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BULLETIN

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THE BRITISH HERPETOLOGICAL SOCIETY

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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 and, among other activities, are invited to participate in an annual "camp" arranged in an area of outstanding herpetological interest.

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. 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
All adult subscriptions become due on the first day of January each year. Payment by Banker's Order is much preferred.

Ordinary Members	£20	(Receive Bulletin only)
Full Members	£25	(Receive Bulletin and Journal)
Family Members	£30/£37.50	(Without/with Journal) Family members with children also receive the YHC Newsletter
Student Members	£18	(Receive Bulletin and Journal)
Institutional rates	£36	(Receive Bulletin and Journal)
YHC (Age 9-18):		
Basic Membership	£6	
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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) EXCEPT for YHC matters. YHC Membership and renewal details are available from the Education Officer (address on inside of back cover). 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
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FRONT COVER
The Golden Tree Frog *(Phyllodytes auratus)*. *See* article on page 3 by Clarke, Ward & Downie.

BRITISH HERPETOLOGICAL SOCIETY MEETINGS FOR 1996

Meetings are usually held at Birkbeck College, Malet Street, London WC1, unless otherwise stated

Early February	Herp Recorders Meeting (HRM). Probably in Edinburgh. Details on separate leaflet.
March 16th	Annual General Meeting 12.30-5 pm. Birkbeck College London. Business meeting with two speakers: (a) Dr Susan Evans, University College London: "Origin, evolution and diversification of lizards". (b) to be arranged.
March 30th	London Zoo. A joint event with London Zoo's Explorers Club. An amazing day of celebrity lectures, special displays and tours behind-the-scenes in the Reptile House. FREE entry to Zoo for YHC members with tickets in advance. Booking ESSENTIAL. Contact the BHS Education Officer on 01202-692378 any Sunday between 7 pm - 10 pm for full details.
May 4/5th	Conservation & Education event in Jersey. There will be a chance to visit Jersey Zoo with a guided tour around the reptile department, and visits to areas of herpetological interest on the island. Details will follow in a flier.
Mid May	Visit to Beam Brook – details to follow.
May 25th	Captive Breeding meeting – Birbeck College: Terry Thatcher – Temperate and Tropical Reptiles and Amphibians in captivity.
July 20th	Captive Breeding meeting – Birkbeck College: Pat Wisniewski – Captive Care of Amphibians/Barry Pomfret – Nutrition in Captive Breeding.
October 12th	Captive Breeding meeting – Venue to be arranged: joint meeting with Milton Keynes H.S.: Stephen Divers – Captive Care of the Green Iguana.
October 26th	Autumn General Meeting. Birkbeck College London. (a) Prof. J. Davenport, Isle of Cumbrae, Scotland: "Intertidal Madeiran lizards – miniature marine iguanas". (b) Dr M.R.K. Lambert, National Resources Institute, Kent: "Herpetofauna as bioindicators to assess environmental impact of a pesticide spill in Somaliland".
November 9th	Captive Breeding Open Day – New Denham.
December 7th	Research meeting – Birkbeck College.

BHS NORTH WEST MEETINGS 1996

February 13th	'Reptiles and Amphibians of the Mediterranean Islands' – Richard Dutton. Includes North West AGM.
April 16th	'India' – Katie Hampson and Allan Guy.
June 11th	Yet to be decided.
August 3/4th	Reptile Rally at Wildfowl and Westlands Centre, Martin Mere, 10.00 - 5.00 pm.
October 8th	Yet to be decided.
December 3rd	Christmas Social

All meetings commence at 8.00 pm except where stated and are all held at Wildfowl and Wetlands Centre, Martin Mere, Burscough, Lancs. Tel: 01704 895181.

TERMS OF REFERENCE FOR THE BHS TRADE OFFICER

AIMS

1. To represent the BHS on matters of trade in reptiles and amphibians or their products and the consequences of such trade.
2. To put the BHS case for change when matters are judged to be less than satisfactory.
3. To canvass the views of others on matters of reptile and amphibian trade and its consequences.

ACTIVITIES

1. The Trade Officer will be briefed by Council or by policy approved of by the membership to define the position from which he/she may act.
2. Comments may be made to third parties on behalf of BHS relating to general policy. Where particular topics or positions are involved, the BHS position shall be sought prior to any release or expression.
3. The Trade Officer shall remain current with developments and provide information when requested.
4. Where necessary the Trade officer shall advise the Society of developments and changes in matters affecting trade in reptiles and amphibians.
5. Activity relating to trade shall be conducted following consultation with the Trade Officer.
6. The Trade Officer will investigate the trade in reptiles and amphibians with respect to animal welfare standards and conservation legislation.

POLICY

1. The BHS policy on trade is published in the Bulletin and this shall form the basis of any BHS activity.
2. The Trade Officer shall provide a lead in any development related to trade on behalf of the Society.

RESPONSIBILITY

1. The Trade Officer shall be an elected member of the Council.
2. The Trade Officer shall report to Council at Council meetings and to the membership in an annual report.
3. The Trade Officer will be entitled to claim expenses from the Society for monies spent in the course of conducting BHS business, at levels to be determined by Council.

REPRESENTATION ON BEHALF OF THE SOCIETY

Following the "BHS policy on animals in captivity, trade and legislation" first published in Bulletin No. 36, p6, 1991, Council has now established a Working Group on Legislative Issues. The terms of reference of this Working Group are as follows:

1. The Working Group will consist of Chairmen, or their nominated representatives, from each of the four committees (Captive Breeding, Conservation, Education and Research) and the Trade Officer.
2. Any request for advice from BHS on matters pertaining to legislation, or any initiatives from BHS concerning legislation, must be discussed and agreed beforehand by the Working Group.
3. These deliberations may be done quickly, since responses are often sought under short deadlines, and can be by telephone without reference to the full individual committees if deadlines make such proper consultation impractical. Any such advice will nevertheless be discussed subsequently by the committee and, if necessary, by Council.
4. In the event of the Working Group failing to agree unanimously, the issue in question must be brought to Council before any advice is given on behalf of BHS even if this means missing the nominated deadline.

FACTORS AFFECTING THE DISTRIBUTION AND STATUS OF THE GOLDEN TREE FROG, *PHYLLODYTES AURATUS*, IN TRINIDAD

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SUMMARY

This study estimates a population of around 20,000 bromeliad-dwelling Golden Tree Frogs on one peak, El Tucuche, with another less defined population on Cerro del Aripo, but probably no other population of this frog in the world. The frogs and their tadpoles were found in only one species of large 'tank' bromeliad. Tank water volume was the major limiting factor, but another large bromeliad species contained no frogs, possibly due to competition with crabs. Efforts to open up paths to the two summits give cause for concern and make a conservation strategy essential.

INTRODUCTION

The Golden Tree Frog, *Phyllodytes auratus* (Boulenger) is a bromeliad-dwelling hylid deriving its common name from two longitudinal dorsal iridescent gold stripes. *P. auruatus* was discovered by F.W. Ulrich during an exploration of Trinidad's second highest peak, El Tucuche. Originally named *Amphodus auratus* (Boulenger, 1917), Bokerman (1966) found that *Phyllodytes* (Wagler, 1830) is an earlier name for the genus. *Phyllodytes* so far comprises only seven species, all bomeliad-dwellers, six located in Eastern Brazil (Caramaschi *et al.*, 1992), several thousand kilometres distant from *P. auratus*. Murphy and Humbert (1982) have suggested that climate change may account for this discontinuous distribution.

The Golden Tree Frog has previously been reported from only two locations in Trinidad, El Tucuche (Kenny, 1969) and the highest mountain, Cerro del Aripo (Read, 1982), and from only one species of bromeliad, the large epiphytic *Glomeropitcairnia erectiflora*. This bromeliad also occurs on the Paria peninsula of Venezuela, but *P. auratus* has not been found there. The frog may therefore be a Trinidad endemic. Given the frog's extremely restricted distribution, the Wildlife Section of the Trinidad Government was keen for a study to be made of its status. The work reported here was carried out in collaboration with the Wildlife Section on two successive University of Glasgow expeditions in 1993 and 1994.

METHODS

Study Sites

Trinidad's Northern Range is an extension of the coastal Cordillera of Venezuela. Although the average elevation of the main ridge is only 600m, two peaks exceed 900m (Cerro del Aripo, 940m; El Tucuche, 937m) and two others exceed 800m (Chaguaramal and Morne Blue).

Beard (1946) found that at around 800m a transition to true montane rainforest occurs in the Northern Range, the precise elevation of the transition depending on local climatic factors. A further transition to 'elfin woodland' occurs above 800m on Cerro del Aripo. Beard reported *G. erectiflora* from the montane forest of El Tucuche, Cerro del Aripo and Chaguaramal, but not from Morne Blue. Our group climbed all four peaks, initially with the help of local guides. Work on El Tucuche included several overnight watches.

Bromeliad sampling

It is unfortunately not possible to sample *P. auratus* without destroying its habitat. The frogs are dorso-ventrally flattened and seem to spend the daylight hours compressed between the bases of leaves deep inside bromeliads. The tadpole stage is spent in the water held within the bromeliad 'tank'.

Given the conservation-sensitive nature of this study, it was agreed with the Wildlife Section that only bromeliads growing on fallen trees would be sampled on El Tucuche, a nature reserve. Bromeliads were identified by means of Smith and Pittendrigh's (1967) key. All reasonable sized bromeliads, irrespective of species, were sampled, in order to investigate the habitat preferences of *P. auratus*.

For each bromeliad, the following measurements were made on the intact plant: water pH and temperature; base circumference and longest leaf length. A large plastic bag was then placed over the plant, which was cut from its branch and then emptied into the bag. Leaves were stripped individually from the plant to check for frogs, tadpoles and invertebrates. Frogs and tadpoles were identified, measured and released into suitable-sized bromeliads of the same species. Larger invertebrates were counted and preserved for later identification. Water volume was measured with a measuring cylinder.

Bromeliad and frog population estimate

Bromeliad numbers on El Tucuche were estimated from 18 5x5m quadrats located along the main ridge from 780-910m elevation. An estimate of the *P. auratus* population on El Tucuche was then made via an extrapolation from the proportion of opened bromeliads found to contain *P. auratus*.

RESULTS

El Tucuche

The summit of El Tucuche was cleared many years ago as a helicopter landing pad by the United States Army: little forest regeneration has occurred since and this 150m^2 area is covered in short grass. The surrounding ridges and slopes are densely vegetated and epiphytic bromeliads are abundant, especially *G. erectiflora* and *Tillandsia* spp.

Table 1

Comparison of characteristics of *G. erectiflora* and *Tillandsia* sp. samples on El Tucuche. Data given as means ± SD, numbers in brackets

Bromeliad feature	*G. erectiflora*	*Tillandsia*
Base circumference (cm)	44.8 ± 25.2 (20)	14.6 ± 6.0 (25)
Water content (ml)	697.9 ± 771.7 (2)	8.8 ± 15.4 (14)
pH of water	5.7 ± 0.8 (13)	5.4 ± 0.6 (5)
% Containing *P. auratus* adult	23	0
% Containing *P. auratus* tadpoles	15	0
% Containing *Flectonotus*	20	11.5

Data on sampled *G. erectiflora* and *Tillandsia* are shown in Table 1. *P. auratus* was found only in *G. erectiflora* and never in *Tillandsia*, though another Trinidadian bromeliad-dwelling frog *Flectonotus fitzgeraldi* occurred in both. The main difference between the two kinds of bromeliad was in size, particularly in tank volume. No *Tillandsia* contained as much as 70ml water, whereas 9 out of 20 *G. erectiflora* contained over 500ml. When *G. erectiflora* containing *P. auratus* adults were compared with those not containing *P. auratus*, the only significant difference was in water volume and not in pH or in measures of bromeliad size (Table 2).

Table 2

Comparison between characteristics of *G. erectiflora* on El Tucuche containing or not containing *P. auratus*. Data given as mean ± SD, number in brackets. Significance measured by t tests.

	P. auratus		
Bromeliad feature	Present	Absent	Significance
Base circumference (cm)	58.9 ± 26.3 (6)	38.2 ± 23.0 (20)	N.S.
Longest leaf (cm)	59.8 ± 10.2 (6)	52.6 ± 19.5 (20)	N.S.
Water content (ml)	1368.1 ± 913.1 (6)	429.8 ± 532.4 (16)	P<0.01
Water pH	5.5 ± 0.8 (5)	5.5 ± 0.8 (11)	N.S.

The quadrat analysis gave a *G. erectiflora* density of 8.72/25m^2 over an area of approximately 259 x 10^3 m^2. Extrapolating from our finding of 6 *P. auratus* from 27 bromeliads gives a population estimate of 19,878 individuals. Using methods in Fowler and Cohen (1990) upper and lower population limits are 29,476 and 13,418 respectively.

