ISSN 0260-5805

THE BRITISH HERPETOLOGICAL SOCIETY

BULLETIN

No. 50

Winter 1994

THE BRITISH HERPETOLOGICAL SOCIETY

c/o Zoological Society of London
Regent's Park, London NW1 4RY

Registered Charity No. 205666

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

The Captive Breeding Committee is actively involved in promoting the captive breeding and responsible husbandry of reptiles and amphibians. It also and 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 fulfill 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	(Receive YHC Newsletter)
Bulletin Membership	£12	(Receive Newsletter and Bulletin)
Group Membership	–	For Schools, Youth Groups etc. Contact Education Officer (Address on inside of back cover) for details)

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
Simon Townson and John Spence.
Contributions and correspondence arising from the Bulletin should be sent to:
Dr Simon Townson, 96 The Avenue, Highams Park, London E4 9RB. U.K.

FRONT COVER
Common Frog *(Rana temporaria)*, see article on page 14 by R. Griffiths & S. Raper.

BRITISH HERPETOLOGICAL SOCIETY MEETINGS FOR 1995

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

March 18th	Annual General Meeting; Lee Brady, "Leeches, malaria and cyclones: studying chameleons in Madagascar"; Ian Bride, "The welfare aspect to the retail pet trade in reptiles and amphibians"; Mark Fisher, "Conservation through commercialisation". Birkbeck College, 12-5pm
March 25th	Veterinary meeting; Mark Geach, Stephen Divers and Malcolm Barnicoat, "Screening animals for parasites"; Peter Dansak, "Veterinary survey of reptiles of Round Island". Birkbeck College, 4-7pm.
April 8th	Young Herpetologists Club annual London Zoo Day. Free entry to YHC members, tours of the Reptile House and a range of special displays and celebrity lectures. Advance booking ESSENTIAL. Details from the BHS Education Officer Tel. 01202 692378.
April 8th & 9th	Sand dunes of the Sefton coast. A field trip to see the Natterjacks of Merseyside. For full details telephone Jan Clemans 01203 506416.
May 21st	"Leapers & Creepers" events, organised by Surrey Wildlife Trust, followed by later (7-9 pm) visit to Beam Brook*.

*For those unfamiliar with Beam Brook, this is an old nursery site with a series of small ponds near the village of Newdigate (south of Dorking) in Surrey. Since 1905 it has been home to a variety of both native and introduced species of amphibians and reptiles, and is particularly renowned for its colonies of edible frogs, Italian crested newts and alpine newts. BHS Members may either turn up at 7 pm at the Beam Brook site, or go there following attendance at the "Leapers & Creepers" session that runs through the day and should finish by 5 pm (for more details, contact Julia Wycherley on 01737 643827). There will be no charge for entry, and Members will be allowed to examine and net the various ponds during the visit (but not to take away any animals caught).

For those going directly to Beam Brook, the nursery is situated in Partridge Lane approximately 1 mile due east of Newdigate village (map ref. TQ 216423). It is reached from Newdigate by taking the road leading out to the north-east, which after about a mile turns south-east and becomes Partridige Lane. Beam Brook is signed on the west side of the road.

May 27th	Mark Hewick, "Breeding reptiles commercially for the pet trade". Birkbeck College, 5-7 pm.
July 29th	Paul Eversfield, "Chelonians in captivity". Birkbeck College, 5-7 pm.
August	Family Reptile Holidays in Dorset. Combine your family holiday with field Herpetology and socialize with other members staying at a Field Centre. Events for all the family. Outdoor vivariums on site.

For full details of this BHS event please send a large S.A.E. to the BHS Education Officer, address on inside back cover. Deadline for booking 1st July.

October 7th — (Provisional) Joint BHS/IHS meeting. Dr. Wolfgang Böhme (eminent German herpetologist) and Eugene Blessett (American python/boa breeder). Woolaton Hall Nature Centre, Nottingham.

October 14th — October General Meeting. Stephen Divers, "Mortality and disease of imported royal pythons"; Rob Quest, "Reptile imports"; Mary Swan, "Results from the National Amphibian Survey". Birkbeck College, 1-5 pm.

November 11th — (Provisional) Annual BHS CBC Stock Sale. New Denham Community Centre, Bucks (off M40, J1), 2-6 pm.

Birkbeck College is situated in Malet Street, London, WC1. Nearest tubes are Goodge Street, Russel Square, Tottenham Court Road and Euston Square. Limited free parking in the University of London car park, entrance in Malet Street.

BHS NORTH WEST MEETINGS 1995

April 18th — Reptiles, Amphibians and invertebrates of the rainforest. Ian Wileman.

June 13th — Reptiles and Amphibians of Spain. Bob Worthington.

August 5/6th — Reptile Rally. From 10.30 until 5.00 pm. Exhibition of native and exotic species.

October 10th — Yet to be decided.

