of trees are typically covered with heavy growths of moss. Understory vegetation is dense in places and sparse in others, with a thick ground layer of wet leaf litter that may be covered with ferns. Approximately 4000 mm of rain falls between May and February, and even the 2 month dry season remains moist.

Estación Biológica Maritza. Volcán Orosí, Pacific versant; 10°57'36"N, 85°29'36"W, elevation 500-600 m. The field station lies at the interface between the Tropical moist forest belts and Tropical premontane moist forest; the former is characterised by an extensive plateau of open, rocky, scrub/savannah, dominated by the grass *Hyparrhenia rufa* with Melastomataceae shrubs and occasional stands of deciduous trees, mostly *Quercus oleoides*, and the latter by closed canopy, semi-evergreen forest, which becomes increasingly wetter with elevation. The area receives some 2000-4000 mm of rain between May and December.

Estación Biológica Cacao. Volcán Cacoat; 10°55'43"N, 85°28'10"W, elevation 1000 metres. The vegetation immediately above the field station is dominated by tall, evergreen closed canopy forest, with relatively sparse understory and ground layer vegetation (Tropical premontane rain forest); at an elevation of some 1500-1650 metres the exposed upper slopes are characterised by elfin cloud forest, with stunted trees festooned with epiphytes (Tropical lower montane rain forest). Rainfall is heavy and may persist for many weeks during the wet season. Nights can be as cool as 14-16°C.

Estación Biológica Santa Maria. Volcán Santa Maria, Pacific versant; 10°46'50"N, 85°17'55" W, elevation 950-1100 m. Tropical moist and Tropical wet forest formations. The area is characterised by tall, semi-evergreen closed canopy forest, with areas of open grassland and dense scrub forest on the lower slopes.

SPECIES LIST

Bufonidae
Bufo marinus L. Cane Toad.
Multiple records (10+). Volcán Orosí, Estación Maritza.
This species was commonly observed foraging at night around the various buildings of the field station.

Hylidae
Scinax staufferi (Cope). Stauffer's Tree Frog.
1. Volcán Orosí, Estación Maritza. Photo ref. T13858.
This individual was found calling on the night of 7th June in the shower block of an accommodation building.

Smilisca baudini (Duméril & Bibron). Mexican Tree Frog.
5. Volcán Orosí, Estación Pitilla. Photo ref. T13835.
Individuals were found between 3rd and 6th June calling at night from small pools after heavy rain, or perched on wooden rafters of field station buildings.

Leptodactylidae
Eleutherodactylus biporcatus (Peters). Broad-Headed Rain Frog.
1. Volcán Orosí, forest trail approx. 1 km above Estación Pitilla. Photo refs. T13837-13838.
A juvenile specimen, S-V length 21 mm, found on 3rd June amongst wet leaf litter. Dorsum dull yellow-brown, darker middorsally and on the upper surface of the forearm, with dark spots enclosing regulate warts and tubercles. Ventral surface dark grey, finely mottled with white under the chin, throat, and forelimbs, and marked with larger, more sharply defined white spots on the abdomen and anterior edge of thighs; undersurface of hands yellowish tan. Eye: iris dark bronze suffused with black.

Eleutherodactylus sp., *cruentus* group.
1. Volcán Orosií, forest trail approx. 1 km above Estación Pitilla. Photo ref. T13839.
A small leptodactylid (S-V length 20 mm) of this species group was found on 5th June amongst wet leaf litter at the base of a dead tree. The specimen had a moderately prominent heel tubercle (calcar) and, following Savage (1981), is assignable to *E. erasinus* (Cope); it had an indistinct canthus, and was conspicuous in also having a relatively small typanum (approx. one quarter of diameter of eye) and a tuberculate dorsum with well developed tubercles on the posteroventral margin of the forearm and lower leg. Dorsum olive brown, almost blackish on the upper surface of the head, with a broad yellowish tan, black-edged middorsal stripe extending from the occiput to the vent; lower dorsolateral surfaces dull silvery-white finely mottled with black. An ill-defined dark 'trouser' patch present at vent. Anterior edge of forearm dull yellowish tan. Hind limbs with prominent darker barring; posterior surface of thigh, calf, and groin

Plate 1: *Norops oxylophus*. Pitilla, Volcán Orosí.

Plate 2: *Imantodes inornatus*. Pitilla Volcán Orosí.

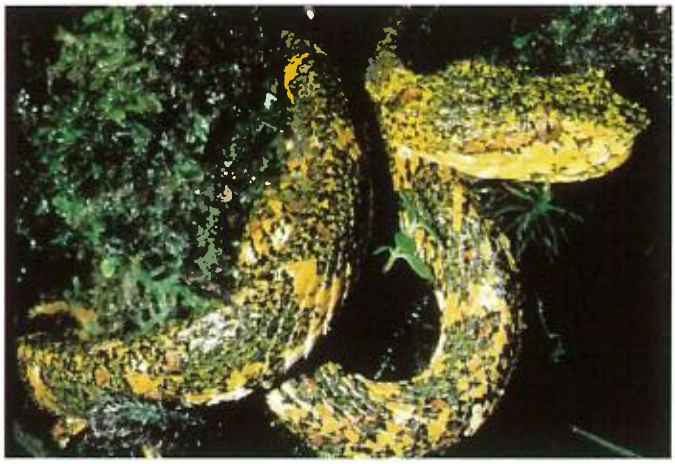

Plate 3: *Bothriechis schlegelii.* Pitilla Volcán Orosí.

Plate 4: *Porthidium ophryomegas.* Maritza, Volcán Orosí.

Plate 5: ***Rhinoclemmys pulcherrima.*** Maritza, Volcán Orosí.

immaculate orange-pinkish brown. Finger and toes disks whitish with dark spotting at the tip. Ventral surface whitish and peppered with fine dark spots, most prominent under the chin and throat. Eye: a conspicuous feature of the frog was the bright yellow coloration of the sclera; iris dark bronze-brown with fine black reticulations.

Although found on the ground, the frog instinctively climbed upwards when released.

Eleutherodactylus gollmeri (W. Peters). Gollmer's Litter Frog.
1. Volcán Orosi, forest trail approx. 1 km above Estación Pitilla. Photo ref. T13836.
An adult specimen, S-V length 40 mm, found during the day (4th June) concealed amongst wet leaf litter. Dorsal coloration pale bronze-brown with a fine yellow middorsal stripe, a pair of conspicuous yellow median blotches, and a pair of small black tubercles behind the shoulders. Head yellowish above, sharply demarcated from the brown dorsal colour by a dark transverse ridge extending between the eyes; side of head with a dark face mask, enclosing the typanum and terminating posteriorly low on the side behind the axilla; canthus marked with a fine white line that follows the upper edge of the face mask behind the eye. A well-defined dark triangular 'trouser' patch present at vent. Limbs pale brown strongly barred with darker brown, the bars finely edged with yellow. Venter whitish, immaculate except for some fine, indistinct grey stippling under the chin. Eye: upper half of iris gold with fine black reticulations and lower half black.

Leptodactylus fragilis (Brocchi). White-Lipped Frog.
1. Volcán Orosí, Estación Maritz. Photo ref. T13840.
An adult frog (S-V length 33 mm) found during the day on 6th June under a stone in transitional open scrub/savannah dominated by *Quercus* and Melastomataceae.

Physalaemus pustulosus (Cope). Tungara Frog.
Multiple records (10+). Volcán Orosí, Estación Maritza. Photo ref. T13841.
These diminutive, toad-like species were observed calling at night in shallow puddles and water-filled vehicle tracks. Several foam nests were also found after rain on 5th June.

Ranidae
Rana forreri Boulenger. Dry Forest Leopard Frog.
3. Volán Orosí, Estación Maritza. Photo ref. T13831/R.
Specimens were all observed in the vicinity of streams and on trails around the field station at night (3rd to 6th June) in closed canopy woodland and open scrub/savannah dominated by *Quercus* and Melastomataceae.