Cerro del Aripo

When we first climbed Cerro del Aripo in 1993, a large area of forest at the summit (which is relatively flat) had recently been felled, with all the cut vegetation left in place. On our next visit in 1994, we were even more disturbed to find that the previously difficult path had been cleared and widened, making access to the summit of this peak quite straightforward.

From 5 *G. erectriflora* sampled in 1993, we found 3 containing *P. auratus* adults and/or tadpoles. Although *G. erectiflora* density seemed lower on Cerro del Aripo than on El Tucuche, the total number of bromeliads may be larger, since the area available at a high enough elevation is greater on this peak.

On Cerro del Aripo, a second large bromeliad species occurs, *Vriesia glutinosa*. These were sampled, along with additional *G. erectiflora* in 1994. *Vriesia* had significantly longer leaves, but in all other parameters, *V. glutinosa* did not differ from *G. erectiflora*. However, although we found *P. auratus* in three out of eight *G. erectiflora* on Cerro del Aripo, we found no *P. auratus* in the eight *V. glutinosa* we opened, nor did we find any *F. fitzgeraldi* in this bromeliad species.

Because of the treacherous conditions created by the tree-felling, we were unable to attempt a population estimate either of *G. erectiflora* or of Golden Tree Frogs on Cerro del Aripo.

Chaguaramal
We found that a dirt road has been opened up to within 50m of the summit and that about half the area of the summit is now under cultivation. Much of the remaining forest is secondary and, although bromeliads were seen on the trees, there were no signs of either *G. erectiflora* or *V. glutinosa*. If *P. auratus* was present in the *G. erectiflora* noted by Beard as growing on this peak in 1946, it is presumably now extinct here.

Morne Blue
We found that although there are settlements of people close to the summit of this mountain, the forest seems undisturbed. However, as Beard (1946) noted, it is lower montane forest in character, and we saw no evidence of the large tank bromeliads found on El Tucuche and Cerro del Aripo.

***P. auratus* – adults and tadpoles**
Table 3 shows the association between all adults and tadpoles found. We only once found two frogs together and in nearly every case, frogs were found along with tadpoles. We were unable to determine the sexes of the adult frogs. Tadpole numbers per tank were small (1-6). This was not, we think, because these were the remnants from a larger clutch, most of which had metamorphosed, since we found tadpoles at a wide range of developmental stages.

Table 3
Association between tank water volume, number of frogs and number of tadpoles: complete data on *P. auratus*.

Water volume (ml)	No. of adult frogs	No. of tadpoles
706	1	0
1117	1	2
571	1	1
1124	1	0
1617	1	6
3074	1	1
3465	2	3
210	1	0
2210	0	1

Invertebrates
A rich fauna of invertebrates was recorded from the large tank bromeliads, including insects, myriapods, oligochaetes, arachnids and crustaceans (see Clark & Ward, 1995 for a complete list). Most were detritus feeders. The only significant difference between the faunas of *V. glutinosa* and *G. erectiflora* was the presence in the former and total absence from the latter of plentiful numbers (more than five per bromeliad) of a brachyuran crab. Using Chace and Hobbs's (1969) key, these could be *Pseudothelphusa garmani*, the Trinidad Forest Crab, which is abundant in the island's upland forest. However, this species can attain a carapace width of 8 cm (much too big to live in bromeliad tanks) and has not previously been recorded from bromeliads. Julius Boos (personal communication) believes from an examination of our specimens that they are most probably juvenile *P. garmani*. The crabs we found are not either *Metopaulias depressus*, the Jamaican Bromeliad Crab nor a member of the genus *Sesarma*, one of the few crab genera known to contain some permanent bromeliad-dwellers (Abele, 1972).

Plate 1. Golden Tree Frog on bromeliad leaf

Plate 2. Bromeliad habitat of the Golden Tree Frog in Trinidad

DISCUSSION

This study has confirmed the existence of populations of the Golden Tree Frog at the summits of two mountains in Trinidad, El Tucuche and Cerro del Aripo, and effectively rules out its occurrence elsewhere on the island. The estimated adult frog population of around 20,000 on El Tucuche alone may seem healthy, but this must be regarded as a crude estimate only, since restrictions on sampling meant we could not investigate factors such as territoriality and height preference which could seriously affect our estimate. Territoriality is a feature of other *Phyllodytes* species (Caramaschi *et al.*, 1992). Our estimate may also be affected by our inability to determine the sexes of the frogs we found.

The frogs (and their tadpoles) were all found in the large 'tank' bromeliad *G. erectiflora*. The main factors behind preference for this bromeliad species appeared to be tank size and particularly water content. However, the other large bromeliad species, *V. glutinosa*, contained comparable water volumes but no frogs. The *V. glutinosa* specimens we opened contained variable numbers of crabs, and there may therefore be a competitive interaction between *P. auratus* and these crabs. We noticed that on Cerro del Aripo, *V. glutinosa* tended to grow on lower branches than *G. erectiflora* and may therefore be more accessible to the crabs. However, we suspect that there must be more to this micro-habitat preference than which animal, crab or frog, gets to the tank first.

Many features of the biology of *P. auratus* remain unknown: we attempted, as have others (Kenny, 1969; Read, 1982) to record the call, but without success. Kenny also attempted unsuccessfully to observe breeding. He found, as did we, small numbers of tadpoles per tank and noted that these could be found all year round. This suggests a spawning strategy well adapted to conditions: a small amount of water per tank, but available all year round. However, whether all eggs are laid in a single tank, or distributed amongst several, is not known.

The conservation status of *P. auratus* gives cause for concern. The disappearance in recent years of *G. erectiflora* from a third peak (Chaguaramal) may have extinguished a third population of *P. auratus*. Now the two remaining sites, El Tucuche and Cerro del Aripo, are being made more accessible to people by the cutting of paths, placing of seats and erection of supporting handrails at steep points.

In general, increasing access to the wilder parts of Trinidad should be helpful to conservation, as it will reduce pressure for exploitative uses such as quarrying. However, there ought to be a clear access policy that aims to conserve the most sensitive areas and their flora and fauna. For example, paths on Cerro del Aripo could take people around the mountain, but not to the summit, thereby protecting the rare 'elfin woodland' ecosystem and the Golden Tree Frog. Our discovery of clear felling at the summit, apparently by a youth section of the Trinidad army, suggests an absence of policy, or its implementation, so far.

There clearly is an opportunity for education here. The Trinidad Wildlife Section has had considerable success in recent years with a voluntary warden system aimed at protecting nesting sea turtles. So far, nothing has been done to highlight the need to protect frogs and the Golden Tree Frog in particular.

ACKNOWLEDGEMENTS

We wish to thank many members of Glasgow University Trinidad 1993 and 1994 expeditions who helped with fieldwork, or guides Simeon Williams and Solomon Aque staff of the Trinidad Wildlife Section, and Patricia Johnston for typing the manuscript. Frank Clarke and Roger Downie received financial assistance from the Carnegie Trust, and the two expeditions were supported by many agencies.

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THE EUROPEAN RATSNAKES OF THE GENUS *ELAPHE*

KEVIN STEVENS

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(presented at the BHS Scottish Symposium 1994)

INTRODUCTION

The genus *Elaphe* consists of around forty species and occurs within the confines of three continents, North (inc. Central) America, Europe and Asia. It contains some of the commonest snakes seen and kept in captivity, including Corn Snakes *(E. guttata)* and the *E. obsoleta* complex, both from N. America, and also some of the scarcest, for example I have not been fortunate to see such species as *E. davidi, E. cantoris* and several others, and I consider myself reasonably experienced in the world of *Elaphe*. In the U.K. it would seem that there is now a growing interest in the rarer species (rarer in the captive sense – many are plentiful in the wild), and it is not impossible to secure such animals as *E. radiata, E. taenuira, E. flavirufa* etc., where as this was not possible only a short time ago. The herpetologist with an interest in the Ratsnakes often includes other genera within their collections such as *Gonyasoma, Bogertophis* and *Senticolis* due to their past classification with *Elaphe*.

Some characteristics of *Elaphe* species are as follows:

Small to medium snakes from around 80 to around 250 cm.
Elongated head which is distinct from neck.
Moderately long tail, i.e. around 20 to 30% of total body length
Body usually cylindrical in shape with a flat belly.
Nine 'plates' on top of head.
Large and often square loreal scale present between the postnasal and preoculars.
Many have divided anal plate.
Hemipene structure has distinctive pattern of small spines and folds, ending in two distinct and equal lobes.
Egg laying.
Young are often different in appearance to the adults.

Many of the above characteristics are not exhibited in certain species, for example *E. rufodorsata* from eastern areas of Asia is actually a live bearer, taking this into account it is not surprising that several taxonomists are presently trying to reclassify many *Elaphe* species. The 'original' *Elaphe, Elaphe quatuorlineata,* was described in 1789 by Lacépède and is thus the 'type' of genus.

Ratsnakes occur in a wide range of habitats in the wild. I have seen and captured Ratsnakes both in Europe and N. America and have found them in all manner of areas; woods, marsh areas, scrubland, rocky screes, along coastlines, around human habitation, agricultural areas, streams and drainage ditches, almost anywhere can and often does provide a home. By past experience I can say that field trips prove most productive in the spring, many snakes only bask at this time of the year after emergence from hibernation. They take advantage of the sun's rays to warm themselves so they can be active to hunt for food after

their winter fast, and also to find a mate. At other times of the year many snakes become more secretive and hide during the heat of the day and become active only at dawn and dusk. I have found that tarmac covered roads are a good place to see specimens on summer evenings as they often attract many species of snake taking advantage of the sun warmed surface. Favourite hiding places include rubbish dumps, sheets of corrugated tin, rotting tree stumps and fallen logs and under large (and often very heavy!) rocks.

The genus *Elaphe* provides the herpetologist with some of the easiest snakes to keep in captivity, many, such as *E. guttata,* present little or no problems to induce breeding, and will live happily and reproduce under many different captive conditions. But, as we have established, this genus is very varied in its content, and thus some of its species do not prove to be as adaptable, many have yet to be bred in artificial conditions. I do not wish to become too involved in general captive husbandry, but I will include both a brief account in general terms, and also some greater details as applicable to the European species later. Many methods of housing these snakes have been employed; I personally use vivariums constructed of melamine covered chip board, with glass fronts and thermostatically heated with an underfloor heat cable, no artificial light is provided. I also have a number of plastic boxes of various sizes to suit from hatchlings up to adults, these are mounted upon shelves which are heated by heat cable, and again only natural light is provided via a large window in my reptile room. Other methods of providing heat can be by the use of heat mats, power plates and ceramic bulbs, but always use a suitable thermostat, many excellent electronic ones are available, the most accurate being the dimming and pulse proportional variety. I tend to use newspaper as a substrate, and only provide a water bowl, a hide box and a branch if the species to be housed is arboreal. Other substrates often used by herpetologists are wood shavings, wood chips and bark chips. Each snake is fed every five to ten days on appropriate size rodents, and a record is made of items consumed, along with copulation dates, egg-laying, sloughs, and anything of interest. Any eggs produced are placed in a tub of vermiculite mixed with equal quantities of water and incubated at 28°C in an incubator constructed of melamine and thermostatically heated with heat cable. I hope this has not been too brief, but I believe that this is not the place for too detailed general captive husbandry. I would refer the reader to many of the excellent general reptile books available (see bibliography) for greater details of methods similar to the above, and also several other variations.

DESCRIPTIONS OF THE EUROPEAN *ELAPHE* SPECIES

***Elaphe scalaris* –Ladder snake (Schniz, 1822)**

I have decided to start with the only truly European *Elaphe, E. scalaris.* This species does not occur anywhere else other than Europe, while the other species ranges stretch into Asia. This is the most westerly occurring *Elaphe,* with a range confined to the Iberian Peninsula, along the Mediterranean coast of France almost to Italy, the Hyéres islands and the Balearic island of Minorca. Strangely I cannot find any records of this snake occurring in neighbouring Majorca. It inhabits sunny areas and is often active during even the hottest of summer days. Vineyards, open woods, scrubland, agricultural areas, rocky areas (inc. dry stone walls) and meadows are amongst the habitat *E. scalaris* prefers. Mainly found upon the ground, but occasionally climbs low bushes and trees. Wild specimens tend to be very aggressive when caught.