December 5th — Yet to be decided.

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

SCOTTISH SYMPOSIUM REPORT 1994

BRITISH HERPETOLOGICAL SOCIETY SYMPOSIUM AT THE BURRELL COLLECTION OCTOBER 23 1994

FINAL REPORT

By any standards this was a major success. We printed 150 tickets and had 29 returned, unsold, therefore we can estimate that 121 people attended. A.S. Mair brought 5 people, the speakers accounts for a further 6 and there were three organisers – so the total audience was 132.

With a two tier pricing system, relying on people's honesty, we could expect somewhere in the region of £605 from ticket sales. In fact the ticket sales amounted to £622, so with sponsorship from A.S. Mairs we collected £722.

LECTURES

All of the lectures were of a good standard and well worth preserving.

CATERING

Despite our frequent warnings, the Burrell staff were ill-equipped to deal with the sudden influx of 130 extra customers. The arrangement for morning coffee was slow, and the service at lunch time caused problems with regards to the running of the afternoon session. This should not go unrecorded. The number of delegates dropped alarmingly after the afternoon tea-break.

We stipulated our requirements for A/V equipment and paid accordingly, however, the Burrell staff were outraged that we had to enter the projection room to operate the equipment! No attempt had been made to explain the security arrangements before the event, consequently we had to break several sacred rules before they could offer some form of compromise. Again, this is not good enough; we are paying for the use of the equipment and if they do not provide the technician to operate it, then they must accept the alternative.

We booked the hall and equipment through the correct channels, but the Burrell staff were, apparently, unaware of the booking *(the presence of the completed booking form came as a complete surprise to The Burrell manager when he discovered it on his desk during my visit prior to the event* – A.D.!) Had we not paid the earlier visit, then the entire event would have been jeopardised.

COSTS

1.	Hire of Lecture theatre and equipment	£175	
2.	Coffee and biscuit	£150	(we are querying this)
3.	Speakers travel costs:		
	Kevin Stevens	£ 50	
	Bob and Val Dvies	£ 50	
	Quentin Bloxam	£220	
	Ron Kivit	£200	
4.	Flowers, gifts for speakers, stamps, posters, etc.	£ 73	
	Total outlay	£913	
	Total income	£722	
	Net loss	£191	

Thanks must go to Mrs P. Darby, "The Linns", Kirk Lane, Blair Drummond, By Stirling, who provided bed and breakfast to Quentin, Bob and Val free of charge.

Two of the speakers cost us more than they had originally intended and this meant that the Symposium ran at a loss. The coffee and biscuits would in future be up to individuals to purchase at their own expense.

PUBLICITY

Every secondary school in Strathclyde and Central Regions was contacted and we did not receive a single request for tickets. The most effective publicity was via *The Daily Record,* with two entries from Richard O'Grady of Glasgow Zoo and the most effective means of selling tickets was by personal approach.

Dave Blatchford contacted about 20 different people within Scotland and the North of England sending maps and posters, but this was not very rewarding.

For future events I suggest we supply key personnel in the target areas and ask them to sell say 10 tickets each. These areas would be:

Glasgow University	Maggie Reilly
Glasgow Vet School	Brendan Godley
IHS	Stephen Winterbotham
A. S. Mair	Willie Jenkins
SHS	Bill Crowe
Fife	Harry Walker (Kirkcaldy)
Cumbria	Brian Ballantyne
North of Scotland	Catherine & Alex Shearer (Skye Serpentarium)
Glasgow	Derek Rintool (Petshop)
Stirling University	Bill Wales
Others	Claire Armstrong

If these areas alone could account for 10 tickets each, then we would have 100 sales.

BRITISH HERPETOLOGICAL SOCIETY ANIMAL HANDLING AND DISPLAY AT EDINBURGH ZOO ORIENTATION CENTRE 29 & 30 OCTOBER 1994

At the invitation of Amanda Alabaster, Marketing Manager of Edinburgh Zoo and, at very short notice, I took a selection of live animals (two young Sinaloan Milksnakes *(Lampropeltis triangulum sinaloae),* four adult Leopard Geckoes *(Eublepharis macularius),* one flap-necked chameleon *(Chameleo dilepis)* and a large male Ornate Horned Frog *(Ceratophrys ornata),* all in plastic *Pals Pens* with granulated corn cob as a substrate), some leaflets, posters and information sent by Colin Fitzsimmons and a selection of Bulletins, YHC Newsletters and Journals.

I had cleared the use of non-zoo animals with Amanda. I had also requested display boards for the posters and these were supplied. We were there from 9.30 a.m. to 5.00 p.m. on Saturday 29 October and 9.30 to 5.00 p.m. on Sunday 30 October.