Rana warszewitchii (Schmidt). Brilliant Forest Frog..
4. Volcán Orosí, forest trails above Estación Pitilla. Photo refs. T13832/R - T13833 (adult) and T13834 (juvenile).
An adult specimen, S-V length 58 mm, and three juveniles (one specimen S-V 25 length mm) were found during the day (4th June) on the forest floor at the side of a shaded stream. Dorsal coloration of adult uniform dark chocolate brown; head with conspicuous, narrow cream-coloured labial stripe. Hind limbs with indistinct darker barring; posterior surface blackish brown on thigh and brick red on calf, sharply contrasted by approx. 5-7 bright yellow spots. Ventral surface of chin, throat and abdomen pale yellow with pinkish flecks; undersurface of hind limbs pinkish-rose, marbled with pale yellow beneath femur. Dorsal surface of juveniles golden tan with irregular metallic green flecks; lateral surfaces and side of head below canthus dark brown; posterior surface of hind limbs suffused with pinkish orange without yellow spots of adult; webbing between toes coral red. Venter whitish finely mottled with brown; a dark 'trouser' patch present at vent, the lower edge bordered with small white spots. Eye: upper one-third of iris gold and lower two-thirds suffused with black.

The frogs had the conspicuous habit of sitting in a pronounced upright position. Both the adult and juveniles produced a 'squeak-like' vocalization when captured.

Emydidae
Rhinoclemmys pulcherrima (Gray). Painted Wood Turtle.
1. Volcán Orosí, rock road to Inter-American Highway approx. 2 km from Estación Maritza. Photo ref. T13842.
An adult specimen of this ornately patterned turtle was found during the morning of 11th June in open scrub/savannah dominated by *Quercus* and Melastomataceae. Weather conditions at the time were dry and sunny.

Gekkonidae
Gonatodes albogularis (Duméril and Bibron). Yellow-Headed Gecko.
Multiple records (10+). Volcán Orosí, Estación Maritza; Volcán Santa María, Estación Santa María. Photo ref. T13843.
Males and females of this strikingly dimorphic and ubiquitous species were observed on most days, typically about 1 metre above the ground on the trunks of large trees and sides of wooden buildings.

Phyllodactylus tuberculosus (Wiegmann). Leaf-Toed Gecko.
Multiple records (10+). Volcán Orosí, Estación Maritza. Photo ref. T13844.
Adults and juveniles of this gecko were commonly observed by night on the outside walls and ceilings of field station buildings (7th to 9th June). Dorsum pale grey with irregular black spots on the head, body (except lateral surfaces) and limbs; an irregular dark stripe extending from the snout through the eye and along the side of the head; tail with dark spotting at the base and tip, with 4 dark crossbands in between; venter immaculate cream.

Sphaerodactylus millepunctatus Hallowell. Spotted Gecko.
1. Volcán Orosí, Estación Maritza.
The specimen was found on 5th June beneath a stone in close proximity to the field station.

Iguanidae
Ctenosaura similis (Gray). Black Iguana.
Multiple records (10+). Lower Pacific slopes of Volcán Orosi.
A common species, frequently observed basking on rocks and in the lower branches of trees in open scrub/savannah. The species is particularly common in the Tropical dry forest zone of the Pacific lowlands.

Phrynosomatidae
Sceloporus variabilis (Wiegmann). Rose-Bellied Lizard.
1. Volcán Orosí, forest trail approx. 500 metres above Estación Pitilla.
The lizard (a female) was found on 3rd June beneath a discarded wooden board in Melastome-dominated scrub forest.
Polychrotidae
Norops capito (Peters). Big-Headed Anole.
1. Volcán Orosí, forest trail approx. 1 km above Estación Pitilla.
A small juvenile (newly-hatched ?) found on 3rd June perched face down on the side of a sapling tree, approx. 2 metres from the ground.

Norops cuperus (Hallowell). Dry Forest Anole.
Multiple records (10+). Volcán Orosí, Estación Maritza; Volcán Santa María, Estación Santa Maria. Photo ref. T13845.
A species commonly observed in the vicinity of the field stations. Dewlap of male pastel pink, with a large yellowish spot covering much of the base and adjoining free margin.

Norops limifrons (Cope). Slender Anole.
1. Volcán Orosí, forest trail in open woodland approx. 2 km above Estación Pitilla.

The specimen (a male) was found basking on the leaf of an understory shrub, approx. 1 metre above the ground (3rd June). Dorsal coloration pale brown with a whitish vertebral stripe, punctuated at regular intervals with small dark spots, and a pale dorsolateral stripe. Tail marked with conspicuous broad, dark bands. Dewlap greyish white tainted with orange at the base.

Norops oxylophus (Cope). Stream Anole.
3. Volcán Orosí, forest trail approx. 2 km above Estación Pitilla. Photo ref. T13846.
All specimens were observed on rocks in or at the side of a forest stream (3rd June). Dorsum of adult male olive brown with a conspicuous pale dorsolateral stripe, extending from the snout posteriorly over the axilla (here bordered above and below by black) and along the side of the body; lower sides dark brown, mottled with whitish spots, and limbs with dark barring; dewlap uniform burnt yellow-orange.
Individuals of this medium-sized anole evaded capture by jumping deftly from stone to stone or occasionally scurrying across the water, taking refuge in crevices between rocks.

Scincidae
Mabuya unimarginata Cope. Central American Mabuya.
1. Volcán Orosí, Estación Maritza.
The specimen was observed basking on a large rock (6th June), concealed amongst climbing foliage in dry scrub/savannah dominated by *Quercus* and Melastomataceae. A second specimen was observed but not captured near the summit of Volcán Cacao, at an elevation of some 1500 metres in elfin cloud forest (9th June).

Teiidae
Ameiva festiva Lichtenstein and von Mertens. Middle American Ameiva.
2. Volcán Orosí, Estación Pitilla.
Both specimens were adults, observed on several occasions between 3rd and 5th June foraging around and beneath the wooden buildings of the field station.

Xantusiidae
Lepidophyma flavimaculatum A. Duméril. Yellow-Spotted Night Lizard.
A juvenile specimen of this highly secretive species was found on 20th June beneath a stone at the edge of the field station. Dorsum black with approx. 50 sharply defined yellowish spots dispersed over the dorsolateral surfaces either side of the vertebral line; head black, with preocular, loreal, anterior nasal, and supralabials outlined with yellow; tail dark greyish brown with indistinct pale spotting.
Colubridae
Conophis lineatus (Duméril, Bibron and Duméril). Road Guarder.
1. Volcán Orosí, Estación Maritza. Photo Ref. T13847.
An adult specimen of the typical striped colour phase was found at 17.15 hrs. on 11th June amongst rocks and dry grass at the edge of the field station clearing; transitional open scrub/savannah dominated by *Quercus* and Melastomataceae. A second snake was observed foraging at the side of a trail at 15.50 hrs. in hot, dry sunny conditions on the following day.

Dendrophidion vinitor Smith. Barred Forest Racer.
2. Volcán Orosí, forest trail approx. 1 and 3 km above Estación Maritza on trail to Cacao. Photo ref. T13848.
The snakes were juveniles (total length approx. 250 mm) found active at 10.00 hrs on 8th June and late morning on 9th June; elevation 750-850 metres. On both occasions the ground was wet following rain, although weather conditions at the time were dry and sunny. Dorsum and tail pinkish brown with numerous (one specimen with 52 on body) silvery-white crossbands extending to the ventral surface, those on the neck broadest (2-3

scales wide) and most sharply defined, the edges of the bands on the forebody irregularly bordered either side with black, those of the lower dorsum bordered with black only on the posterior margin; the crossbands become progressively indistinct posteriorly (almost indeterminate on tail), dividing into regular lines of dark and light spots, the lowermost row (dark) forming a continuous narrow stripe along the ventrolateral edge of the tail. Top of head same colour as dorsum, paler on the sides with whitish supralabials; upper edge of supralabials behind eye edged with a fine dark line. Venter dull whitish, immaculate.

When alarmed, these wary and swift-moving snakes had the conspicuous habit of raising the head and forebody high off the ground.