E. scalaris is not a large snake and tends to grow to around 120 cm with a large individual perhaps reaching approximately 150 cm. The adult colouration is quite variable but uniform, I have seen brown, rusty orange, dark green, light green, grey and many

variations of shade. There are two dark stripes running the length of the body. The juvenile colouration and pattern differs; they are often a pale yellow green colour, and the two stripes are joined by bars to form a ladder pattern, hence the name. The adult colouration can take three to four years to develop, even though by this time the animal will be an adult. The belly of both babies and adults is often an unmarked off-white colour, occasionally with black markings. The head has a dark line running from behind the eye to the mouth, spots and bars on the labials and often dark bars over the nostrils. The body scales are smooth, there are 27 or 29 mid-body scale rows, 200 to 220 ventral scales, 48 to 68 paired sub-caudals and a divided anal plate (on occasion, single). The identifying scalation details of the head are as follows; two preoculars (occasionally one), two postoculars, two temporals and seven supralabials, the most obvious identifying characteristic is the large and extended pointed rostral scale which extend between the two internasals.

This species is not commonly kept in captivity, due to perhaps its temperament, but more likely that it is infrequently imported into the U.K., and thus rarely offered for sale. Despite its aggressive tendencies it does settle into captivity well, and often becomes calmer. As with all reptiles it is best to only maintain animals that are captive bred as this not only removes pressure from the wild population, but also they are less likely to carry parasites and disease and thus have a better chance in captive conditions. Captive bred hatchlings are best kept in small lunch boxes racked on a heated shelf system. I provide a water bowl, a toilet roll tube for hiding and kitchen towel as a substrate, temperature within the hot part of the box is around 28°C, with the opportunity of a cooler area. They soon grow on a diet of rodents (usually they take defrosted food without hesitation), and once adult (often their third summer) they will breed. As an adult they need a vivarium of perhaps around 60 cm by 30 cm floor space, and as they do not climb very much I only provide them with a height of 30 cm. Other conditions are similar to those described for the hatchlings. Breeding is initiated by first providing a three month hibernation period at around 10° - 12° C, during this period disturbance is kept to a minimum, and fresh water is always available. Copulation takes place some 30 to 45 days after emergence from hibernation, and the eggs are laid 40 to 70 days after successful mating. Females tend to lay their eggs ten days after the pre-lay slough, clutches of around 4 to 7 are common, and around ten eggs is not unheard of. An incubation time of around 60 days at 28°C is usually exhibited. Hatchlings first food is usually defrosted pink mice.

***Elaphe situla* – Leopard snake (Linnaeus, 1758)**

This species is certainly the prettiest of the European *Elaphe*, and this combined with its interesting and nervous habits (i.e. a challenge to maintain in captivity and to find in the wild) makes it one of the most desirable *Elaphe* for the herpetologist. It is not a widespread animal, confined to mainly the eastern parts of Europe, it is found most westerly in Malta and Sicily, through southern Italy, from the former Yugoslavia, through Greece (inc. many Greek islands) to Albania, into Turkey and southern Bulgaria and thus into Asia Minor and the Caucasus. *E. situla* is a lowland species rarely found above 500 metres and often around the coastline. Habitats include rock piles, field edges, dry stone walls, rocky screes and occasionally around marshes, but by far the commonest around human habitation, the Greeks know this snake by the name 'House snake'. They are often found actually in houses, under them, in cellars, barns, gardens and rubbish dumps, where they are undoubtedly attracted by rodents. Most tend not to climb, and are generally more active by dusk, disliking intense heat, they often retreat into hiding to escape the heat and are rarely seen during the hotter months of the year.

Plate 1. Sub-adult male *Elaphe situla* (Maltese form).

Plate 2. Head of *Elaphe situla*.

E. situla is not a large snake growing to no more than around 100 cm, usually less. The adult and juvenile pattern remain the same throughout life, but there are two distinct forms, one blotched (formerly described as *E. s. leopardina*) and one striped (formerly *E. s. situla*). Both forms occur within the same range, and do 'inter-breed', producing both striped and blotched hatchlings. Blotched animals have brown to red blotches (often 'dumbbell' in shape) on a grey, yellow grey or green grey background. Striped animals have the same background colours, but instead of the blotches, two red/brown stripes run the length of the body. The underside of both is often off white towards the forepart of the body, leading to either black markings or totally black towards the rear. Some individuals have a totally black belly. The head is marked similarly in both forms, with a distinctive band which stretches from each eye and resembles a 'Lone Ranger' type mask, (sometimes only two black spots are present), there are two lines extending away from the rear of the eye, some black bars on the labials (often one under the eye) and a distinctive 'V' or 'Y' shaped red mark along the neck onto the top of the head to between the eyes. There are 27 (rarely 25) mid-body scale rows, 220 to 260 ventrals, 68 to 90 paired sub-caudals and a divided anal plate. The distinguishing head scalation is that there is one preocular, two postoculars, two temporals and eight supralabials.

This species has gained a reputation of being a poor captive, but I feel it is not too difficult a snake to maintain, but by no means easy. It is better that only captive bred specimens of this species are maintained as wild caught individuals often become stressed within captive conditions (due to their nervous disposition), and thus the parasitic burden within them often proves too much and they succumb quite quickly. Wild caught animals can be acclimatised to captive conditions if they have a full faecal sample analysed and precautionary drugs administered, to clear the specimens of any parasites within them. Even so, they often do not appreciate this kind of handling, and even if they do survive their first year, it often takes them this length of time before they resume feeding by themselves. I have heard of one case of wild caught animals surviving their ordeal, but it took two years of careful acclimatisation before they were settled enough to breed. Captive bred animals are much easier and they seldom provide great problems. The main thing to keep in mind is that this species does not like it too warm, I find that 25°C at the hottest part of the cage is sufficient, and also to provide plenty of hiding places. I personally have found that they do well in the box system similar to that mentioned for the hatchlings earlier, but with boxes of proportionate size (Tupperware cake boxes are ideal for adults), but some other keepers prefer more 'open' vivaria such as glass fish tanks as they have observed their animals basking in the early morning sun. I provide my animals with three months of hibernation during the winter months at around 10° - 12°C, copulation is around 30 to 45 days after emergence. Around three to five long sausage shaped eggs are laid some 60 to 70 days after copulation, the female usually sloughs twelve days before. They are incubated in wet vermiculite for approximately sixty days at 28°C, the hatchlings first food is small pink mice, usually taking defrosted with no hesitation.

***Elaphe longissima* – Aesculapean Snake (Laurenti, 1768)**

This is one snake with quite a history behind it. Its name stems from the Greeks identifying the snake with their god of medicine, Aesculapius. The Romans picked up on this and also regarded the species as sacred. It is said that the widespread range of *E. longissima* is due to the Romans taking them along on their crusades. Yet another theory has little to do with the Romans; it could have been changing weather patterns that forced them out of Northern Europe, only surviving in the warmer areas of the present day range. I am not one to speculate but I rather fancy the former theory! It could be possible that they are both valid. *E. longissima* is found widespread throughout central and southern Europe, from central France through southern Switzerland, Austria, Czech Republic, to Ukraine and southward to extreme north east Spain, Sicily and southern Greece. Isolated colonies exist in Germany and north west Spain. The range spreads into Turkey and North Iran. Habitats

include dry, sunny woods, dense vegetation, agricultural areas and it is often found residing in deserted ruined buildings. In the north of the range they are often only found on south facing slopes, and are sometimes found in mountainous areas up to nearly 2,000 metres in the Tirol. They can climb well, and although sometimes found active within the hottest part of the day, favour cooler conditions. This species consists of one nominate, *E. l. longissima,* and one subspecies, *E. l. romana* (Suckow 1798). The latter is confined to southern Italy and Sicily. *E. l. persica* (Werner 1913) is now often given species status, i.e. *E. persica,* and occurs in northern Iran.

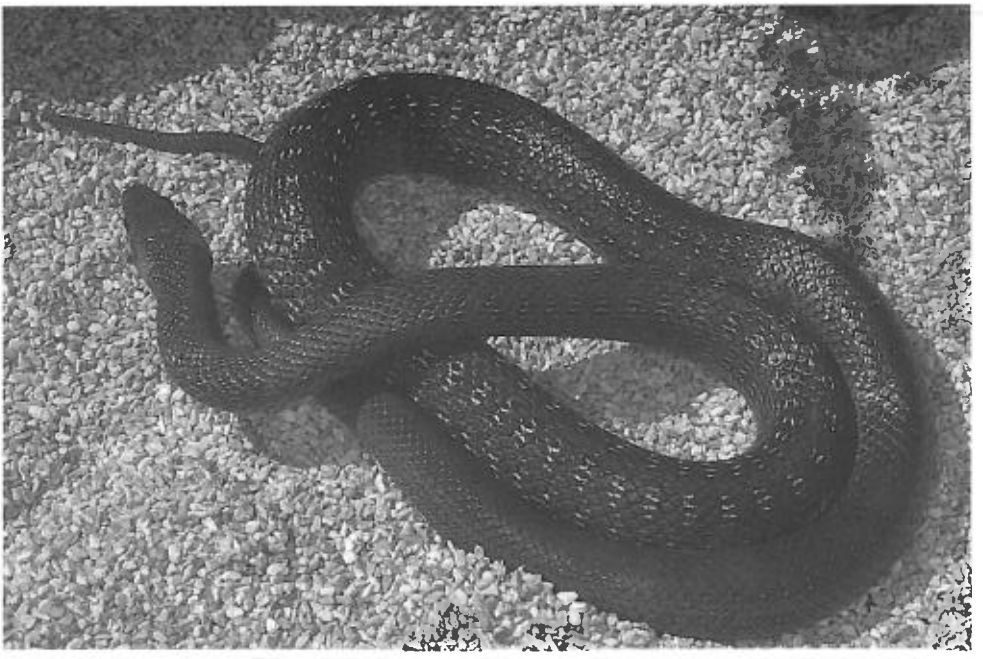

Plate 3. Sub-adult male *Elaphe longissima*

A medium sized snake of around 150 cm, occasionally up to 200 cm. The general adult colour is a green to grey buff, often olive, and the scale tips are sometime etched in white. The head is often marked with a dark line from the rear of the eye, and the labials are usually yellow, sometimes a yellow collar is also present. When juvenile they tend to be uniformly green to dark green, nearly always with white tipping to the scales. The yellow head markings and collar are much more prominent, the collar also often outlined with a black area. The underside varies from uniform white or yellow to totally black, or only black markings – especially towards the rear of the body. *E. l. romana* has the same general colour and markings, but in addition tends to have light or sometimes darker stripes running the length of the body. The body scalation details are the same for both ssp., in that there are 23 (occasionally 21) mid-body scale rows, 205 to 248 ventrals, 60 to 91 paired subcaudals and a divided anal plate. The head has one preocular, two postoculars, two temporals, eight (sometime nine) supralabials and nine infralabials.

Although not kept in captivity very widely, they make ideal captives and are relatively easy to maintain. I supply a glass fronted melamine vivarium, heated and furnished in the manner described earlier. Suitable vivarium dimensions for an adult are around 80 cm by 45 cm with a height of around 45 to 60 cm to enable them to climb. Hatchlings are best maintained in lunch box style vivaria upon heated shelves. Temperature in the warmest part of the cage should not exceed 28°C. Feeding presents few problems, all of the individuals I have maintained have proved to be avid feeders on appropriate sized rodents. Hibernation is carried out within the winter for around three months at 10°C to 12°C.

Copulation is usually observed some 30 to 40 days after this period, with the eggs being produced around 45 to 70 days later. The female completes a pre-lay slough 12 days before laying her eggs. An average clutch of eggs varies from five to twelve, and take 50 to 63 days to incubate at 28°C in the usual conditions. These observations are taken from my own experience and other herpetologists records and only concern *E. l. longissima*, I have not been able to find any captive husbandry records for *E. l. romana*, but it is not unreasonable to assume that they do not differ from the nominate immensely.

***Elaphe quatuorlineata* – Four-Lined Snake (Lacépède, 1789)**

This is the bulkiest of all the European *Elaphe*, reaching some 200 cm, and has been known to grow to around 250 cm. There are three distinct 'forms' that have been given subspecies status, *E. q. quatuorlineata*, the nominate, *E. q. sauromates* (Pallas, 1814) and *E. q. muenteri* (Bedriaga, 1881). A further two forms have been described, *E. q. prematura* (Werner, 1935), a form occurring within the Greek Isles and now synonymous with *E. q. muenteri*, and also *E. q. rechingeri* (Werner, 1932), (also sometimes listed as *E. longissima rechingeri*), a form that only exists on the Greek island of Amorgos, and over which there have been many discussions concerning its taxonic status. This is not an appropriate paper in which to discuss this problem, and indeed I'm not sure that I am qualified to speak on the matter so I will refrain from doing so! Each of the three generally accepted forms mentioned above differ in many ways, so apart from a few general points I feel they deserve individual attention.