I took three school pupils, Andrew Steele, Alan Cruse and Fiona Thomas, all pupils at Graeme High School, Falkirk and committee members of the school's Pets Club (Alan and Fiona also came on Sunday). They worked from 8.30 to opening time at 9.00 to get the display ready. The Orientation Centre has AV displays to show the workings of Edinburgh Zoo and serves to introduce the public to the zoo. It is situated in the main entrance to the left and before the ticket sales point. Due to terrible weather, the zoo was not very busy with only about 500 paying visitors on each day. During the day, the three youngsters amended and improved on the display and put notices in the main entrance. This brought in more people. During the day we sold £1.85 of leaflets. On the Sunday, with the introduction of *hard*

sell, the amount raised increased to over £20! On both days we were joined by Kirsty and Tobias Hanning, children of the curator of big cats at the zoo, and live within the zoo. They proved very good at showing how to correctly handle live snakes and lizards, and a letter of thanks was sent to them for all their help.

On Saturday, Dr Bill Wales, treasurer of the BHS Scottish Group came to give a hand. On Sunday, Stuart Donaldson of Dunshalt, Fife and his mother visited the stand and helped for a few hours. Stuart is a member of the YHC.

We were visited by two of the keepers of reptiles, and we also went up and had a look round the breeding house for the reptiles. The work they do is very good, although I was dismayed to see a label on a cage housing a pair of *Phelsuma standingi* decreeing **"all offspring to be destroyed".**

Although the numbers of people visiting the zoo were small, those who did ranged from small toddlers to grand parents. First reactions from young people was mostly of a curious nature, with little fear or revulsion. Older people needed to be persuaded, but many who were there did handle the snakes or geckoes, once they had seen their children doing so. The weekend was very successful and, hopefully, would encourage people to look on reptiles and amphibians more favourably. I am a great believer in *hands on* experience, as pictures and films never manage to demonstrate the *presence* of an animal and what it feels like. It is a pity the weekend was so late in the season, although I found out later that it was part of the Edinburgh Zoo Halloween festivities, with a Halloween walk after the zoo closed on the Saturday night!

Thanks must go to Fiona, Alan, Andrew, Kirsty and Tobias for all their help and enthusiasm and to Amanda Alabaster for supplying us with coffee, tea and biscuits. The Education Centre for providing display stands. Thanks must also go to Bill Wales and Stuart Donaldson, who also brought along some newts. Stuart is running his collection down as he is off to university next session.

A.W. Darby
24 November 1994

MEMBERS' ADVERTISEMENTS

Wanted: 1 male Green Lizard *(Lacerta viridis)* and 1 male Balkan Green Lizard *(Lacerta trilineata)* for breeding purposes. B. Lewis 0843 866053.

For Sale: Juvenile Boa Constrictors, off-spring of a Surinam Red-Tail *(constrictor)* and a Colombian *(imperator)*. Beautifully marked and feeding well. Also an adult male Colombian Boa Constrictor and a juvenile Corn Snake (hatched Summer 1994) available. Can supply frozen rats, mice and pinkies. Tel: Simon Townson 0181 531 1378.

THE PREVALENCE OF GASTROINTESTINAL PARASITES IN A SMALL POPULATION OF CAPTIVE BOAS AND PYTHONS (FAMILY BOIDAE)

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SUMMARY

This paper reports an investigation of the prevalence of helminth parasites in a population of 24 snakes belonging to the family, Boidae. The degree of parasitism was calculated using the McMaster method, and 10 different helminths were identified from the structure of the ova and the host species. Captive bred animals and wild animals that had received effective anthelmintic treatment were discovered to be free from helminth parasitism.

INTRODUCTION

Reptiles are becoming increasingly popular as "pets" and this is paralleled by increased activity of herpetological organisations arranging meetings and events. New publications, especially of a verterinary nature are also becoming available and reflect the increasing likelihood of the veterinary practitioner to be confronted by the reptilian patient. Despite the successful captive breeding of many species of reptiles within the United Kingdom, many are still imported from their country of origin. In particular, due to their docile nature and graceful appearance, the boas and pythons (family Boidae) are amongst the most celebrated and popular of all reptiles. Until recently the major limiting factor for maintaining reptiles in captivity was poor management, however, advances in our knowledge of reptile husbandry (Mattison, 1987; Mattison, 1989; Mattison: 1991), heating/lighting technology and reptilian medicine (Cooper and Jackson, 1981; Frye, 1991; Beynon, Lawton and Cooper, 1992) has greatly increased the health of captive specimens.

Captive breeding of many species is now commonplace with the mass importation of wild specimens no longer required. Nevertheless, due to the cheapness of imported stock the import trade in reptiles is still widespread. In an attempt to identify potential problems facing captive boas and pythons this study investigated the endoparastic status of 24 captive bred and wild caught Boidae snakes.

MATERIALS AND METHODS

As is the case in domestic animals, the diagnosis of helminthiasis is made by the microscopic examination of fresh stools (Thienpont, Rochette and Vanparijs, 1986). In order to obtain faecal material from both captive bred and wild caught reptiles it was necessary to contact several herpetologists and reptile retailers for assistance.