Imantodes inornatus (Boulenger). Yellow Blunt-Headed Tree Snake.
1. Volcán Orosí, forest trail approx. 200 m below Estación Pitilla. Photo ref. T13849.
An adult specimen (approx. total length 520 mm) of this vine-like arboreal species was found after dark (18.45 hrs.) on 4th June in a small tree some 2.5 meters from the ground, at the edge of a seasonal (dry) pond. Cloud cover at the time was extensive, screening illumination from the moon, and rain was falling as a fine mist. Dorsum and tail orange brown with very narrow, indistinct, dark crossbands; head also orange brown (including iris of eye), sparsely flecked with black. Venter pale orange-brown peppered with small dark dots, and a dark, diffuse median line.

In response to capture, the snake flattened its head and compressed the body laterally, although refused to bite.

Masticophis mentovarius (Duméril, Bribron and Duméril). Neotropical Whipsnake.
2. Volcán Orosí, rock road to Inter-American Highway approx. 8 and 10 km west of Estación Maritza.
Both snakes were large adults observed on 11th June, one was a recently killed specimen found dead on the rock road to the field station (total length 1.6 metres), and the other was watched as it foraged along the edge of a pool in open scrub/savannah. Guyer and Laska (1997) reported on a specimen from Cacao attempting to engulf a juvenile *Boa constrictor*.

Ninia sebae (Duméril, Bibron and Duméril). Red-Backed Coffee Snake.
1. Volcán Santa Maria, Estación Santa Maria. Photo ref. T13850.
The snake was an adult (approx. total length 200 mm) found during the day on 19th June beneath a rusting metal sheet in the field station clearing. Dorsal surface dull reddish brown, unicolour with a dark nuchal band edged anteriorly and posteriorly with yellow; upper surface of head black.

Spilotes pullatus (L.). Tiger Rat Snake.
1. Volcán Orosí, rock road to Inter-American Highway approx. 250 m west of Estación Maritza. Photo ref.T13851.
A large adult, total length in excess of 2 metres, found on the ground (11th June) in transitional open scrub/savannah dominated by *Quercus* and Melastomataceae. Dorsal coloration predominantly pale yellow, marked with broad, black, diagonally oriented bands anteriorly, and with black on the lower dorsum and tail confined to the outlines of the scales.

Stenorrhina degenhardtii (Berthold). Degenhardt's Scorpion-Eating Snake.
1. Volcán Orosí, forest trail approx. 500 m. above Estación Pitilla. Photo ref. T13852.
A juvenile found on 4th June during light rain in an area dominated by tall grasses and Melastomataceae shrubs. Dorsum pale brown with a middorsal series of blackish brown blotches extending to the tip of the tail (22 on body and 6 on tail), the first forming an

inverted 'Y'-shaped stripe on the nape, and the remainder aligned as irregular transverse bars. Sides marked with two alternating series of small, squarish spots, and a lower series of occasional spots on the ventrolateral edge. Head same colour as dorsum with the sutures of the upper head scutes darkened, a diffuse, dark spot in the centre of the frontal and at the posterior confluence of the parietals, and another irregular dark blotch in the centre of each parietal; side of head with an indistinct dark stripe bordering the upper edge of the supralabials behind the eye. Venter dull whitish with dark spots and a medial suffusion of dark pigment on the subcaudals.

Viperidae

Atropoides nummifer (Ruppell). Jumping Pitviper.

2. Volcán Orosí, approx. 1 km (photo ref. T13853) and 2 km (photo ref. T13854) north of Estación Maritza on trails to Casa Fan and Cacao.

Both specimens of this stout-bodied terrestrial species were large adults (total length in excess of 650 mm), found on 8th and 10th June in open woodland, one observed active in mid-morning and the other in the afternoon (16.30 hrs.) concealed amongst leaves and dry grass at the side of the trail. Weather conditions on both occasions were warm, dry and sunny. When disturbed the snakes formed a tight circular coil with the head in the centre and the mouth widely agape, although neither attempted to bite.

Bothriechis schlegelii (Berthold). Eyelash Palm Pitviper.

2. Volcán Orosí, forest trail approx. 1 km above Estación Pitilla (photo ref. T13855); Volcán Cacao, Estación Cacao (photo ref. T13856).

The two specimens represent different colour variants of this polymorphic species. The Pitilla snake, an adult approx. 600 mm in total length (marbled yellow-green colour form), was found at 13.30 hrs. on 3rd June near ground level draped over a heap of fallen, moss-covered branches. Surrounding understory vegetation was wet and dripping heavily after prolonged rain.

The specimen from Cacao, total length approx. 400 mm. (grey-green lichenose colour form), was found on the evening of 9th June perched unconcealed on a rafter inside the roof of a wooden building, approx. 3.5 metres above the ground; elevation 1000 metres.

Porthidium ophryomegas (Bocourt). Dry Forest Hognosed Pitviper.

1. Volcán Orosí, Estación Maritza. Photo ref. T13857.

A juvenile (total length approx. 300 mm), found on 11th June foraging after dark (19.00 hrs.) during light rain close to the field station in an area of open scrub/savannah dominated by *Quercus* and Melastomataceae. The species is primarily an inhabitant of lowland Tropical dry forest, and occurs here at the boundary of the Tropical moist forest and Tropical premontane moist forest belt probably at the limit of its ecological distribution.

RESUMEN

Este trabajo recoge una amplia lista de anfibios y reptiles estudiados en la Cordillera de Guanacaste en Costa Rica, entre el 30 de Mayo y el 23 de Junio de 1996. El área estudiada abarca una gran diversidad con diferentes tipos de vegetación, que van desde el bosque tropical seco de la llanura costera del Pacifico, pasando por diferentes pisos de vegetación, hasta el bosque lluvioso 'elfin'. Las observaciones se hicieron a diferentes alturas del Volcán Orosí, Volcán Santa Maria. Se incluyen breves descripciones de color de las especies más variables y menos conocidas. Las fotografias realizadas se utilizaron para verificar la identificación, copias de las mismas se encuentran depositadas en la Biblioteca Fotográfica del Museo de Historia Natural de Londres.

ACKNOWLEDGEMENTS

The author is grateful to his wife, Marian, for her invaluable assistance with field work, Enriqueta Martin-Consuegra for help with Spanish translation, and D.H. Janzen (Univ. of Pennsylvania), who commented on an earlier version of the manuscript. For their assistance in Costa Rica he is also indebted to J. Francisco Morales (Instituto Nacional de Biodiversidad) and Róger Blanco Segura (Programa de Investigación, Area de Conservación Guanacaste).

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COMMENTS ON HABITAT AND THREATS TO POPULATIONS OF THE PUERTO RICAN CRESTED TOAD *(PELTOPHRYNE LEMUR)* IN THE VIRGIN ISLANDS

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Since the rediscovery of the Puerto Rican Crested Toad (*Pellophryne lemur*) on Puerto Rico proper (Garcia-Darz, 1967), this endemic species has received much local attention there (Rivero, Mayorga, Estremera & Izquierdo, 1980; U. S. Fish and Wildlife Serv., 1987), yet little has been advanced in the literature on the status of the poorly known Virgin Islands population (Philibosian & Yntema, 1976 and 1978; Mayer & Lazell, 1988) since *Peltophryne* specimens were collected at Virgin Gorda, British Virgin Islands in 1915 (Barbour, 1917). With the addition of a new report from the American Virgin Islands, the purposes of this note is to illucidate habitat requirements and potential threats to this internationally threatened species.

Subtropical dry forest life zone (Eewel & Whitmore, 1973) typifies the dry habitat regime of Virgin Gorda, British Virgin Islands, where the only specimen of the toad has been reported on the eastern Puerto Rican marine shelf (Barbour, 1917). However, on 6 April 1978, while surveying wildlife on the south coast of St. John, American Virgin Islands in remote Lameshur Bay, (18° 19'N, 64° 44'W), Norton (1997) discovered a Crested Toad (*Peltophryne lemur*). Habitat characteristics (Rivero *et al.*, 1980) described on Puerto Rico are primarily in the context of limestone or karst topography of the interior of the dry limestone, coastal forest of Guanica. The collection site of the rediscovered toad at Isabela, Puerto Rico (Garcia-Diaz, 1967) is very similar to the location on St. John, where moist alluvium substrate ranged in size from boulders to pea-sized gravel and sand. The site at Lameshur Bay is very similar to a variety of sites visited by Philibosian & Yntema (1978) in xeric scrub and xeric woods at elevations from sea level to 100m within 1 km of the shoreline. The St. John location was an alluvial deposit at the base of a gulley (Grey Ghut) (Norton, 1979). After heavy rains, this deposit is scoured out by the force of rushing water enough to leave a depression of about 0.5-1.5 m in depth depending upon evaporation and percolation rates. Sometimes rainwater might stay in the depression for several days, and I have found crayfish carapaces measuring about 7.5 cm in this depression. Unlike Coamo Springs and Guanica, Puerto Rico, limestone habitat is not found in the vicinity of Lameshur Bay.