Taken as a species on the whole, its range exists from Sicily, central and southern Italy, then from Croatia, southwards through Albania, Greece, including most Greek islands and through to Asia Minor including Ukraine and Kazakhstan. It is often found in warm, sunny, sometimes humid areas, open woods, meadows, rocky over-grown hill sides, ruins, dry stone walls, and sometimes even marshy areas and around drainage ditches. It occurs up to around 1200 m, especially in the south of its range. The appearance of each subspecies is distinct, see later descriptions. The head pattern is much the same in all and tends to be little marked apart from a streak from the rear of the eye, colour is uniform apart from the labials, which in adults are often lighter. The underside is often an off white or yellow colour, sometimes unmarked, some have an indistinct series of darker markings. The juvenile appearance is also similar in all, the ground colour of the body being grey to grey brown, with black or black brown blotches along the back, often with a further series of spots along the flanks. The head is heavily marked with black parietals and supraoculars, and a 'Lone Ranger' mask between the eyes. Depending on the subspecies this pattern slowly fades to leave an adult pattern of four stripes. Each blotch slowly fades, apart from each outer edge along the flanks, which become darker, and slowly join each other to form the stripes. This may take up to three or four years to fully develop. Scalation details are the same for all, the head has two preoculars, three (sometimes two) postoculars, two temporals and eight (occasionally nine) supralabials, the body has 25 mid-body scale rows (rarely 23 or 27), 195 to 234 ventrals, 56 to 90 paired sub-caudals and a divided anal plate. The body scales are faintly keeled.

E. q. quatuorlineata

Occurs throughout Italian and Sicilian range, many parts of Greece, Albania, former Yugoslavia, commonly known as the Western Four-Lined Snake. Adults are typically yellow brown to grey brown with four dark stripes along the body. Some stripeless animals have been known. Captive requirements are reasonably easy to cater for, vivaria similar to the preceeding species will suffice, but keep in mind that *E. q. quatuorlineata* grow to a large size and will need an appropriately larger vivarium. Temperatures at a maximum of around 28°C are favoured. Diet consist mainly of rodents, but some have been known to eat eggs. From personal experience some hatchlings prove to be problematic and will only feed after a period of hibernation. A three month period of hibernation at 10 - 12°C is required to breed from healthy adults, after which copulation takes place, some 36 to 60 days after emergence. Approximately 30 to 56 days pass before up to 16 eggs are laid. The female sloughs between 11 and 16 days before laying. Incubation ranges from 60 to 62 days at 28°C.

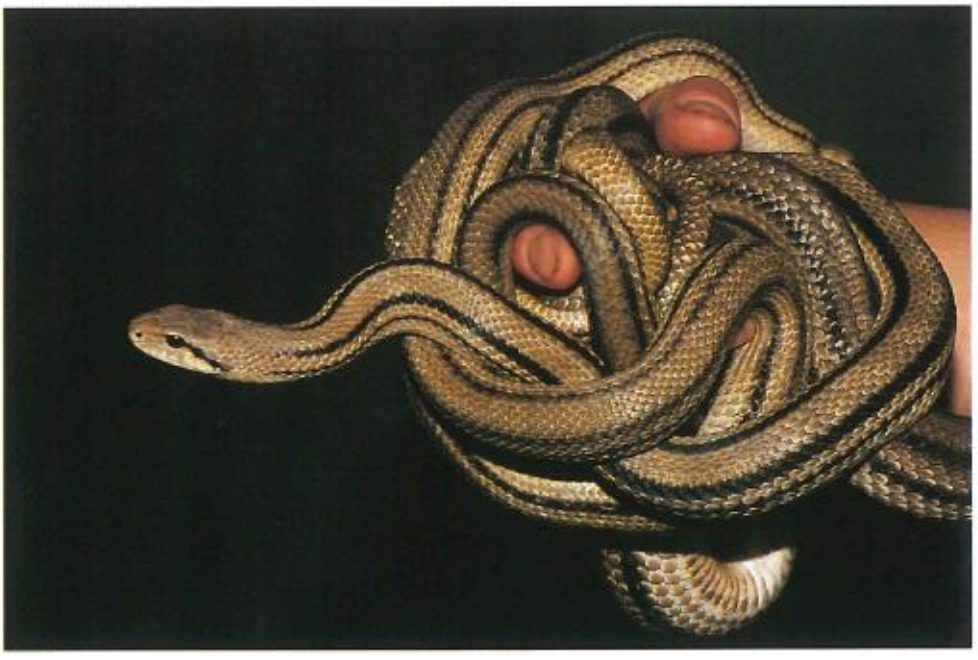

Plate 4. *Elaphe quatuorlineata muenteri*, adults

Plate 5. Hatchling *Elaphe quatorlineata quatuorlineata*

E. q. muenteri

The basic appearance of both adult and juvenile are the same as the preceeding description, the main difference being the size, *E. q. muenteri* rarely exceeds 150 cm. The adult pattern is developed at a much earlier age, for example at around 18 months, an *E. q. muenteri* will be, say around 60 cm, an *E. q. quatuorlineata* will also be around the same size, but the former will almost have fully developed the adult pattern, perhaps some 12 to 18 months before the latter. Found only on some islands within the Cyclades including Milos, Santorini, Mykanos and Amorgos. Rarely found in captive collections, but it is kept in the same manner as the nominate, with perhaps a smaller cage being more suitable. Provided with a hibernation of two to three months at 12°C - 15°C, copulation is usually observed around 60 to 100 days after this period. Eggs are laid 30 to 50 days later and they hatch within 45 - 56 days at 28°C.

E. q. sauromates

As a juvenile resembles the preceding descriptions, but this pattern is retained into adult life, and does not develop stripes. Some even lose the blotches, and become almost patternless. The ground colour as an adult is generally yellow to yellow brown, with dark brown markings and blotches (if present). As a hatchling the only obvious difference between *E. q. sauromates* and *E. q. quatuorlineata /muenteri* is that many of the former have a red spot within the region of the parietals and frontal scales, the latter two always lack this feature. This subspecies is known commonly as the Eastern Four-Lined Snake and is thus found primarily in he most eastern parts of Europe, from north east Greece through to Asia as far as the Aral sea, north to Bulgaria and Romania, and south to North Iran. Again not commonly seen in captivity, but does make an ideal captive subject. If subjected to a hibernation period of three to four months at 10°C copulation often takes place 16 to 40 days after, and 6 to 16 eggs are laid around 35 to 60 days later. Incubated in wet vermiculite at 28°C the eggs will take up to 60 days to hatch.

THE EURO/ASIAN *ELAPHE* SPECIES

It would be incorrect to finish without mentioning the two species often listed in the literature on European herpetofauna, even though strictly speaking they do not occur in Europe. *Elaphe dione,* the Steppes / Diones ratsnake (rarely referred to as the Eastern Leopard Snake), is a widespread animal occurring in areas within Turkey, throughout Asia into China. It is found in a variety of locations, from lowland to mountainous regions and often around human habitation. Individuals are often brown of varying shades in colour with a series of darker speckles and small blotches. I have in my own collection some very attractive yellow individuals with reddish blown blotches. The head is similar in appearance to *E. situla* but the pattern (if present) is less distinct, with the markings often being of almost the same colour as the base colour. Brief scalation details are as follows, 25 (sometimes 23 or 25) mid-body scale rows, 171 to 214 ventrals, 51 to 78 paired subcaudals, the anal plate is usually divided, usually two preoculars, sometimes one, two or three postoculars and eight supralabials. Grows to around 100 cm in length. This snake is reasonably easy to keep in captivity, and reproduces frequently, hibernation of no less than three months and no higher than around 10°C is needed, and mating is often reported after hibernation. I have heard that good results can be obtained by allowing copulation to take place before hibernation (personal communication), this I have yet to authenticate. Eggs are usually laid around 53 days after copulation and hatch after only 25 to 35 days at 28°C.

Plate 6. Adult male *Elaphe dione* (photo, M. Curruthers)

Elaphe hohenackeri, Transcaucasian or Hohenackers Ratsnake grows to around 90 cm and occurs throughout Turkey into Asia as far as Iran. There is one subspecies, *E. h. taurica* which occurs in southern Turkey. It is a grey to tan coloured snake, with two rows of spots, and again resembles *E. situla* in many ways. Scalation is as follows, 23 (sometimes 25) mid-body scale rows, 195 to 226 ventrals, 57 to 74 paired subcaudals, one large preocular, two postoculars and eight supralabials. Habitat includes mountain forests, rocky screes and gardens. Little is known about this little snake, either in the wild or its captive husbandry. Hibernation is thought to be required, and it is known that three to seven eggs are laid in July in the wild and that probably a short incubation period is exhibited.

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I would like to take the opportunity to thank the British Herpetological Society for asking me to speak on a subject I feel so enthusiastic about. Special thanks go to Mr. David Blatchford and Mr. Antony Darby for not only organising a well planned event, but for also having confidence in me and my lecturing ability.

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NOTES ON THE NATURAL HISTORY OF THE SMOOTH SNAKE, *CORONELLA AUSTRIACA*, IN THE SWISS ALPS

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The Smooth Snake *(Coronella austriaca)* is a small sized (generally less than 70 cm long), live-bearing colubrid which is currently threatened in several European regions (Corbett, 1989). Throughout the Alpine massif this species is still widespread and locally abundant, generally at altitudes ranging between 600 and 2000 m a.s.l. (Ortner, 1978; Barbieri *et al.*, 1994). In the Swiss Alps it is abundant up to altitudes of 2100 m a.s.l., but the same is not true on the plains where it is increasingly disappearing due to habitat destruction (Hofer, 1993). Although the ecology of the Smooth Snake has been studied in detail in other European regions (especially in Great Britain: e.g. see Spellerberg & Phelps, 1977; Goddard, 1984; Gent & Spellerberg, 1992), it still remains, due to its secretiveness, one of the least known of the Alpine snakes. In fact, apart from very detailed research on the ecology and reproductive biology of Italian Smooth Snakes (Luiselli, Capula & Shine, 1995), no other study has been published on alpine populations of this taxon. Obviously this lack of knowledge is quite serious because it prevents the establishment of firm, functional conservation measures to prevent its continued decline. In this paper we present some data on the basic biology of a mountainous population of Smooth Snakes inhabiting an alpine region of western Switzerland. These data were collected during a long-term study on the sympatric vipers *Vipera aspis* and *V. berus* (Monney, 1993; Money *et al.*, 1995).

Data given here was collected by one of us (JCM) between 1988 and 1992 in a Prealpine area of western Switzerland situated at about 1400-1600 m a.s.l. (Bernese Oberland). The study area, about 40 ha, is a southeastern facing slope including two torrential alluvial cones. There are both *(Molinion)* and dry *(Cynosurion)* meadows including some man-made stonepiles, grassy and rocky areas dominated by *Calamagrostis varia, Picea abies* woods, *Salix* sp. and *Alnus* sp. groves. Three sympatric snakes occur in the area *(V. aspis, V. berus, C. austriaca)* but only the former two are common and widespread. Two lizards *(Anguis fragilis, Lacerta vivipara)* and three amphibians *(Salamandra atra, Rana temporaria, Bufo bufo)* are also found. When a smooth snake was encountered in the field, it was individually marked by "scale-clipping", and the lesion resulting from this procedure was immediately disinfected by Acutol (liquid). The number of subcaudals (SC), the snout-vent- (SVL), tail- (tL) and total lengths (TL) were measured immediately on capture. Moreover, the body weight was also measured if no recent trophic activity was detected (i.e. if no food remains were found in the stomachs). Food habits were studied by collection and laboratory analysis of faecal pellets by Monney's (1990) method. Movements were calculated by noting the exact location at which each snake was encountered on an accurate map of the study area (1: 5,000), which was divided into areas of 5 x 5 m. The displacements were then measured as a straight line between the location areas on the map. The reproductive status and the clutch size of the females were determined by palpation of the ovarian follicles and embryos during July and August. Data were analysed with StatView software (Abacus concepts, Inc., Berkeley, CA, 1992), and

α was assessed at 5%. In all tests performed, the hypothesis was that H_0: $\mu 1 = \mu 2$, H_a: $\mu 1 \neq \mu 2$. In the text the means are followed by ± one standard deviation.

Smooth Snakes were very elusive and apparently rare in the study area. Throughout the research period we captured and marked only 20 different individuals, that were re-encountered a total of 68 times (versus over 3000 "contacts" with each of the two sympatric *Vipera* species). The number of adult males exceeded that of adult females (apparent sex-ration = 1.56 : 1), but the difference was not statistically significant (binomial test, $P > 0.1$). Two juveniles were also encountered. The estimated density was about 0.5 adults per ha, i.e. about half of the density of *V. berus* and one third of the density of *V. aspis* in the study area.