The frequency of snake defecation varies with the size of the snake, size of the prey and the frequency of feeding, and therefore it was necessary to allocate a period of three weeks for the collection of stools from 24 snakes. Fresh stools were collected and securely stored in universal containers. Each container was labelled with the date of collection, and the owner and individual snake were identified by a unique alphanumeric code. This code was cross referenced to a record sheet which recorded

the date of stool collection, the species, age and history of the individual. In order to maintain sample viability for up to three weeks it was necessary to store all collected material at 4°C. All participants received an information sheet which described the methodology outlined above, together with universal containers, printed labels and a faeces collection record sheet.

Coprological examination was performed by the author at the Institute of Zoology's Pathology Department. In order to investigate a helminth burden the faeces were examined microscopically for parasite eggs, with the number of eggs considered proportional to the degree of parasitic burden. To obtain a more quantitiative estimate of infection, the number of helminth eggs per gram of faeces was calculated using the McMaster method (Thienpont *et al,* 1986). A saturated sucrose solution, with a density of 1.50 at 20°C, was used as the floatation medium. From each sample, 2.0g of faeces were suspended in 60ml saturated sucrose solution. To remove the hairs and other large particles of debris, the suspension was straned through a fine wire sieve and the residue pressed out. The suspension was stirred to obtain a completely homogenous mixture of any eggs that might be present. Using a Pasteur pipette, one compartment of the McMaster slide was filled, being careful to tilt the slide to allow any air bubbles to escape. The same operation was repeated to fill the second compartment. The slide was then left to stand for 5 minutes to allow any eggs to float up to the surface of the floatation medium and adhere to the cover glass. Under low or medium magnification any eggs present could be easily observed and readily counted. Each counting compartment contained 0.15ml of liquid and both compartments were counted for each sample. The number of eggs per gram of faeces (e.p.g.) was obtained by multiplying the average number of eggs counted from both compartments by 200.

Samples were also viewed under high power to facilitate identification and, when possible, photography.

RESULTS

All of the snakes examined were considered healthy by their owners and of the 24 faecal samples examined, 12 contained helminth eggs while the remaining 12 samples contained no eggs and were considered to be clear of any obvious helminth infection. This represents a prevalence of gastrointestinal helminth parasitism of 50% for the population of snakes in this study.

Of the snakes that failed to exhibit helminth eggs in fresh faeces, 9 (75%) were captive bred and the remaining 3 specimens (25%) were long term captives that had been treated with the anthelmintic, ivermectin, within the last twelve months. Of the snakes that were found to be harbouring helminth parasites, 10 specimens (83%) were recently imported or long term captives that had not been treated with any anthelmintics. The remaining 2 specimens (17%), an adult D'Alberts Python *(Liasis albertisii)* and an adult Brazilian Rainbow Boa *(Epicrates cenchria cenchria),* were considered by their owners to be captive bred.

Parasite identification was performed by the author on the basis of host species and the genus of helminth reported in the literature to parasitise a particular species of snake host (Kiel, 1975; Frank, 1981; Bernard, 1986; Frye, 1991). In addition to the recognised parasities an interesting pseudoparasite, probably of plant origin, was identified from the faeces of a Brazilian Rainbow Boa, *Epicrates cenchria cenchria* (Plate 1).

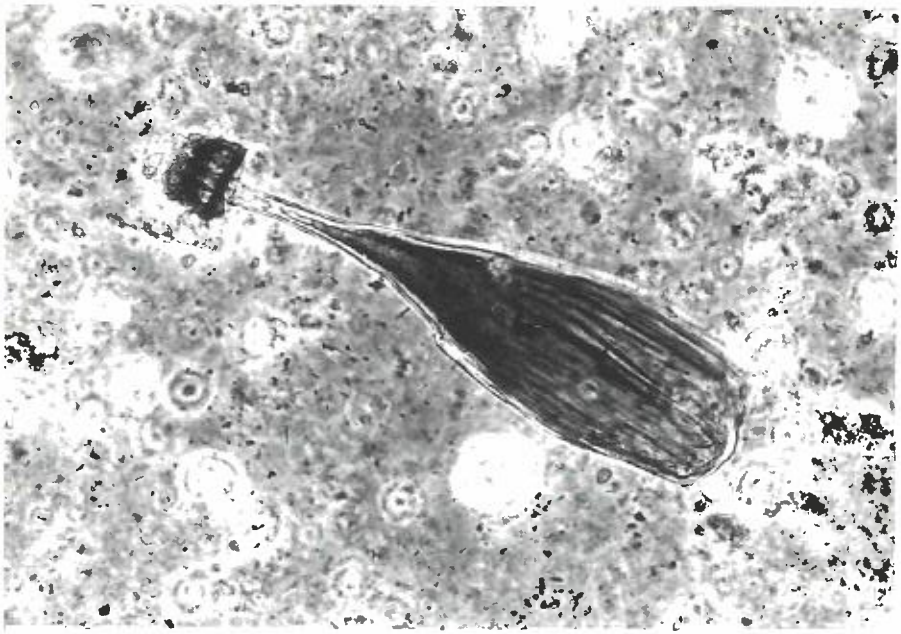

Plate 1. Pseudoparasite (probably of plant origin) from a Brazilian Rainbow Boa *(Epicrates cenchria cenchria)*