Breeding at Guanica, Puerto Rico is dependent upon sporadic and heavy rainfall (ave. annual 79 cm). On St. John the onset of the spring rainy season occurs in April through May (U.S. Virgin Islands National Park, POR 110 years) and may produce 2-5 cm in either month. St. John (el2980m) and Virgin Gorda (280m) are perhaps unusual locations for toads where annual rainfall averages about 17 cm per year, that could further explain rarity. Since abundant moisture is important to breeding (Rivero *et al.*, 1980), Puerto Rican sites generally receive more rainfall and thus account for a wider, and possibly more abundant, distribution than the smaller, dry regime sites of the Virgin Islands archipelago. Breeding periodicity is therefor highly dependent upon the periodicity of

heavy rainfall. In the Virgin Islands there is a bimodal peak of rainfall; April-May and September-October. During nonbreeding periods, toads may migrate to areas of cover such as under edges of large boulders, rock, or fallen trees near guts where some measure of moisture may persist.

The occurrence of such a vulnerable creature as this toad was incredulous to me because of the common presence of the Small Indian Mongoose (*Herpestes auropunctatus*) on St. John, particularly near VIERS (the College of the Virgin Islands Ecological Research Station). Indeed, Schmidt (1928) suggested the mongoose was responsible for the scarcity of the toad on Puerto Rico and that the haphazard distribution of the native "*Bufo*" among the Virgin Islands was a process of extinctions. A similar disjunct population of Virgin Islands Boa (*Epicrates monensis granti*) on St. John has also been attributed in part to the presence of mongoose (Nellis, Norton & McLean, 1983).

Population numbers of the Crested Toad on St. John may be limited by the same factors as those affecting the Puerto Rican population with the possible addition of two unreported factors. When ground water reaches the surface in deep gulleys upslope of Lameshur and Fish Bays (*pers. observ.*), pools of fresh water often harbour fairly large native crayfish. These predatory crustaceans probably achieve their rapid growth on a supplement of *Peltophryne* eggs, tadpoles, and toadlets. While I have observed tadpoles in such situations, I was unaware that they may have been anything other than *Eleutherodactylus* sp.

Another unreported threat to populations, at least in the Virgin Islands, is sand and gravel mining. Sites such as the one at Lameshur Bay are on **Cb** type soils (cobble gravel) of alluvial fans (Rivero *et al.* 1970). Colour ranges from very dark grayish brown to dark yellowish brown, sometimes reddish. Thus, the soil colour can select for cryptozoic appearance in Crested Toads. The threat for toads may be the value of the soil type since it has poor workability and drains rapidly (Rivero *et al.* 1970). This type of soil is easily recovered for building purposes and represents an unregulated source of building material. "Gut gravel and sand" was the first material of choice in small villages located near large stream beds and ocean outfalls of Tortola, B.V.I. (S.A. Bennerson, *pers. commun).* The depletion of gravel habitat on Virgin Gorda may be responsible for the reported extinction of that population since the British Virgin Islands have experienced rapid population and building growth (*pers. observ.*).

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COASTAL DEVELOPMENT IN THE MEDITERRANEAN AND THE STRIPE-NECKED TERRAPIN *(MAUREMYS CASPICA)*

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One positive outcome of the massive tourist development of the Mediterranean over the last 30 years or so has been that this region with its wealth of wildlife interest has become readily accessible to northern herpetologists (and other forms of naturalist), who may be starved of such variety in their home country and therefore thoroughly enjoy a brief sojourn in the sun with a diverse array of lizards, frogs etc. to whet their appetite. Non-herpetologist tourists sometimes get hooked during a Mediterranean holiday – they cannot help but notice e.g. the hosts of lizards scampering over walls or ruins and may continue their new-found interest upon returning home, and on balance this must be a good thing. However, it is all too easy to draw up a long list of the environmental damage that has occurred as a result of mass tourist development, many aspects of which continue to give cause for concern even in an age of increasing awareness of such issues and the strenuous efforts at all levels to reduce long-term despoliation and/or destruction.

To raise just one herpetological example of the effects of coastal development, I have come across two instances in the last three years of small, isolated and ageing populations of the Stripe-Necked Terrapin (*Mauremys caspica*) marooned in tiny water bodies in the centre of expanding villages/towns and with no further likelihood of reproduction. One of these examples is in the village of Nidri on the Ionian Greek island of Lefkas which I visited in August 1994, the other in Turunc, a coastal village in the south-western corner of Turkey, visited in August 1996. I suspect the pattern of development of these villages has been broadly similar, and probably typical of the majority of such situations all around the Mediterranean, occurring in the following manner. A coastal settlement developed in a bay, with a variable area of flat land behind drained by seasonal streams and inhabited amongst others by terrapins. The terrapins had access to exposed sand banks in which to lay their eggs, and co-existed well enough as the adjacent land was given over to agriculture. Remnants of this system can be seen behind Nidri where there are still irrigation ditches although now mostly abandoned and heavily choked with reed and unsuitable for terrapins. Turunc is still far less developed than Nidri and on a smaller scale, but without any extensive areas of wetland adjacent to the single drainage channel. As the village/town grew, so did the necessity to prevent winter flooding, or to provide suitable building land right up to the channel, and the channel was canalised with vertical concrete sides to contain the water, while the agricultural hinterland immediately inland was increasingly sold off for development. A typical situation seems to be that water ceases to flow in these small streams early in the summer but a short stretch of water remains behind a sand or gravel bar that separates the mouth of the stream from the sea, the water apparently brackish since I have seen marine fish and prawns along with the terrapins (Turunc) and, surprisingly, Green Frogs (Nidri).

The sketch map in figure 1 shows the situation in Nidri, with a remnant pool in a dip in the stream channel bed as it leads under the main road in the centre of the town. In this pool could be seen two very large female and one large male *Mauremys* only (August, 1994). They often attracted the attention of passing tourists who thronged the bridge during the evening, and it seemed to me that they were highly vulnerable to undesirable attention although I only ever witnessed healthy interest on the part of anyone who had noticed them. Plate 1 shows the seaward end of the channel, in which I did not see any terrapins, although Green Frogs were plentiful in the rank vegetation just upstream from the brackish pool as well as in the pool itself, and Grass Snakes (*Natrix natrix*) occurred. However, now that the stream sides are canalised the terrapins probably have no access to suitable egg laying sites and as far as I could tell the population no longer reproduces. The size of the three adults suggested they were of some age and it is possible that no reproduction has occurred for several years, a population indeed on the point of collapse.

Plate 1. The channel at Nidri, looking upstream from the saltwater pool at the seaward end. The base of the channel is concrete-lined, covered in places with well-vegetated coarse gravels presumably deposited by winter flow. Green Frogs and Grass Snakes could be found here, but no terrapins.