Smooth Snakes were encountered in all habitat types within the study area, but most of the observations occurred along the stony banks of a torrential alluvial cone. In general these snakes selected dry spots and, like *V. aspis*, exploited wet meadows less intensively than *V. berus*. Pregnant females frequently used the same gestation sites of both *Vipera* species : these were always stony, well exposed, sunny, eastern-southeastern facing places. The vegetation cover of these sites was usually sparse, although in most cases there were some bushes and grassy areas. Pregnant females spent more time in the open than other females: this is evidenced by the fact that 81% of our female observations were of gravid individuals. Conversely, males were more readily seen during springtime, when they searched for mates. Both sexes were also frequently seen during the moulting phases, when they showed a high thermophily in addition to sedentary habits.

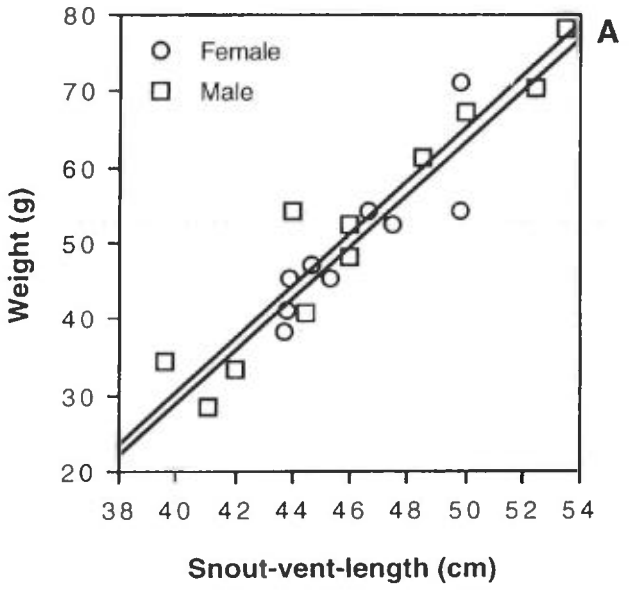
The duration of the annual activity appeared to be shorter than that of the two sympatric vipers (see Monney, 1995; Monney *et al.*, 1995): earliest males were found above-ground while sloughing at the beginning of May, while no female was observed in the open before early June. Thus, we suggest a prenuptial male moulting may exist in this population, although more information about underground spring activity would be necessary to prove this. With the exception of one female (9 June 1991), first ova were detected by palpation of the abdomen usually in mid June. Parturitions occurred during September.

Table 1

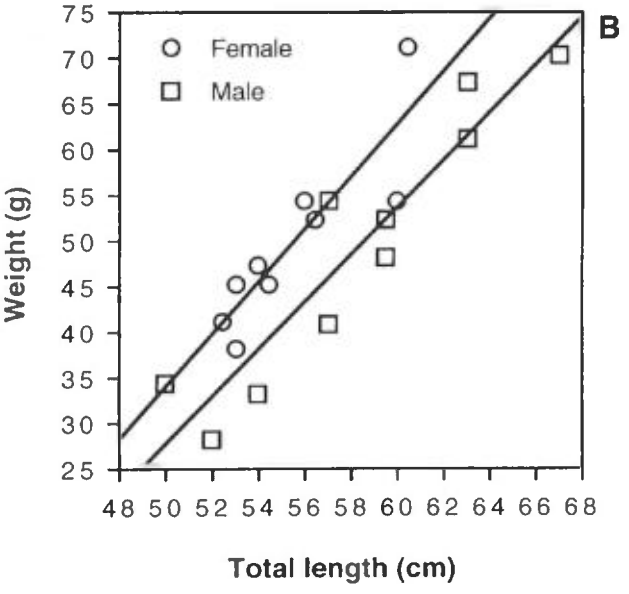
Average total length (TL, in cm), snout-vent length (SVL, in cm), tail length (tL, in cm), body weight (W, in g), and number of subcaudals (SC) in males and females *Coronella austriaca* from the Bernese Oberland (west Switzerland). Numbers in parentheses indicate standard deviations. For statistical comparisons, see text.

Sex	TL	SVL	tL	W	SC
Males	58.20 (5.30)	46.15 (4.56)	12.78 (1.37)	51.41 (16.48)	56.60 (2.32)
Females	55.55 (2.98)	46.15 (2.49)	9.40 (0.58)	49.66 (9.74)	49.86 (1.86)

Morphometric characteristics and body sizes of male and female *C. austriaca* are given in Table 1. The relationships between SVL and body weight (Figure 1A) and between TL and body weight (Figure 1B) were highly significant in both sexes (in all cases Spearman's rank correlation, $r > 0.9$, $P < 0.01$). The two sexes did not differ significantly in TL ($t = 1.318$, $df = 17$, $P = 0.205$), SVL ($t = 0.01$, $df = 18$, $P = 0.999$), and body weight ($t = -0.279$, $df = 18$, $P = 0.783$). The tail was significantly longer in males than females ($t = -6.838$, $df = 17$, $P < 0.001$), and the number of subcaudals was significantly greater in males than females ($t = -6.368$, $df = 15$, $P < 0.001$). Pooling together males and females, SC was significantly correlated with tL (Spearman's $r = 0.79$, $P = 0.001$, Figure 2). The ratio "tL/SVL" (females: 0.204; males: 0.281) was significantly different between sexes ($t = 14.311$, $df = 17$, $P < 0.0001$).



Weight (g) = -107.462 + 3.404 * Snout-vent-length (cm); R^2 = .757 (Female)
Weight (g) = -108.038 + 3.455 * Snout-vent-length (cm); R^2 = .913 (Male)



Weight (g) = -111.15 + 2.895 * Total length (cm); R^2 = .785 (Female)
Weight (g) = -102.096 + 2.592 * Total length (cm); R^2 = .877 (Male)

Fig. 1. A: Relationship between snout-vent length and body weight in male and female Smooth Snakes from the study area; B: relationship between total length and body weight in male and female Smooth Snakes from the study area.

Only eight out of 68 (11.76%) encountered specimens provided faecal pellets useful for dietary analyses. Common lizards *(L. vivipara)* constituted 62.5% of the total prey, while small mammals (a single Microtidae and two newborn indetermined rodents) accounted for the remaining 37.5% of the diet.

Our data on Smooth Snake movements are rather scarce, and we can present only preliminary observations. In general the movement rates per day were small (< 8 m/ day): for instance, the male No. 7 moved 225 m between 1.6.1991 and 23.8.1991 (x = 4.24 m per day). This was evident also during the mating season: for instance, the male No. 9 moved 115 m from 6.5.1990 to 30.5.1990 (x = 4.79 m per day). The monitored females were highly sedentary during pregnancy: the female No. 1 moved 0 m between 30.6.1991 and 7.8.1991, and the female No. 7 moved only 5 m between 8.7.1992 and 4.8.1992 (x = 0.18 m per day). The snakes were highly sedentary also during the moulting periods: the male No. 7 moved less than 5 m between 9.8.1989 and 22.8.1989. Some individuals showed seasonal migrations from hibernacula to summer areas: e.g. a male No. 3 moved 85 m from the hibernaculum (situated in the torrent banks) to the summer habitat (a grassy pasture), and the female No. 5 moved 215 m between 8.7.1992 and 4.8.1992 (x = 7.96 m per day), from her foraging area situated along a marsh, to her gestation site situated in a stony torrent bank. It is interesting that in this latter case the gestation site was also the hibernaculum for the female. When searching for prey, however, the Smooth Snakes showed sometimes relatively long displacements: the female No. 6 moved 140 m from 27.7.1991 to 1.8.1991 (x = 28 m per day), when she finally obtained food. Site fidelity among years appeared to be very variable depending on the individuals: the male No. 7 was observed 14 times between 9.8.1989 and 23.8.1991 along a transect 90 m long of a torrent; the male No. 9 was observed four times between 6.5.1990 and 9.6.1992 along a transect 115 m long of the same torrent; the male No. 6 was observed two times between 23.6.1989 and 18.7.1991 in two spots far less than 80 m each from the other, and the female No. 1 was found pregnant in both summer 1989 and 1991 in the same spot. Conversely other specimens moved remarkably between years: the male No. 6 covered 475 m of distance (from 1760 m a.s.l. to 1510 m a.s.l.) between 6.8.1989 and 17.8.1990.

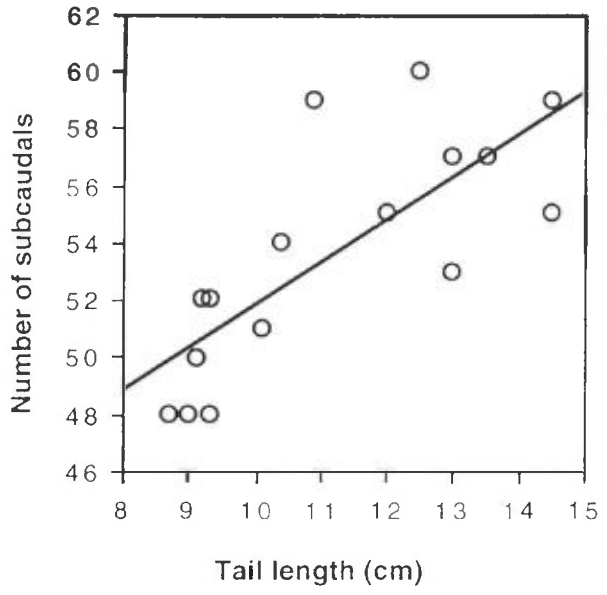


Fig. 2. Relationship between tail length and number of subcaudals in the Smooth Snakes from the study area. Males and females are considered together.

The exact frequency of reproduction was determined only in two females: female No. 1 was gravid in 1989 (with 3 embryos in the abdomen, when measured 53 cm TL and 45 g weight), not-gravid in 1990 (when she weighed only 35 g), and was newly pregnant in 1991 (with 6 embryos in the abdomen, when measured 54 cm TL and 47 g weight). Another female was not gravid in 1991, but it was pregnant the next year. These observations suggest a biennial female frequency of reproduction. Female fecundity averaged 6 ± 1.55 young (range from 3 to 7, *n* females = 6). There was a trend (but statistically not-significant) for fecundity to be correlated with female size (Spearman's $r = 0.78$, $P = 0.07$; Figure 3).

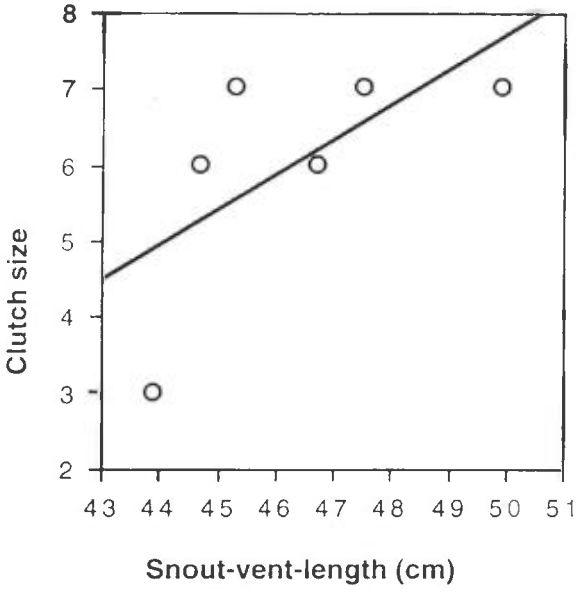


Fig. 3. Relationship between female size (SVL) and fecundity in the Smooth Snakes from the study area.