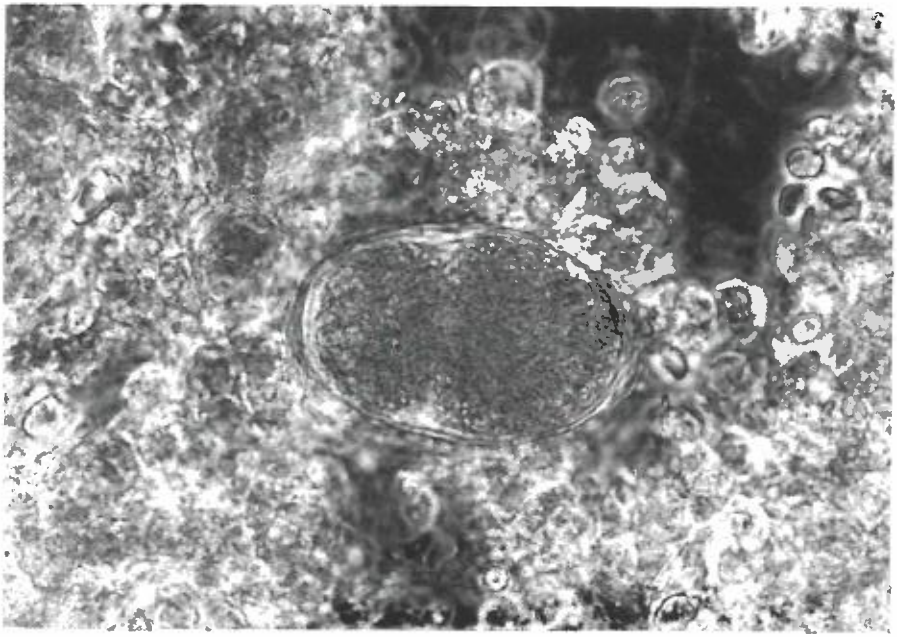

Plate 2. Trematode Ovum (Family Plagiorchiidae) from a **Red-Tailed Boa Constrictor** *(Boa c. constrictor)* X140.

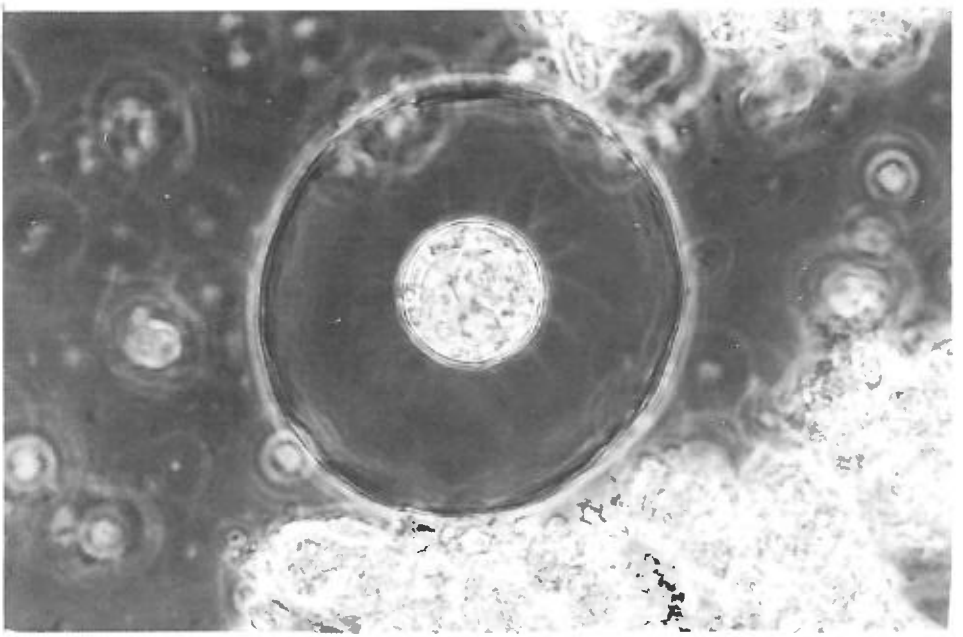

Plate 3. Proteocephalidea Cestode Ovum *(Ophiotaenia* sp) from a Rainbow Boa *(Epicrates c. maurus)* X140.