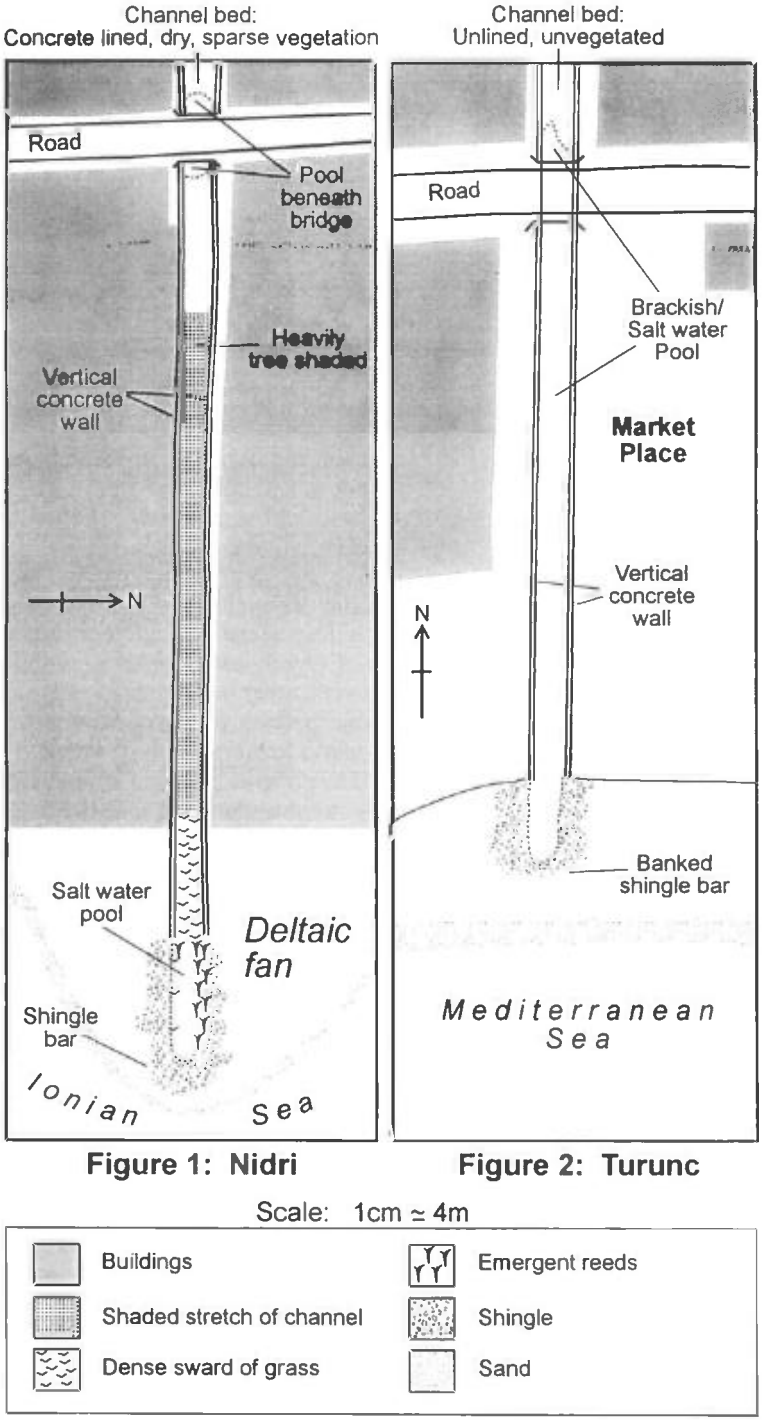

Figure 1: Nidri **Figure 2: Turunc**

Figure 1. Sketch map of drainage channel through Nidri (Lefkas, Greece)

Figure 2. Sketch map of drainage channel through Turunc (Mirmaris, Turkey)

The *Mauremys* population in the stream mouth at Turunc was larger (August, 1996). Although I was unable to make an accurate estimate the population certainly numbered over 10 individuals and may have been substantially higher, but the situation is essentially the same as at Nidri in that there is no obvious place where successful nesting may take place, except possibly the stream bed itself immediately upstream of the permanent water (figure 2). I only saw adult terrapins in this population.

The Mediterranean coastline has hundreds if not thousands of villages or towns that began in similar circumstances. No doubt any terrapin populations have long since vanished from the older and/or larger resorts, but is the situation described here repeated elsewhere where terrapins have managed to survive particular developments of their habitat but locked into a sterile, non-reproductive existence? I see no reason to suppose otherwise. Publicity about aquatic chelonian conservation in this region has centred on the marine turtles, all of which have suffered extensively and are threatened, whereas the freshwater terrapins are not, at least not to the extent of regional extinction of species. However, I suspect that at a local population level extinction is happening, partly due to the reasons described. Corbett (1989) dealt extensively with the marine turtles particularly in the eastern Mediterranean but not specifically with freshwater Chelonia, although he noted that Greece and Turkey both had urgent and pressing problems concerning the conservation of their herpetofaunas.

Mediterranean terrestrial habitats tend to decline through a well known sequence as coastal development proceeds, firstly suffering fragmentation and degradation, finally succumbing to total obliteration in the centres of towns, but any naturalist visiting such locations is quick to notice a range of plants, insects, other invertebrates and birds as well as certain lizard species that appear to maintain healthy populations in derelict sites, ruins, overgrown gardens etc. In contrast, aquatic habitats become either drained or canalised as described. If they survive at all it is to serve as drainage channels, for which some provision clearly must be made, and they are thus confined to a far greater extent even than they were pre-development. Within such unpromising boundaries it seems that even terrapins can survive, but I strongly suspect that the long term prospects for such remnant populations in these circumstances are bleak, without conservation measures being taken that would first ascertain the breeding status of any given population and then if appropriate provide suitable sites within or next to such channels for successful egg-laying and incubation.

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CAN A SALAMANDER CHANGE ITS SPOTS?

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Fire Salamanders, *Salamandra salamandra,* are very variable in body pattern. As juvenile salamanders grow so there are dramatic changes in spot patterns. Juvenile post metamorphic salamanders are often almost pure yellow in coloration, with a few black flecks. This soon changes as the size of the salamander increases. The yellow pattern breaks up to form discrete spots and stripes and these drift apart and change shape until the animal reaches adult size. It has been assumed that the body patterning of adult urodeles changes comparatively little and that these markings can be used as a means of identifying individuals eg. in the Crested Newt (Hagstrom, 1973). Whether this holds true for the Fire Salamander was tested by the authors quite by accident. In 1975 2.2 nominate race Fire Salamanders *Salamandra s. salamandra* originating from the former Yugoslavia were obtained via a herpetological supplier. These were apparently of adult size and in 1979 produced tadpoles (Wisniewski & Paull, 1986).

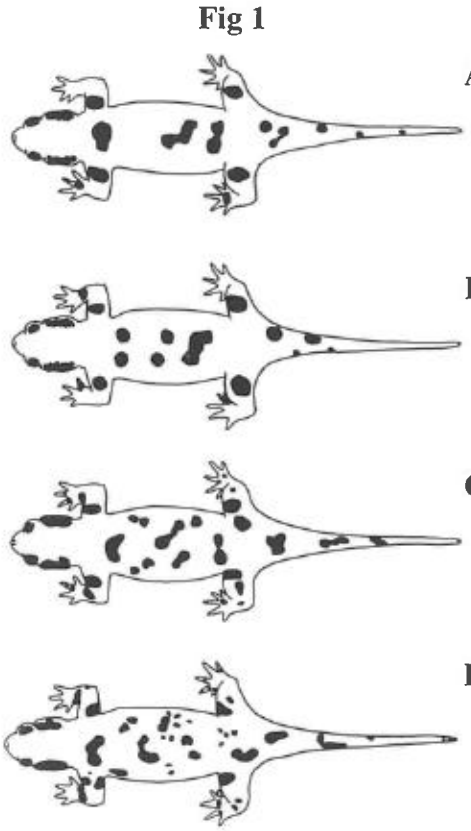

Fig 1. Body patterns recorded for two males A and B in 1982 and two young animals C, a female, and D a male in 1983.

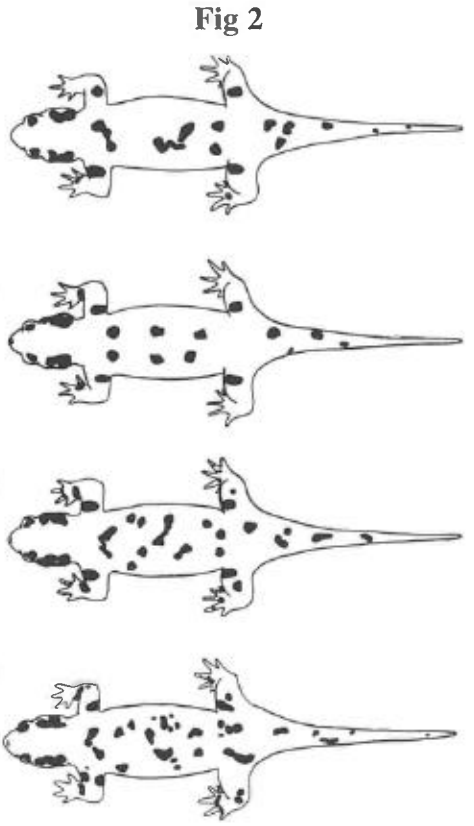

Fig. 2 Body patterns recorded for A to D in 1996.