The basic biology (density, body sizes of males and females, reproductive cycle and fecundity, food habits) of the Smooth Snakes studied here resembled that of conspecifics of other European regions (e.g. France: Duguy, 1961; Britain: Goddard, 1981; Spellerberg & Phelps, 1977; Gent, 1988; Spellerberg, 1988; Austria: Waitzmann & Sandmayer, 1990; Sweden: Andrén & Nilson, 1992; Italy: Luiselli et al., 1995). In fact, also in our population the population density was low, the males and the females attained very similar sizes, the diet consisted of lizards and juvenile rodents, the reproductive cycle of the females was biennial (for an exception see Duguy, 1961, that reported annual cycles in French Smooth Snakes), and the fecundity was rather low. The males had (1) longer tails and (2) greater number of subcaudals than females. While point (1) seems to be rather universal not only in Smooth Snakes but also in other European colubrids (Feriche, Pleguezuelos & Cerro, 1993), point (2) seems to be not so general: in British *C. austriaca,* for instance, both sexes usually have 52-55 subcaudals (T. Gent, personal comm.). The low *C. austriaca* density at the study area might be due to the presence of two sympatric viper species, which have diets similar to that of Smooth Snakes (Monney, 1993). In this regard, Spellerberg & Phelps (1977) suggested that interspecific competition may occur between *C. austriaca* and *V. berus* in southern England. Clutch size and frequency of reproduction of our Smooth Snakes were nearly identical to those of conspecifics from the eastern Italian Alps (Luiselli *et al.,* 1995). Contrary to these latter, however, the females in our population showed no

statistically significant correlation between fecundity and female body size, but this probably depended merely on the small size of the sample examined. In fact, the sole female was gravid in two different years produced more young (six versus three) at the second reproduction, when she was 1 cm longer. Moreover, the movement rates of the Swiss Smooth Snakes were similar to those of radiotracked individuals from southern Britain (Gent, 1988; Gent & Spellerberg, 1993): in fact, although some individuals may show relatively large movements during some part of the annual activity cycle (e.g. when searching for prey), the daily movement rates were small in most cases. The general movement patterns (e.g. stationary habits of moulting individuals, lack of site fidelity in some but not in other individuals, etc.) also resembled those of British Smooth Snakes (Gent, 1988), but in these latter there were no significant differences in mobility of gravid and non-gravid individuals (Gent, 1988). Seasonal migrations have been observed also in other *C. austriaca* populations (Strijibosch & Van Gelder, 1993; T. Gent, personal comm.), but this did not seem to be 'universal' and predictable behaviour in most of the animals in a population (Gent, 1988).

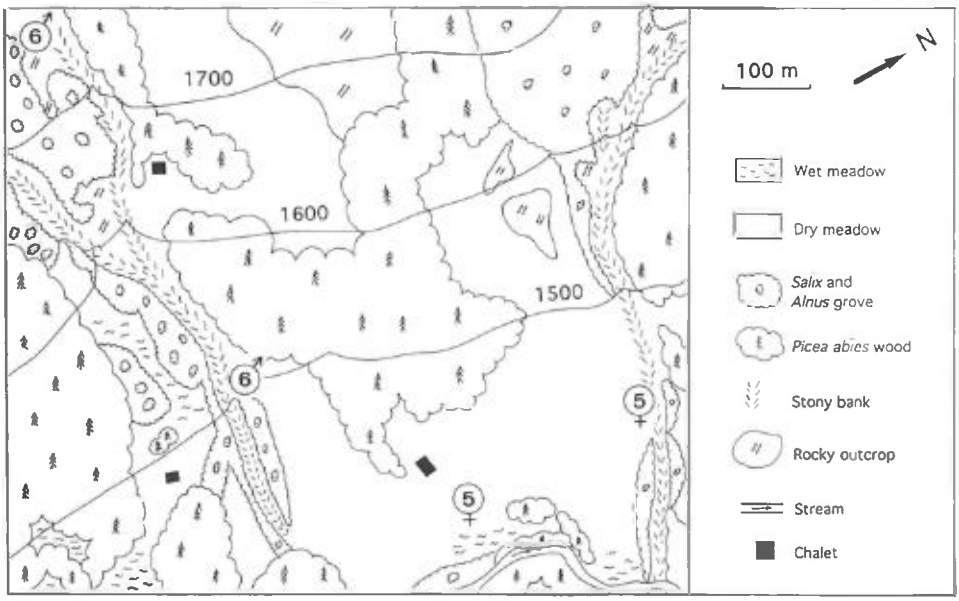


Fig. 4. Movements of two individuals (male No. 6 and female No. 5 throughout the study area. The male moved 475m and the female moved 245 m.

ACKNOWLEDGMENTS

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PHELSUMA STANDINGI: NOTES ON CAPTIVE REPRODUCTION

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INTRODUCTION

Standing's gecko, is the largest living species in the Genus *Phelsuma,* only *Phelsuma madagascariensis grandis* can equal the adult length but is not nearly as thick set. *Phelsuma standingi* has recently received interest from conservation groups who have acknowledged the population declines in this species, due mainly to charcoal burners destroying vital habitat in south-western Madagascar (McKeown, 1993).

The main reason for these notes is to provide my experiences with *P. standingi* to other herpetologists who may be lucky enough to possess stocks of this species, in a hope that a viable captive population can be established with a view to ensuring survival of this species. The formation of a studbook for Standing's Day Gecko is currently being compiled by Edinburgh Zoo in order to help ensure their survival.

DESCRIPTION

Phelsuma standingi was described in 1913 by Methuen & Hewitt. Loveridge (1942), reviews the description which appears to be of a juvenile specimen as he makes references to the dark transverse barring which is characteristic of young specimens. The paratype Loveridge reviews has a total length of 149 mm (88+61 mm) which also indicates a juvenile/sub-adult specimen, although he comments on the appearance of a regenerated tail.

Juvenile colouration consists of a lime green head which is patterned with brown reticulations, the dorsal surface of the torso is grey with dark brown transverse bars. The tail has blue bars on a blue/grey background. Adult colouration is not as spectacular as the juveniles; again the head is green, marked with brown, the bars on the torso fade with age, the tail remains blue/grey in colour. The ventral surface is whitish with spotting present around the chin/throat region. Maximum adult size is around 280 mm, most specimens being around 240-250 mm region. Hatchlings are reported by Zimmermann (1984) to be 66 mm total length.

This species can be very nervous in captivity, therefore plenty of shelters should be provided for specimens. This species can also be very aggressive to members of its own species, so sexual pairs should only be housed together in my experience.

Phelsuma standingi occurs in south western Madagascar. There are five localities given by Glaw & Vences (1994), one of which (Maroamalona) coincides with the type specimen collection, the other localities being Bas-Fiherenana, N. Foliara, Ifaty, and north east Sakaraha. The status of wild populations is yet to be assessed but it is hoped to be studied in the near future (Blake, 1994).

HOUSING

Adult pairs of this taxon are housed in 100 H x 50 L x 50 W glass fronted wooden vivaria. They are provided with access to Tru-Lite, full spectrum bulbs at all times and are maintained at temperatures of around 30°C as a daytime high temperature dropping to 20°C at night.

SEX DETERMINATION

P. standingi has in some cases proved to be a problematic taxon to sex, both gender showing varying degrees of secondary sexual characteristics.

Endolymphatic (chalk) sacs of females which in many *Phelsuma spp* provide a fairly good indication of the sex of an individual, are in *P. standingi,* obscured by the large jowls. Femoral pores, probably the best secondary sexual characteristic for assigning an individual to a sexual group in most species of Day Gecko are very variable in this taxon, varying from present to completely absent and any degree between these two extremes. Yellowing around the cloacal region is a very good indicative feature, present in males of many of the larger *Phelsuma* species, again may be present or absent in P. *standingi.* Hemipenal bulges present in males are also a good indicator of sex, although this characteristic may be obscured if a specimen is particularly well fed.

As can be seen from the above notes *P. standingi* can be difficult to assign to a sexual group, this is especially so with juveniles, although with some experience the task becomes easier.

COPULATORY BEHAVIOUR

The observation of copulatory behaviour in this taxon is difficult to observe due to their nervous disposition. I have observed mating behaviour on two occasions, and a summary is provided below.

Copulation in this species, in my observations, is initiated by the male, by his movement towards the female. The approach by the male is slow and deliberate. As he nears the female his movements become jerky and side to side head movement occurs. If the female is receptive this side to side head movement is mirrored by her after which she will remain motionless. The male then moves close enough to lick her flanks and tastes her cloaca. The male then aligns himself alongside her and her neck is gripped. The grip lasts until copulation has ceased. The matings observed by myself lasted up to eighteen minutes.

STIMULUS

The stimulus for breeding in *P. standingi* appears to be a cooling period; this usually lasts around three months in my vivaria. This cooling period consists of a day time high (DTH) temperature of 25°C (usually lower) and a night time low (NTL) temperature at 15°C. These temperatures may seem a little extreme but in my experience copulation does not occur at significantly higher temperatures. McKeown (1993) states that night time drops in temperature are the main stimulus for breeding in this species. More extensive work needs to be carried out to provide conclusive evidence that the night time drop is the stimulus, as in the past reproduction in this species has been rather "hit and miss".

Plate 1. Typical clutch of eggs laid as a pair. Note egg with indentation, which hatched perfectly well. 18 mm diameter. No additional moisture is required during incubation.

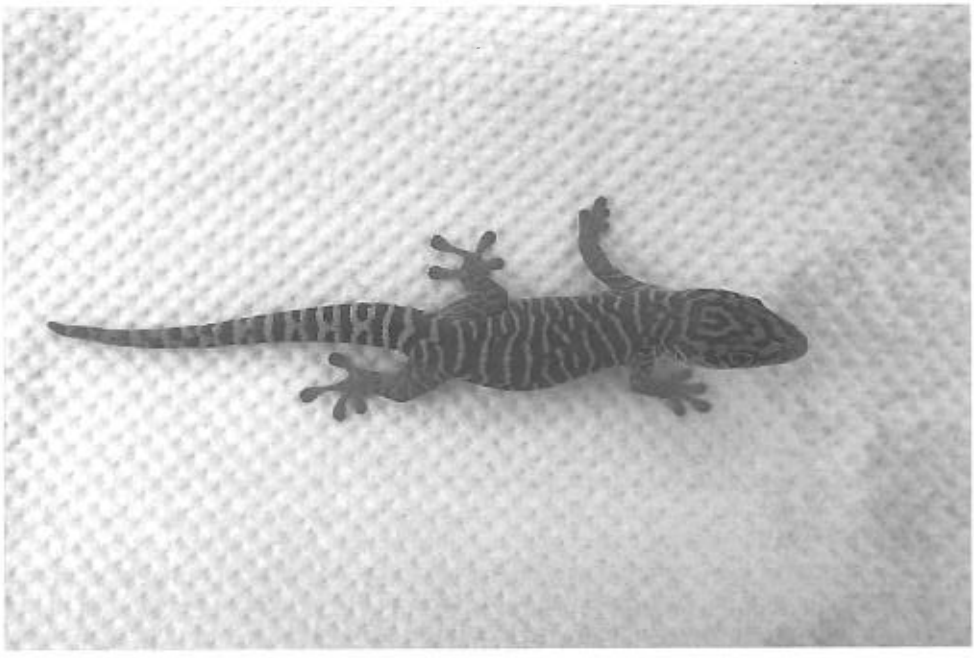

Plate 2. Neonate *P. standingi*

EGG PRODUCTION

After the resumption of normal day/night temperature cycles (DTH 30°C: NTL 18°C) the first clutch of two eggs is laid within one month and each subsequent clutch about every 21 days. The eggs are removed from the parents and incubated in a crude incubator maintaining the eggs between 26 and 30°C. The reason for this fluctuation is to allow a more natural incubation for the eggs and comparisons of my hatchling data and that reported by Zimmermann (1983), whose eggs were incubated at a constant 30°C, show an average 1.5 cm increase in neonate size. Incubation times at the above temperatures average 77 days.

CARE OF NEONATES

Upon hatching, the neonates are transferred to ventilated plastic cages furnished with a folded piece of tissue and are maintained at the same temperatures as the adults. During their first 10 days of life they do not respond to live prey, but instead prefer to lick fruit. After the first week or so they begin to accept live prey such as *Drosophila, Aceta,* and *Galleria.* Growth in the first 4 months is very rapid after which it slows down until adult size and maturity are reached at around 18 to 24 months.

The use of vitamin supplements is particularly important at this critical stage of development and a regime of 2 out of every 3 feeds dusted with vitamins (Nutrobal, Vetark) has proved to be adequate. A problem which has been observed in *P. standingi,* as well as in other large *Phelsuma* is the large deposits of fat at the base of the tail without sufficient pelvic calcification, thus when the gecko adopts their usual head down, vertical position the tail is unable to be supported and falls at right angles to the body. The author has never encountered this problem with his own animals, and believes this to be due to overfeeding, especially of fatty foods to young and sub-adult geckos without proper care towards vitaminisation of food. The access of the specimens to U.V. light in the form of full-spectrum bulbs should also eliminate calcium metabolism disorders such as rickets.

COMMENT

Communications with various herpetologists have indicated that this taxon can be problematic in its propagation and I hope that these notes can be of assistance to other herpetologists experiencing problems and any correspondence regarding this species is welcomed by myself.