Plate 4. Spirurid Nematode Ovum *(Dracunculus* sp) from a Brazilian Rainbow Boa *(Epicrates c. cenchria)* X70.

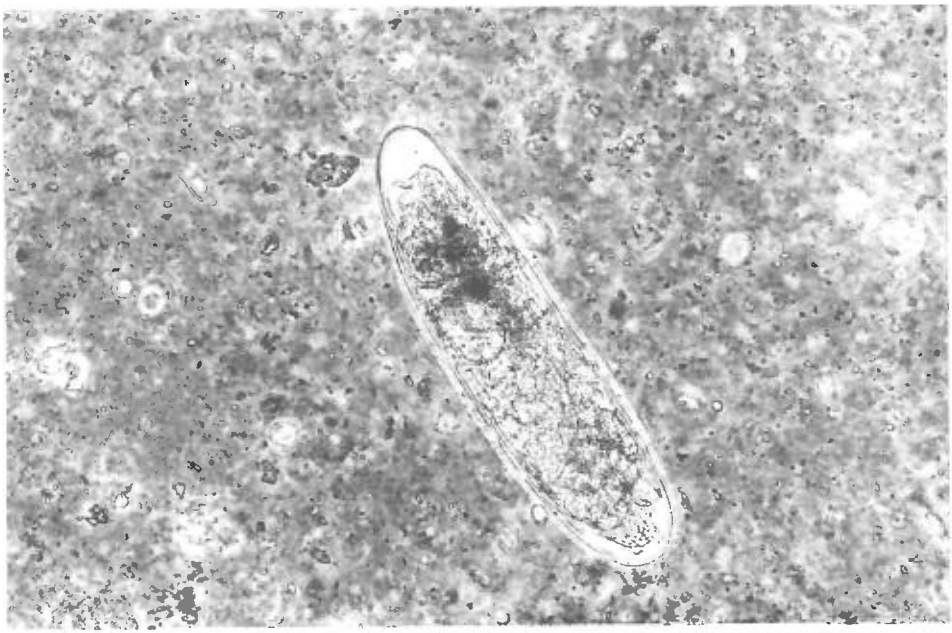

Plate 5. Oxyurid Nematode Ovum *(Spironoura* sp) from a D'Alberts Python *(Liasis albertisi)* X70.

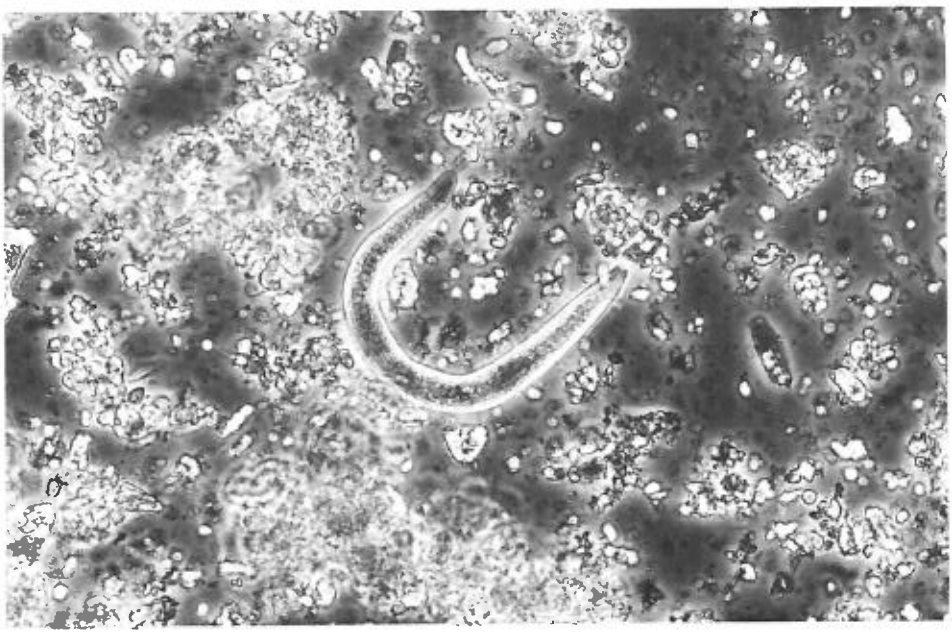

Plate 6. Strongylid Nematode Larva *(Kalicephalus* spp) from a Blood Python *(Python curtus)* X70.

For a fuller description of the parasites identified, including life-cycle, epidemiology, pathology, diseases and tretments, the reader is directed towards the comprehensive literature on reptilian parasitology (Kiel, 1975; Frank, 1981; Barnard, 1986; Frye, 1991; Bone, 1992).