In January 1982 the body patterns of the remaining 2.1 animals were recorded in order to distinguish them from other adult salamanders incorporated into the colony. In August 1983 the body patterns of the three remaining animals born in 1979 were recorded before they too were incorporated into the main colony (apparently at adult size).

In May 1996 the drawings were compared with the animals in the main colony. Of the original 2.1 adults the female had died but the two males were still recognisable. However, subtle changes had taken place in the extent and configuration of the yellow markings.

These changes involved the splitting and subsequent drifting or fusing of spots, relative reduction or increase in size of spots and "ghosting" or loss of spots. The latter should not be confused with the overall loss of colour sometimes seen in sick and dying animals which appear to suffer an inability to slough. No new spots appeared, at least on the dorsal surface, the only surface for which records were kept.

Splitting and drifting of spots can be clearly seen in animal A (original male) between the shoulders and mid-dorsum; in animal B (original male) on the lower dorsum and base of tail; in animal C (captive bred female) on lower dorsum and animal D (captive bred male) on mid and lower dorsum and base of tail.

Reduction of spot size can be seen in A at the base of the tail; in B on the right hind leg; in C on the parotoids and hind legs and D on the left foot and hind legs.

Increase of spot size can be seen in A on the right side of the lower dorsum.

"Ghosting" or loss of spots can be seen in A on the right side of the mid-dorsum, left front foot, right hind toes and tip of tail; in B on the hind toes and in C on the left hind toes.
Fusion of spots occurred in A on the lower dorsum.

In addition, the shoulder spot of D had taken on a very different form to the oval spot observed in 1983, possibly prior to splitting.

These results indicate that in the spotted forms of the Fire Salamander body patterns change relatively little over a period of twelve years or so, though changes do indeed occur. Individual animals can still be recognised. However in the striped forms of Fire Salamander breaking up of the pattern might present a more severe handicap to individual recognition.

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GECKO PREDATION BY SKINK OBSERVED IN TANZANIA

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An arboreal skink *Mabuya striata striata* (the Common Striped Skink) on the trunk of a tree by the waterfront of Tanzania's main port and capital, Dar-es-Salaam, was observed in morning sunshine (08h30LMT) by CFD (14 May 1997) to hunt-down and eat a diurnal Dwarf Gecko *Lygodactylus luteopicturatus luteopicturatus* (the Yellow-Head Dwarf Gecko). The trunk surface was uneven with cracks and crevices, and holes providing refuge for the lizards. The skink sighted the gecko near the base of the tree, and, with tail twitching from side to side, moved down the trunk to give chase. The gecko saw the skink, and promptly moved round and down to the other side of the trunk. The skink continued its way down and around the trunk in the opposite direction, having lost sight of the gecko. However, after searching for a minute or two, it suddenly moved at speed, and emerged on the other side of the trunk with the struggling gecko transversely positioned in its jaws. The skink came briefly to a halt, and then ran up the tree and disappeared from view, presumably to ingest the gecko undisturbed, and out of danger itself from predation.

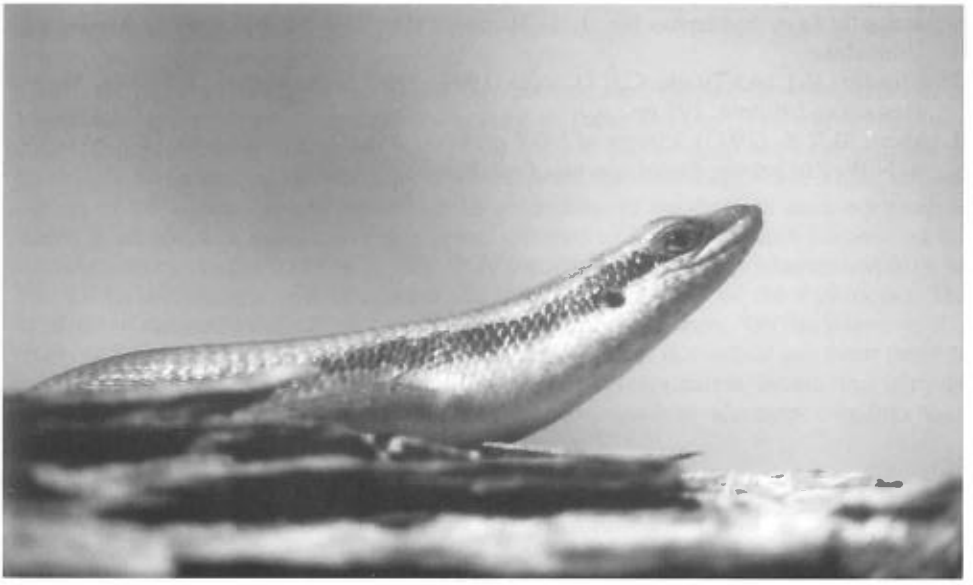

Plate 1. *Mabuya striata wahlbergii* – Whalberg's Striped Skink (snout-vent length 7 cm) basking in morning sunshine (10h00) on trunk of mopane tree, near Siabuwa (Matabeleland North), Zimbabwe (21 May 1989) Photo: MRKL

In N.W. Zimbabwe, Lambert (1993) observed that sighting rates (no. man-h^{-1}) and percent frequency of the arboreal skink *Mabuya striata wahlbergii* (Wahlberg's Striped Skink) in mopane woodland declined significantly with increasing numbers of annual DDT treatments against Tsetse Flies – Tsetse resting sites on trunks were ground-sprayed up to 3 m above the ground (160-250 g ha^{-1}). Conversely, percent frequency increased significantly with number of treatments, and sighting rates rose in the diurnal Dwarf Gecko *Lygodactylus chobiensis* (Chobe Dwarf Gecko) – lizard nomenclature after Broadley (1988). The decrease in numbers of *M. s. wahlbergii*, which is probably territorial, was attributed to an increase in whole body DDT residue levels in relation to number of treatments. The numerical increase of *L. chobiensis* was attributed to reduced competition from *M. s. wahlbergii*, which also primarily depended on epigeal insect prey (Douthwaite & Tingle, 1994), frequenting trunk surfaces, that would have had DDT-contaminated particles adhering to their bodies. *Lygodactylus chobiensis*, on the other hand, depends more on termites as prey (Branch, 1988) which are sub-surface dwelling and therefore less exposed to contamination. Although neither of these lizards occurs in Tanzania (Broadley and Howell, 1991), the observation of predation by the closely related *M. s. striata* on the smaller *Lygodactylus l. luteopicturatus* belonging to the same genus suggests that direct predation, in addition to competition for refuges, may also explain why the number of *L. chobiensis* rose with *M. s. wahlbergii's* decline, notwithstanding the different invertebrate prey ingested by the two species in Zimbabwean woodland.

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ON *EUPROCTUS PLATYCEPHALUS*

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Euproctus platycephalus has recently been included on the critically endangered list. The reasons that have been given for the decline have been many and varied but appear to be speculative. It has been well established for a very long time now that in the Pyrenees *Euproctus asper* does not occur where trout are present in the same streams. Nothing else appears to have such a dramatic effect on the local distribution of *Euproctus asper.* Similarly it would be expected that *Euproctus platycephalus* would not survive where trout are present.