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OBSERVATIONS ON THE DISTRIBUTION OF THE COMMON LIZARD *(LACERTA VIVIPARA)* IN SCOTLAND

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I saw my first Common Lizard *(Lacerta vivipara)* in the summer of 1940, a bronze-black baby of less than five centimetres long darting across rocks at the edge of Combe Martin beach. My only field guide at that time was the Observer's Book of British Animals, which had rather poor photographs of lizards, and until a visit to a museum in Ilfracombe, which had pickled animals in jars, enlightened me, I laboured under the delusion that immature bronze-coloured Common Lizards were adult *Lacerta vivipara,* and adult females were Sand Lizards *(Lacerta agilis).*

I continued to find Common Lizards in Devon, Wiltshire, Buckinghamshire, Sussex and the Isle of Wight, until my father was sent to Scotland in 1944, and we lived in rural Renfrewshire, which despite much likely-looking rough country, had no reptiles and very few common amphibians. I have been continuously resident in Scotland since that time, and I have only had two sightings of Common Lizards in lowland Scotland; one in Troon in Ayrshire in 1958, and one near Dunbarton in 1965. However soon after moving to Dundee in 1974, I went hill-walking in Perthshire, and was amazed to come upon several Common Lizards six hundred metres above sea-level, torpid with cold. Checking the distribution maps in Deryk Frazer's field guide "Reptiles and Amphibians in Britain", I realised that the Eastern Highlands, particularly the Angus Glens, had excellent populations of Common Lizards and Adders, many inhabiting particularly high altitudes.

In contrast the lizard populations of Lowland Scotland seem to be disappearing fast. Before 1959 there were several lizard sites around the coast of Fife and in 1983 lizards were found in two inland locations there as well. They are now hard to find in that county, despite the fact that there has been comparatively little disturbance of the coastal heathland where they used to be found. I have spent hours peering into what looks like ideal habitats and have found nothing. Presumably the answer lies in the chemicals used to treat the cornfields lying behind the littoral heathlands.

For the last few years I have been watching a population of lizards that live on the south facing bank of a path going through Glendoll Forest, roughly thirty miles north of Dundee. This is at the beginning of the so-called "Jock's Road", a tortuous scramble over the Grampians of Braemar, seventeen miles to the north. The habitat is a heathery, rocky strip with a ditch in front and Scots pines and beech trees behind, getting sufficient sunshine to provide ideal basking places. In summer this path is very popular with hikers, walkers with dogs, and even mothers with children. The lizards tend to be very wary; the fact that many sport renovated tails speaking for itself. Nevertheless this path, which is about three miles long, usually reveals something of interest. On very warm days the lizards do not appear until the sun has slipped behind the hills, when they bask in the gloom on the warmed rocks and pine logs. The average number seen in August on any one day is usually under half a dozen, mostly gravid females. I have observed three colour variations; the normal yellow and brown patterns with spots; a yellow and orange morph without spots which superficially resembles a *Psammodromus algirus,* and a greenish morph with a fine network of small black spots. I have not seen the completely unmarked light brown lizards in Glendoll which are frequently seen in others parts of the Scottish Highlands.

Unlike the animals found at higher altitudes, which do not often exceed ten centimetres in length, the Glendoll lizards look as large as their English counterparts, the luxuriant vegetation of the ditches providing a copious diet.

Reptiles are very local in Scotland; rare in the lowlands, and continue to become more scarce there, despite large tracts of very suitable habitat in under-populated country. Whilst they may be under-recorded, due to lack of interest on the part of Scottish nature lovers, who prefer eagles, ospreys and pine martins, there must also be other reasons for their apparent demise, providing areas of research which should be properly investigated.

Just as efforts are being made to re-introduce Sand Lizards to the coastal dunes of the West country, so the re-introduction of Common Lizards in Fife could be similarly rewarding. The huge forest of Tenstmuir, in the north-east of the county, approximately ten miles square, with the fastest developing dune system in Britain, would, in my opinion, be an ideal location.

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THE PRECARIOUS STATUS OF *RANA DALMATINA* ON JERSEY

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The Agile Frog *(Rana dalmatina)* has a wide range throughout much of central and southern Europe, including the Channel Islands of Jersey and Guernsey (Frazer, 1989). Literature suggests that since the 1940s this species has been recorded at relatively few sites on Jersey, with the species' stronghold being at Quaisné, on the south-west of the island (Tonge, 1986). In addition, populations of Agile Frogs on the island have been declining since the mid-1940s and numbers have continued to decrease dramatically during the 1980s. In 1986 the Jersey Wildlife Preservation Trust was invited to co-operate with a local captive rearing and release initiative. Froglets were reared in captivity and released at Ouaisné. However, the released animals did not survive at the site and the decline of frogs in the wild continued. Searches for Agile Frogs, carried out in successive years between February and April, have revealed that the population has declined almost to extinction. In 1993, only two spawn clumps were found (Jones and Freeman, 1993). No breeding adults have been found over the last two years, although this year (1995) about thirty juveniles were discovered.

Tonge (1986) speculated that the decline in Agile Frogs at the key site at Ouaisné was due to the vegetational succession of ponds and possibly a lowering of the water table. However, loss of breeding sites does not appear to be the sole cause of the decline. Introduced predators, such as fish, domestic cats, some of which may now be feral, and ferrets must have taken a toll of the frogs. Furthermore, the key to the disappearance of the Agile Frog may lie in the quality of the water on the island. Intensive agriculture and sporadic sewerage leakages into water courses may be affecting water quality to the detriment of the frogs.

Two other amphibians are found on Jersey, Palmate Newts *(Triturus helveticus)* and Common Toads *(Bufo bufo)*. Palmate Newts are still widespread and common. However, Common Toads, although they are breeding in garden ponds, seem to be experiencing adverse conditions beyond the garden habitat, where large-scale spawn mortality has been observed. A survey of water bodies, other than garden ponds, was carried out by Kevin Buley on behalf of Jersey's Environment and Countryside Services. Of 352 water bodies, toad spawn was found in only seven of them, and of these only four sites were recorded,where tadpoles survived in numbers sufficient to ensure significant recruitment. In addition to the ponds surveyed by Buley, one more successful toad breeding site has been recorded, giving a total of only five known, productive toad breeding sites on Jersey, besides garden ponds.

Initiatives progressing under direction of Jersey's Environment & Countryside Services include investigations of water quality, paying particular attention to the high nitrate levels that have already been recorded. In addition, the rearing and release programme is being continued, in collaboration with the Jersey Wildlife Preservation Trust and several private

individuals on the island. Enclosures in private gardens and at the Jersey Wildlife Preservation Trust are being used to maintain breeding populations of Agile Frogs and also to rear juveniles. Some seventy adult frogs form the captive breeding population, and this year approximately 300 newly metamorphosed froglets are being reared. A major factor contributing to the success of the rearing enclosures, compared with the fate of the frogs in the wider countryside, seems to be water quality. The breeding enclosures incorporate ponds that are constructed with impermeable liners or moulds, and are filled by rainwater rather than being exposed to inputs from watercourses.

Plate 1. *Rana dalmatina*, adult

Last year (1994), tadpoles were released into a natural pond, located to the north of the island. This location, where there are three ponds in close proximity, is a particularly important amphibian site on Jersey. It is probably the only natural site left with the potential to act as a successful recipient for released frogs, and it is also the breeding stronghold of the Common Toads. Fortunately, the tadpoles of the two species do not appear to complete directly, occupying different habitats within the pond. The released Agile Frog tadpoles have survived to metamorphosis at this location and small, but rapidly growing frogs were observed in the area during the later part of the summer. Further releases of tadpoles are planned for 1996 and it is hoped that Agile Frogs will become established at this site. Future plans to construct artificial breeding ponds in suitable habitats are being discussed and an investigation into the genetic differences between the Jersey and mainland Europe populations of Agile Frogs is also planned.

ACKNOWLEDGEMENTS

We would like to thank Richard Griffiths and Jeremy Partridge (Jersey's Environment & Countryside Services) for their help in writing this note.

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SECOND CHANCE FOR THE TUATARA

BOB HOLMES

A reptile so rare that it lives only on one tiny bump of rock off New Zealand is being given a better chance of fending off extinction this week as conservationists attempt to found a new population on a second island.

The release of captive-bred *Sphenodon guntheri,* the rarer of the two species of tuataras, is the culmination of a six-year conservation effort. If successful, the introduction of the tuatara will be the first founding of a new population of either of the two species, say conservationists.

Although tuataras look superficially like lizards – and were classified as such for the first 40 years they were known to Western science – they are a separate branch on the reptile family tree, only distantly related to other living groups. They once ranged throughout New Zealand, where the absence of any land mammals kept them safe from predation. When people arrived a thousand years ago, the rats and dogs they brought with them all but wiped out the slow-moving tuatara.

By the time Captain James Cook landed in New Zealand, tuataras were probably extinct on the main islands of New Zealand. "After 80 million years of good times, there's been a thousand years of disaster," says Charles Daugherty, a conservation geneticist who heads the tuatara research programme at Victoria University of Wellington. "Now the tide is starting to turn."

In the mid-1980s, Daugherty's research team worked out the reproductive behaviour of tuataras and learnt to incubate their eggs and rear young in captivity (see "Tuatara sheds its fossil image", *New Scientist,* 20 October 1990). Between 1989 and 1991, they collected 200 eggs from the only known population of *S. guntheri,* about 300 individuals on North Brother Island, a 4-hectare islet in Cook Strait between the North and South islands of New Zealand.

With careful nurturing, the researchers coaxed 85 per cent of these eggs to hatch in the laboratory – a big improvement over the success rate in the wild, where only around 30 per cent of eggs hatch,, says Daugherty. The tiny hatchlings were sent to a sanctuary near Wellington, where they spent a sheltered youth under semi-natural conditions. Here, too, survival was much higher than it would be in the wild, where many hatchlings are eaten by adult tuataras, says Daugherty.

Meanwhile, conservationists searched for a suitable rat-free island on which to found a second population of *S. guntheri.* They finally settled on a nearby island of about 30 hectares in Cook Strait. This week, biologists plan to release 50 captive-hatched juveniles – now between 4 and 6 years old – and 20 adults from North Brother Island onto the new island. Daugherty prefers not to name the island to avoid disruption by visitors.

Researchers will monitor the colonists to see how well they do, and the result will be used to help design further release programmes for *S. guntheri* and the slightly more common *Sphenodon punctatus.* This second species lives on about 30 islands, all of which are off-limits to the public. If all goes well says Daugherty, conservationists will soon establish "tourist" populations, so the public will finally be able to view this unique reptile in the wild.

ANCIENT EGYPTIAN SNAKE MYTHOLOGY AS SEEN AT THE BRITISH MUSEUM

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INTRODUCTION

It may seem, from the perspective of the modern herpetologist, that it is only during the past few decades that the value and beauty of snakes has been appreciated, albeit by a dedicated few. However, this is certainly not true as the snake has played a significant part in several cultures, not least in ancient Egypt, and this can clearly be seen in the Egyptology collection at the British Museum.

HISTORICAL BACKGROUND

Current understanding of ancient Egyptian society is still fairly patchy, which is hardly surprising given that it extends back over five thousand years, but has increased dramatically over the past few decades owing to deciphering of hieroglyphics and improvements in archeological techniques. One thing is certain however, the Egyptian people were very much tied to the land, as agriculture and hunting were the basis for survival, and this led to a wide variety of observations and speculation about the fauna of the area.

The special relationship between Egyptian people and wildlife is clearly expressed in artefacts that have survived. Many of these depict scenes of religious significance and can clearly be seen on elaborately painted coffins, where animals and human forms with animal characteristics are the embodiment of cult icons. In addition, their hieroglyphic symbols contain several animals, including snakes, as a part of their language that demonstrates the closeness of Egyptian culture to the natural world.

Two recognisable species of snake were commonly depicted, the Saharan Horned Viper *(Cerastes cerastes)* and the Egyptian Cobra *(Naja haje)*, the former being easily identified, even in the crudest symbols, by the often exaggerated horns above the eye and the latter through the spread hood. Both of these species would have been remarkable for their distinct appearance, ability to disappear quickly and without trace and also for their ability to kill with speed. It is very unlikely that the concept of envenomation would have been grasped and one must presume that a high proportion of snake-bite victims would have died given the limited medical knowledge available.

In addition, it seems likely that the Egyptians would have had considerable fascination for a snake's skin shedding process, that may have symbolised rebirth of life, a subject that had enormous importance for their culture. Although the exact details of their beliefs surrounding life after death cannot be known, the elaborate nature of funerals, that ensured the dead person had as many worldly possessions as possible, and the care that was taken during embalming of the body, both suggest a strong belief in some form of afterlife. If ecdysis did appear to be a kind of regeneration of life than one can see another reason for the snake to have such a powerful and mysterious image for Egyptians.

One of history's most famous snakes, the 'asp' of Cleopatra fame, may also provide an insight into their cultural significance. As Professor Cloudsley-Thompson (1994) points out in a recent paper, the snake most likely to have been responsible for Cleopatra's death was the Egyptian Cobra, but why choose to commit suicide by using a snake rather than a simpler method? In fact, Cleopatra had attempted suicide previously, once with a knife and once by setting fire to a building. Both these attempts were made under pressure, but the final one was a more considered effort. The choice of the 'asp' may have been made because of its association with the sun God Ra, which, according to the historian W.W. Tarn, was seen as his divine minister capable of deifying those killed.