Table 1. Helminth Eggs Identified from the Faeces of Boas and Pythons

ID Code	Species of Snake	Helminth Parasites Identified	Eggs per gram of faeces
PO8	*Boa constrictor constrictor*	Cestodes; *Ophiotaenia* sp. Nematodes; *Ophidascaris* sp.	650 950
P10	*Boa constrictor constrictor*	Trematodes; *Plagiorchiidae* sp. Nematodes; *Ophidascaris* sp.	275 750
B01	*Epicrates cenchria cenchria*	Nematodes; *Ophidascaris* sp. Pseudoparasite (plant origin)	3100
BO4	*Eryx colubrinus loveridgei*	Nematodes; *Hexametra* sp. *Spironoura* sp.	950 850
R13	*Python molurus bivittatus*	Nematodes; *Ophidascaris* sp.	250
R14	*Liasis albertisi*	Nematodes; *Ophidascaris* sp. *Spironoura* sp.	1200 700
R15	*Boa constrictor constrictor*	Nematodes; *Dracunculus* sp.	400
H02	*Python molurus bivittatus*	Nematodes; *Capillaria* sp.	450
	Python molurus bivittatus	Nematodes; *Capillaria* sp.	350
H06	*Boa constrictor imperator*	Nematodes; *Capillaria* sp. *Ophidascaris* sp.	250 200
V04	*Python curtus*	Nematodes; *Hexametra* sp. *Kalicephalus* sp.	450 275
V08	*Epicrates cenchria maurus*	Cestodes; *Ophiotaenia* sp. Nematodes; *Ophidascaris* sp. *Capillaria* sp. *Drancunculus* sp.	250 1000 550 275

DISCUSSION

Helminth identification was made on the appearance of the egg and their host species distribution (Kiel, 1975; Barnard, 1986; Frye 1991). In most cases identification of the family and genus was possible, but species identification was not attempted due to the taxonomic difficulties involved.

All of the reptiles that were found to harbour helminth parasites had low/medium egg counts and appeared to their owners to be healthy. No specimen exhibited a significantly high level of helminth parasitism as determined by the faecal egg counts. The lack of obvious disease amongst the afflicted individuals is attributable to the ability of wild reptiles to withstand a low degree of parasitism. In captivity improper husbandry, inadequate hygiene and "captive stress" can significantly depress this ability and result in disease (Frank, 1981; Frye 1991). For example, *Kalicephalus* sp is the principal strongylid nematode of snakes with the transmission of infective third stage larvae by drinking and through skin penetration. If maintained in humid and dirty conditions, larval numbers can build up with massive skin penetration, secondary bacterial infection, and focal dermatitis. The majority of helminths have indirect life cycles and require an intermediate host, however certain nematodes may have a direct life cycle and therefore overcrowding and poor hygienic practices can result in a multiplication of infection and very large burdens and possibly obstruction of the gastro-intestinal tract. On the basis that captive bred reptiles fail to become infected by the vast majority of helminths due largely to lack of contact with intermediate hosts, specimens R14, an adult d'Alberts Python *(Liasis albertisii),* and B01, an adult Brazilian Rainbow Boa *Epicrates c. cenchria)* must have their captive-bred status questioned. On further investigation, the Brazilian Rainbow Boa was imported from an unknown origin in the U.S.A., and therefore its captive bred status is difficult to verify.

CONCLUSIONS

This investigation demonstrates that wild caught and imported snakes are commonly infected with various species of helminth parasites, but captive bred snakes or wild caught specimens treated with an effective anthelmintic, such as ivermectin, can be clear of helminth parasitism.

Snakes can play host to a wide variety of helminths from all the major groups (cestodes, trematodes and nematodes), but individuals can appear healthy if the level of parasitism is low and the captive husbandry is adequate. On the basis of this study, captive bred boid snakes, being less likely to carry helminth parasites, are to be preferred over wild caught specimens as captives. On those occasions when wild caught boids are presented a faecal examination and appropriate treatment performed by a veterinary surgeon should be sought, even if the snakes appear healthy.

The cost of a faecal examination and effective worming is likely to be in the range of £10-£20 for a medium to large boid. Furthermore, a snake that has been wormed, kept in a clean vivarium and isolated from any unwormed snakes is likely to remain free from helminth parasites once treated. Considering this with the fact that certain metazoan parasites, namely the pentastomes, can potentially infect humans, it becomes clear that the costs of worming are relatively small compared to the long term health benefits available to both the snake and its owner.

ACKNOWLEDGEMENTS

The author is indebted to Howletts Zoo Park (near Canterbury, Kent), The Reptile House (London Zoo, Regent's Park, London), The Vivarium (55 Boundary Road, London E17), The Reptile-arium (Culvers Nursery, Enfield), and several BHS members for providing material. In addition, the author would like to thank Mr. Andrew Cunningham (Pathology dept., Institute of Zoology, London) for providing laboratory facilities and equipment and Ms. Angie Poole (Anatomy Dept., Royal Veterinary College, London) for developing and printing the photographs.