Trout are now present in at least some of the Sardinian mountain streams. Have local Sardinians recently taken to the introduction of trout for fishing purposes? The structure of the Sardinian river system is such that a few very long rivers are fed by a large number of smaller tributories. Trout present in any of these tributories will have easy access to the other streams via the main river and could spread quite quickly. Adult *Euproctus platycephalus* are quite large and produce noxious skin secretions, both of which give them some protection against predators, but *Euproctus* tadpoles have no such protection. A population of *Euproctus* which has been subjected to predation by trout would show a distribution of individual sizes skewed towards the larger sizes as the tadpoles and smaller individuals are moved from the population. Any study of the size of individuals in a population subject to predation by trout should show this skewed form. Unless the trout are removed such a population would age and eventually become extinct when the oldest individuals die.

Under the international agreements and conventions alien species are to be kept out of participating territories. Trout do not belong in these streams. The *Euproctus* have evolved over many millions of years in an ancient relationship with the streams of Sardinia into an unique species quite different from the other *Euproctus.* These streams belong to the *Euproctus* and should not be given over to trout which have not evolved there. It would be a disgrace if they were allowed to become extinct because of the introduction by man of some alien fish. Only the removal of these predatory fish from all the Sardinian streams will guarantee the long-term survival of the *Euproctus.* The creation of the new national park will do nothing to protect them. On the contrary, it is likely to have an adverse effect in that officials may claim that action has been taken to protect the *Euproctus* when in fact it has not. The responsible authorities may be reminded of their international obligations not to introduce alien species into their territory.

BOOK REVIEWS

***A Tale of Old Serpents.* Garth Underwood, with a companion article by Robert J. Devaux O.B.E., *The Extermination of the Cribo in Saint Lucia.* Published by the St. Lucia National Trust, P.O. Box 595, Castries, Saint Lucia, West Indies, 1995. 29 pp., line drawings, black and white photographs, 3 tables (appendices). $EC 9.00. P/b ISBN 976-8052-62-7.**

In this interesting little booklet the authors chronicle the recent discovery, and apparent extinction in the late 19th century, of the St. Lucia Island Cribo *(Clelia errabunda)*. This previously unrecognised species of snake was formally described by Underwood in 1993 on the basis of four preserved museum specimens, all of which were collected more than a hundred years ago. The saga that unfolds not only demonstrates the value and importance of carefully maintained taxonomic collections, but serves as a sobering reminder of how a species can vanish at the hands of man before it has even been 'unearthed' by science.

The text is divided into two complementary parts; the first is a tale of diligent detective work in which Underwood provides historical information on the specimens of *C. errabunda*, and a summary of how the new species differs from its congeners. One of the specimens (illustrated) is remarkable in that it seems to have been captured, killed, and preserved in the act of swallowing a *Bothrops caribbaeus* (herpetologists will know that the first reaction of a snake disturbed while swallowing its prey is to disgorge it). There then follows some well-grounded speculation on how the ancestral form of *C. errabunda* might have arrived from the mainland and established itself on the island.

In the second part, Devaux recounts the blundering 'experiments' designed to eradicate the venomous St. Lucian Fer-de-Lance *(Bothrops caribbaeus)*, but which instead lead to the demise and eventual extermination of the Cribo, its natural predator! First among these was the implementation of a bounty system, which resulted in the indiscriminate killing of all (at that time five) native snakes, followed by the mass introduction of the mongoose. The mongoose in particular was to become directly responsible for the extinction of several other endemic animals, and continues to wreak havoc by attacking domestic poultry. Ironically, the Fer-de-Lance appears to have returned to its former numbers and, in parts of the island, is said to be 'abundant beyond belief' (Lazell, 1964).

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Peter J. Stafford

***Captive Husbandry and Propagation of the Boa Constrictors and Related Boas* by David Fogel. Hardback, 98 pages, illustrated with 60 colour plates, plus monochrome. Krieger Publishing Company. ISBN 0-89404-921-3 UK price approx £35.**

With the increasing sophistication of literature intended for the serious, amateur herpetologist there is an increasing demand for definitive books that can supply all the relevant information within increasingly narrow fields. To some extent this market is being satisfied by the plethora of booklets that have appeared of late but there is still a need for a solid, reliable guide that offers more than the continual re-issue of what should be common knowledge. This book falls precisely into this category, the author has identified a taxon that is popular, glamorous and diverse and produced a well researched authoritative – and readable guide. The bias of the book is slightly unusual but refreshing as it is clearly intended for the snake-keeper, for instance after an introductory chapter on the taxonomy of the sub-order (mercifully free of yet another discourse on Linnaeus and his cunning idea) the following chapter, on husbandry, commences with "designing a snake room!" no half measures here. The information presented here is excellent but written from the American viewpoint so some of the equipment described may have no European counterparts; in some cases it is superseded by technology regularly used on this side of the Atlantic.

A section of 60 colour plates then follows covering some 41 forms, disappointingly not all of the subspecies of Boa constrictor are illustrated; however "trade" names such as Surinam, Peru and Hogg Island are shown. Similarly only three of the Rainbow boas subspecies are illustrated. However some very unusual forms are depicted including Tropidophus and Trachyboa species.

Krieger seem to have relegated the word "chapter" into oblivion, consequently the next "section" is dedicated to a general account of boa reproduction. Specific information is supplied in the species accounts. A table, reproduced from Ross and Marzec's book, lists the probe depth for sex-determination for over 40 different forms; this is accompanied by colour plates illustrating the technique but these are inadequate for the purpose and would have benefitted from line drawings. Bizarrely the plates are reproduced on opposing pages in muddy, monochrome pictures. The same production fault occurs on the subsequent page.

The author states his intention in the taxonomy chapter, not to confuse the reader with the recent, and probably contentious, revisions in the Boinae and has persisted with widely accepted names. Paradoxically the earlier book from Krieger by Stafford and Henderson, took the opposite stance and had, for instance, *Corallus enydris* redefined as *hortulanus*. The section devoted to the species accounts occupies some 40 pages and is divided into geographic groupings, eg Central and South American boas, Madagascan and African, Pacific and finally North American boas.

There is a very extensive list of references plus indices to common names (and subjects) plus scientific names.

This is an impressive albeit slim book. It offers in a very practical and efficient manner exactly the information the title promises. It is a highly useful production and I commend to it to any snake enthusiast.

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David Blatchford

***The Question & Answers Manual of Reptiles and Amphibians* by Robert & Valerie Davies, 208 pp. London: Salamander, 1997. ISBN 0 86101 943 1**

This book is a *must* for anyone interested in the keeping of reptiles and amphibians. The authors' combined 70 years' experience in keeping and breeding these fascinating animals has been used to provide the reader with a book that not only caters for the absolute beginner, but would be a valuable addition to an experienced herpetologist's library.

The book is divided into colour coded sections; the first being *Starting Out* (5 pp), where you learn the considerations needed before embarking on keeping "herps" [reptiles and amphibians], and includes *legal aspects* and *selecting stock*. Then follow chapters on *Reptile Care* (35 pp), *Reptile Species* (89 pp), *Amphibian Care* (21 pp), and *Amphibian Species* (38 pp). They deal comprehensively with keeping and breeding a wide range of herptiles suitable for amateurs. Large pythons, monitor lizards and crocodilians are omitted, as the authors rightly state that they "tend to be subject to much stricter regulation", these species being "for experts only". The *Care* sections deal with *What is a reptile/amphibian, Housing – the Vivarium, Heating, Lighting and Humidity, Furnishing the Vivarium, Foods and Feeding, Breeding* and *Health and Disease*. Every aspect of general care is covered so the reader would feel able to provide the conditions needed to keep a reptile or amphibian in perfect health in a variety of habitats. In the sections on species, specific information is also given on *ease of keeping, winter cooling,* and *incubation of eggs* on a range of species of reptiles from Water Dragons to Musk turtles; and amphibians from True Toads to Newts and Salamanders. These, and other details are given in useful columns highlighted in blue throughout the species sections. The attention to detail in the confines of a relatively small book is excellent with dozens of species covered, with comprehensive notes on their husbandry.