So, one can see there is a substantial amount of historical evidence suggesting that snakes had significant role in Egyptian mythology and this can clearly be seen at the British Museum.

SNAKE REPRESENTATION

Many of the exhibits in the Egyptology collection are herpetologically interesting, the following being especially noteworthy:

Exhibit No. 29779 The Coffin of Nebudjat Priestess of Min (Post 200 B.C.). The main depiction on the lid is of the passage of the Sun God in a boat from day to night, who is represented at the back of a line of twelve protectors. These are people and animal-headed people, with various symbolic functions, that are using a snake as a protective force. Each of the people have their arms held down by their sides in order to support the body of a huge snake that stretches the entire length of the line of people. Its body is grey with regular black crossbars and the head region is an exaggeration of a cobra's hood. This formidable creature is arrayed against four grotesque green dog-like creatures apparently attacking the boat.

There are other snake images on this coffin, but their meaning is less clear. On each side of the lid there are fifteen boxes that contain animal headed human forms, one side having a snake above every box. They are all facing in one direction, uniform in size and are painted in a concertina form that is probably an exaggeration of a snake's movement. It seems very likely that these images would have had considerable importance to ancient Egyptians, given their prominence on the coffin and that they appear above the human forms, but a more precise significance can only be conjecture.

Exhibit No. 22942 Coffin of Ahmose, Theban Official (c. 1050 B.C.). This example is probably more than 800 years earlier than the previous one and also shows snake symbolism. On the floor of the coffin is a representation of the dead King Amenophis I, patron of Theben workmen, that provides two very important Egyptian images seen on many different artefacts. Firstly, the King is shown wearing a crown that has a Cobra rearing at the front, which believed to have come into existence when Upper and Lower Egypt were united as one political entity, and symbolises the King's power. Just above this is an representation of the Sun God Ra as winged and with two Cobras coming from him. This clearly shows the direct relationship between the most important God and snakes.

Exhibit No. 22939 Coffin of Priestess, Tjentmutengebtiu (c. 1000 B.C.). Several of the depictions on the outside of this coffin are of snakes that have wings, an association that seems relatively commonplace. On both sides one can see a fairly large image, some 8 inches by 8 inches of winged cobras alongside two figures that wear the crown of unified Egypt. It may be that ancient Egyptians believed snakes had wings as a necessary method of movement in the spiritual world, possibly because of their close association with the Sun God, who may have been regarded as an airborne powers.

In this scene one can see another form of association between Sun God and snake. There is an elaborate pillar in the centre of the scene that has two snake heads on the top, both having yellow circles on their heads that represent the God in a slightly different form from those mentioned before.

CONCLUSION

The British Museum's collection of ancient Egyptian artefacts gives the modern herpetologist a fascinating insight into a distant culture's perception of snakes and provides examples of most important associations with key divinities. In addition, there are other representations to be seen that have not been so clearly explained, which gives the interested herpetologist room to provide their own speculative theories.

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The following article has been reprinted from **New Scientist,** ***2.12.1995***

A TASTE FOR SWEDE

The Swedes are Europe's leading victims of Adder bites, beating the Swiss and British, according to a survey conducted by Scottish Natural Heritage. The study estimates that 77,000 people have been bitten by Adders in Europe in the past 125 years. A total of 95 died.

Of these, 44 deaths were in Sweden, 25 in Switzerland, 14 in Britain and 7 in Denmark. But there have been no reported deaths in Britain for 20 years. In two-thirds of cases, there are no symptoms apart from vomiting and localised swelling.

A detailed analysis of Scottish victims showed that Adders preferred young males, aged 6 to 21, who suffered 58 per cent of bites. Only 12 per cent of the victims were female.

LETTERS TO THE EDITORS

UNUSUAL REFUGIA SELECTION BY ADDERS *VIPERA BERUS?*

Over the past three years I have carried out management for Natterjack Toads at the Sellafield BHS reserve in West Cumbria. Much of this work involved removing dense stands of Sea Clubrush *Scirpus maritimus* from the breeding ponds. I placed much of the cut material in a series of piles, with an eye to attracting Grass Snakes which have recently been found nearby. On the 19th March 1995, I was raking up piles of tidal refuse which had accumulated around these mounds when I uncovered two female Adders. They were both under damp rotting clubrush litter, one was actually below the level of the highest tidal inundation, and was unlikely to have hibernated there. The debris was not warm, but probably insulated them against frost. The snakes were in material heaped up against a railway embankment which provides more typical Adder habitat, with tussocks and mammal burrows.

This fortuitous observation indicates that piles of plant debris may be of value to Adders as well as Grass Snakes.

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DO HERPTILES MAKE HERONS ILL?

Over the past few years of amphibian monitoring, I made three unusual and rather unpleasant observations, which I have put down to heron predation. In March 1990, I visited Drigg dunes in Cumbria, and found a 'ball' of partly digested anurans (6 toads and 5 frogs some of which were unmarked, albeit slightly squashed), floating near the edge of a pond. I presume that this was a regurgitated bolus from a heron with the belly ache!

Even more bizarre was a similar finding at Woolmer forest in Hampshire, on the 20th April 1994. Again a large 'ball' of partly digested remains, were seen floating in the pond. The contents were as follows:

22 Palmate Newts (which are abundant in the pond), mostly undigested.
5 Eels (small c. 10cm long, and all well digested).
1 Common Lizard's tail.
4 large diving beetle larvae *(Dytiscus semisulcatus)*, which are abundant in the pond in the spring.

Intriguingly the body of the lizard was found 15m away on the far side of the pond. Was the writhing detached tail the cause of the regurgitation? Clearly the eels were the predator's previous snack, as they are absent from the ponds in the area. The culprit was almost certainly a heron, but it managed to avoid leaving any tell-tale footprints. I have

worked on this pond rich site for nearly 8 years, but during this time I have never seen a heron on the ground. Indeed they are an unusually rare sight in the air above the forest, possibly because of the regular sound of gunfire at the site. Judging by the reaction of this visitor, it is likely to remain so!

At a neighbouring Hampshire heathland site, I found a pile of 4 desiccated Grass Snake corpses, with the well digested remains of three large fish (pike and carp). the Remains were in a rather inaccessible boggy area, and I again suspected that our lanky friend 'Old Frank" may have been the culprit. The merest sniff of Grass Snake makes me feel ill, so perhaps it was no surprise that the predator couldn't keep it's dinner down. Still surprising that it managed to eat three snakes before deciding enough was enough!

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BLUE-TONGUED SKINKS

Earlier this year, two forms of the Blue-Tongued Skink (genus *Tiliqua),* were imported from the continent of Indonesia. One of these, the "Banded Blue-Tongue" was featured recently in an article by Peter Weis in the American magazine *Reptiles.* Weis suggests that this animal, reportedly from the southern tip of New Guinea, is a subspecies of *Tiliqua scincoides,* previously believed to hail only from Australia. The other form which is reported to inhabit islands in the Moluccas has, to the best of my knowledge, not been catalogued in any literature, and as such, both animals remain 'undescribed'.

This second form, in contrast to the "Banded Blue-Tongue", appears to be more closely related to the nominate form of Indonesian Blue-Tongue, *T. gigas.* However, it differs from the described species most notably by its strikingly different coloration, being various shades and stripes of green, yellow and light brown. It also exhibits other different behavioural traits.

I was fortunate to purchase three of these lizards in February of this year, chosen from a group of seven. This group have now produced a litter of eight babies which themselves have habits which differ from that of the siblings of the nominate *T. gigas.* I am now in the process of compiling an article based on this unusual form of Blue-Tongue, and would very much like to contact anyone who is also maintaining this animal, with a view to obtaining more data and comparing observational notes generally.

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BOOK REVIEW

A personal review of *Smuggled,* by Raymond Hoser. 1992. Apollo Books, xii + 149 pp., 8.5 x 5.5. in (21.5 x 14 cm). ISBN 0 947068 17 1 and (pbk.) 0 947068 18 X. Now available from "Kotabi", P.O. Box 599, Doncaster, Victoria 3108, Australia, at 20. – $ (Australian), postage included.

Terrorism in the sky, and the resulting anti-terrorism measures on the ground, nowadays constrain the innocent reptile smuggler. Besides, I have my own philosophical reasons to respect the rules of nature conservation. Hence when I conceived a research programme which required the collecting of up to 150 geckos in Australia (Montgomery et al., 1995; Safford et al., 1995), I proceeded accordingly.

What I experienced while striving to legally export from Australia live common geckos for sophisticated experimentation in the USA, makes Hoser's book uniquely meaningful to myself. But "Smuggled" will both fascinate and enlighten anybody interested in the welfare of animals, the conservation of nature, or – the integrity of officialdom.

In my case, I initiated inquiries at both the Western Australian Department of Conservation and Land Management (CALM), for permit to collect, and the National Parks and Wildlife Service (NPWS) in Cannberra, for permit to export. I inquired by fax from Israel on 8 June 1993 but by 11 July 1993, when I left for Australia, I had an answer only from CALM, polite and constructive. To cut a long and bizarre story short and dry, some 120 geckos were gradually collected, legally and with the advice and partial support of the Western Australian Museum, and housed by permit at the University of W.A.

Meanwhile the NPSW, Cannberra, was being less cooperative. Among other things, the intended recipient, the University of Pennsylvania (Philadelphia), had duly submitted a documented application (38 pp.) to become entitled to receive the animals. NPWS was to assign them a code number, which I had to state on my application to export. But NPWS would not divulge this number. Circumstances dictated the date of sending the animals by air. But NPWS kept hiding behind an answering machine, returning no calls.

Three days before take off, having verified that Umbudsman Australia would happily intervene, I recruited the W. A Museum. They knew direct telephone lines of NPWS officials, bypassed the unanswering machine, and told them a thing or two. NPWS responded: "OK, then I'll fax you a permit". Museum: "But would a fax be legally valid?" NPWS: "Of course not, but to send an overnight bag I'd need approval." Museum: "So send it at our expense". Thus I received the permit, with barely time to pack the animals. (I weighed the relevant documents: we had consumed at least 2 kg of paper!)

My dream of selling this presumably original story was dispelled in Philadelphia when a friendly colleague heard my account, he retorted, "Oh, but this is exactly as in the book!" It transpired that Raymond Hoser had already written my story, together with many others. Hoser is a Melbourne-based herpetologist (Welch, 1990) and conservationist (Schooley, 1992) who in recent years has been investigating the illegal traffic in animals, especially reptiles, and the role of conservation officers in it, especially in Australia (Hoser, 1995).

"Smuggled" comprises (beyond Foreword, Preface, Introduction and Bibliography) fifteen chapters, with tell-tale captions: 1, Who wants our wildlife? 2, Types of wildlife smuggling. 3, Official smuggling. 4, Retail smuggling. 5, Private smuggling. 6, Detection of smugglers and smuggling activities. 7, The role of wildlife authorities. 8, The Fauna Squad. 9, Zoos and other institutions. 10, The Mafia's involvement. 11, The smuggling inquiry. 12, The American scene. 13, Smuggling rackets in other countries. 14, Stopping the illegal trade in live wildlife. 15, Saving our native animals and the future. The book is illustrated with black-and-white photographs and copies of documents, especially newspaper clippings.

The book's most shocking component is detailed and documented reports of how some conservation officials, in some Australian states, wrongfully harassed reptile keepers and appropriated their animals. One class of m.o.'s involved declaring the permit invalid (the permit could be oral, or a carbon copy that had been issued instead of the original, or even fully valid). The fate of the taken animals was often unknown but some ended up on the (black) market and some were returned to the owners after these took legal action. I hate to imagine where a faxed export permit could have landed my research geckos.

Naturally "Smuggled", and related articles published by Hoser, evoked assorted responses against the author, some unlawful, others legal, and in parallel were countered by waves of NPWS-inspired "anti-Hoser" news items in the papers. However, Hoser won all litigation and the press finally upheld the complaints on NPWS (SMH 1994; TA 1994; DTM 1994).

In 1995 Hoser also published "The Hoser Files" (available as above, same price), which I have yet to see, and early in 1996 "Smuggled-2" is expected. Therefore it may be irrelevant to thrash out here some minor deficiencies of "Smuggled", such as the poor printing of photographs or the use of both inside covers for text. "Smuggled" remains recommended reading, not only for animal lovers or law-and-order fans, but simply for sheer suspense.

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Breeding Reptiles & Amphibians

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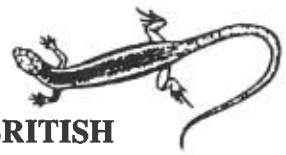

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