There are also sections on *Herptiles and the Law* – particularly important when many species, such as tortoises, are considered endangered and are subject to legislation; a comprehensive *Glossary; Further Reading* and *Useful Addresses.*

There are two aspects of this book I would especially like to highlight. Firstly there are the many stunning photographs. The Strawberry Arrow-poison Frog *(Dendrobates pumilio)* just about leaps off the page (p 166) and the blue Panther Chameleon *(Chamaeleo pardalis)* from Nosy Bé, (Madagascar), looks out of this world (p 59). The startlingly vivid picture of a gravid female chameleon *(Chamaeleo minor)* is testament to the fact that chameleons don't need to be put on a tartan rug to produce bizarre colouring (p 12). She is just using it to "repel amorous males". Secondly, there are the superb

Question and Answer sections which give the book its title. In the *Introduction*, the authors state that these are questions they have been asked or have asked themselves over the years. It seems every question one could possibly need to ask has been thought of, and such insight can only have been developed by years of experience in keeping and breeding many different species [although I would like to challenge the view that a Tokay "will barely break the human skin" (p 75) when biting. My adult male can draw blood through leather gardening gloves!] This book will be an excellent substitute for those people who are not so fortunate as to be able to discuss their hobby with experts and it would grace the book shelves of any lover of reptiles and amphibians. Armed with the knowledge it provides, a budding herpetologist could easily set up a little piece of desert or rain forest in his or her own living room.

A W Darby

BRITISH HERPETOLOGICAL SOCIETY
50th ANNIVERSARY MEETING

Huddersfield Technical College, October 25, 1997

Report by Roger Meek

Huddersfield Technical College was the venue for one of a series of regional meetings to commemorate the founding of the British Herpetological Society fifty years ago. Approximately thirty-five delegates attended the meeting to hear talks by five speakers on a range of herpetological topics. Delegates travelled from a wide area including Aberdeen in Scotland. Also in attendance were several local veterinary surgeons and John Avison, the environment officer from the pharmaceutical giant Zeneca. After a brief welcome to the college by Martyn Dunn, one of the college tutors, Roger Avery, BHS President, welcomed the delegates on behalf of the British Herpetological Society. Roger Avery, who chaired the meeting, then introduced the speakers.

John Baxter

John Baxter, a veterinary surgeon from Leeds, is well known for his television appearances including his own series 'It's a vet's life'. Burns, mouth canker and viral papilomas are just a few of the reptilian ailments he is presented with as a practising vet. He drew attention to the particular problem of anaesthesia in reptiles since a wide range of dosage levels are often recommended in text books. Preventative medicine by researching each species' natural history and designing a captive environment that takes such factors into account should always be a priority before purchasing reptiles. Maintenance of healthy stock can be assisted by minimal handling of animals which reduces stress.

John Baxter's particular area of interest in medicine is cryosurgery – the use of very low temperatures to remove unwanted tissue. Using a series of slides he described how the process works and showed some examples of its use in both reptiles (see Baxter & Meek, 1988) and mammals. He pointed out however that more research is needed before we have any real understanding of the response of reptilian tissue to the technique, particularly in the way that blood flow mechanisms respond to the ice ball. Finally he suggested close co-operation between herpetologists and vets to keep reptile health problems to a minimum.

Patrick Wisniewski

Patrick Wisniewski, from the Wildfowl and Wetlands Trust at Martine Mere in Lancashire then took the stand. Patrick has specialised for many years in the husbandry of a large range of amphibians. However, at the meeting he concentrated on relating his experiences with the tailed amphibians. A description of several little known forms was given and some of the difficulties in understanding their reproductive behaviour discussed. Although amphibian behaviour has been studied for many years he pointed out that we still have much to learn about many aspects of amphibian life history and captive husbandry. Attention was drawn to the numerous species inappropriately imported by the pet trade which are impossible to breed. Several slides of little known *Triturus* were shown, these he has managed to breed.

Patrick Wisniewski's continuing enthusiasm for the subject became immediately apparent at question time when he gave details of the amount of time he devotes to maintaining his large collection of amphibians.

Donna Thornton and Roger Meek

The next lecture was a contribution from representatives of Huddersfield Technical College, Donna Thornton, a second year National Diploma student and Roger Meek. They began by describing the herpetological unit at the college, the breeding success of the species housed there, and the herpetological research projects being undertaken by other students. They then went on to give details of the preliminary results of their own research, thermoregulatory behaviour and spacing patterns in the Asian Water Dragon *Physignathus cocincinnus*. Found over a large area in south east Asia *Physignathus* is a medium sized agamid lizard of around 0.5 Kg adult body mass.

Although much of the information on reptilian thermal biology concerns lizards, relatively few studies have examined lizards of this size range from tropical environments. The work has been carried out in the large tropical enclosure at the college's herpetological unit which simulates closely the natural environment of this species in south east Asia. A non-invasive infra-red detector is used to measure body temperatures allowing undisturbed behaviour patterns in the animals.

One aspect of the research involves measuring the temperatures of models of *Physignathus* and comparing them with those of real lizards (the null hypothesis). This method is a test for evidence of thermoregulation and preliminary results in combination with regression analysis indicates control of body temperature. They described (using a series of slides and graphs) different aspects of behavioural thermoregulation in different types of weather. Sexual differences in vertical and horizontal movement behaviour were indicated and possible reasons for this discussed.

Much of the thermoregulatory behaviour of *Physignathus* appears to be concerned with avoiding excessive heat loads and thermoregulatory strategies have evolved which satisfy this requirement in addition to other ecological constraints. Little is currently known about any aspect of the biology of *Physignathus* despite its occurrence in the pet trade.

Plate 1
Two of the speakers at the meeting Donna Thornton and John Baxter pose, with friendly reptiles, for photographs while being interviewed by a local newspaper in the tropical enclosure at the college's Herpetological Unit

Dr Roger Avery

The last speaker, Dr Roger Avery from the University of Bristol is well known for his research on lizards. His talk described aspects of lizard thermoregulatory behaviour from a different perspective to that of the previous speakers – the problems of small lizards heating up in a temperate climate. He began by showing how thermography – basically temperatures transformed into coloured images, can be used to investigate the thermal relations of lizards (see Avery & D'Eath, 1986). Roger then went on to talk about the parietal eye in lizards. This organ is believed to be involved in lizard thermoregulation but nevertheless it is an example of something that we know very little about.

Habitat selection was discussed next with particular reference to the Common Lizard (*Lacerta vivipara*). In a series of slides, different areas with different densities of Common Lizards were shown. Undisturbed habitat often had the highest densities, although habitats adjacent to one another but with different structural complexities could have quite different densities.

Roger Avery concluded his talk by describing his work on Green Lizards (*Lacerta viridis*) and Wall Lizards (*Podarcis muralis*) on Jersey. Estimating their numbers was a major consideration and the method of achieving this by counting lizard droppings was described. Green Lizards were found to be reasonably abundant but Wall Lizards more limited in their distribution and their numbers lower.

During the lunch break, Huddersfield Technical College ran a minibus service between the main college and the Taylor Hill Annexe. This enabled delegates to view the herpetological unit including its new simulated desert environment housing desert reptiles and plants. They were met there by reporters and photographers from two local newspapers who reported the event (Plate 1).

Mike Naden, head of the Animal Care Unit at Huddersfield Technical College, briefly took the stand at the beginning of the afternoon session when he announced plans for a course in herpetology. This will take place at the college's herpetological unit beginning early 1998. He also announced plans for a joint venture between the Animal Care Unit and Zeneca to create a series of large ponds for native British amphibians and other wildlife. This will eventually provide a basis for student ecology projects.

The day's proceedings were concluded with a question and answer session when all the speakers took the podium. Following this Roger Avery closed the meeting by thanking the college for its support, in particular two of its staff, Martyn Dunn and Robert Nicholls, for their efforts in organising the event.

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The **Herpetological Association of Africa** is dedicated to the study and conservation of African reptiles and amphibians. Members receive two issues of the journal, *African Journal of Herpetology* ISSN 0441-6651 (review papers, research articles, short communications, book reviews) and two newsletters, *African Herp News* ISSN 1017-6187 (short articles, life history, distribution and snakebite notes, bibliographics, husbandry hints, announcements *etc.*) per year. Both English and French language contributions, especially those dealing with African reptiles and amphibians, will be considered for publication in the journal.

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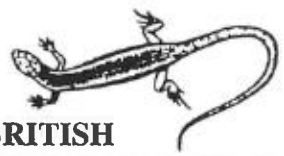

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