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HOW MANY CLUMPS ARE THERE IN A MASS OF FROG SPAWN?

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INTRODUCTION

The Common Frog is an explosive breeder with all spawn being laid within about ten days at any one site (Smith, 1969; Reading, 1984; Beebee, 1986; Ryser, 1989). A convenient and widely used method for estimating the size of a common frog population involves counting the number of spawn clumps laid, soon after breeding is over, as each female lays one clump of eggs, the number of clumps gives a reliable estimate of the number of female frogs in the breeding population. However, there are two problems with using this method. Firstly, after breeding has finished the spawn clumps tend to coalesce into a single spawn mass. This makes distinguishing individual clumps difficult. Secondly, what constitutes a 'single clump' in a spawn mass may depend upon prior knowledge of how large an individual clump actually is. Estimates of the number of clumps in a mass by inexperienced field workers may therefore be unreliable.

As part of a wider study to evaluate survey methods for the British amphibians, we have (1) compared the reliability of spawn clump estimates by 'trained' and 'untrained' observers; and (2) developed a simple method for estimating the number of clumps present based on the area covered by the spawn mass.

METHODS

Recorder Variability

In mid-March 1994 sixteen surveyors independently estimated the number of frog spawn clumps in a spawn mass at Beverly Farm Pond on the University of Kent campus. The surveyors were divided into two groups; one group (n=7) consisted of 'trained' surveyors, while the second group (n=9) comprised 'untrained' surveyors. The 'trained' surveyors were all given a two-minute explanation of how to conduct a spawn clump count at the pond. This consisted of a demonstration of how to separate clumps within the mass, and what a single clump looked like. The 'untrained' group were given no briefing, and consisted of individuals who had never attempted a spawn clump count before.

Estimating Spawn Clumps

The number of spawn clumps deposited at each of eighteen ponds in Kent was counted between 4 and 18 March 1994 by an experienced surveyor (one of the authors). For most sites the date of counting was between seven and ten days after spawn deposition. At the same time the area covered by the spawn clump mass was determined. This was done by measuring the dimensions of the mass with a tape measure or ruler, and estimating its area by equating it to the most appropriate shape (i.e. circle, oval, rectangle, triangle etc.). Regression analysis was used to determine the relationship between the number of clumps and the spawn mass area.

RESULTS

Recorder Variability

All of the trained individuals gave very precise estimates of the number of clumps in the mat, which had a mean of about 33 (Table 1). The untrained group, however, gave much more varied estimates of the number of clumps, with a lower overall mean.

Table 1

Comparison of estimates of the number of frog spawn clumps in a mat by 'untrained' and 'trained' surveyors. C.V.; coefficient of variation.

Untrained group	Trained group
37	33
32	34
8	33
38	33
10	34
9	31
48	33
31	
33	
n=9	n=7
mean=26.0	mean=32.8
SD=16.60	SD=1.09
C.V.=63.8%	C.V.=3.3%

Estimating Spawn Clumps

The number of clumps at the eighteen sites varied between 1 and 160, corresponding to areas of 0.12 m^2 and 2.26 m^2 respectively. There was a strong linear relationship between the two variables, which was highly significant (Fig. 1; $F_{1, 16} = 277.8$, P 0.001, $R^2 = 94.6\%$). Thus the number of clumps laid, and thereby the number of breeding females, can be predicted with a high degree of accuracy from measurements of spawn mat area.

DISCUSSION

There is clearly a source of considerable error in determining spawn clump number, and hence the number of females in the population, if the surveyors are inexperienced. Providing even brief guidelines on how to estimate spawn clumps can result in a much more precise determination of the number present. If surveyors are inexperienced, or uncertain how to count clumps, the number present may be detemined by measuring the area of the spawn mass and reading off the corresponding number of clumps using Fig. 1.

It is important to realise that spawn clump counts can only yield estimates of the number of breeding females. In some populations female frogs may not breed every year (Ryser, 1989), so the total female population may be larger. Estimating the number of males in a population may also be a problematical. Although some observers have found a sex ratio near to unity (Smith, 1969; Cooke, 1975; Griffiths *et al.*, 1986), others have observed a male-biased sex ratio (Oldham, 1963; Hazlewood, 1969; Ryser, 1989). Extrapolating spawn clump counts to actual population size therefore requires knowledge of the adult sex ratio.

If spawn clumps are to give a reliable estimate of the number of females in a population they must be counted after all females have spawned but before eggs have hatched. The map provided by Cooke (1976), and reproduced in the BHS leaflet *Surveying for Amphibians,* gives a useful guide to spawning times across the country. Peak spawning activity usually occurs about four or five days after the first clump has been laid (Reading, 1984; Beebee, 1986). However, the spawning period may be interrupted or prolonged by flooding or cold weather (Cooke, 1982), and this should be taken into account when deciding the best time to conduct a count.

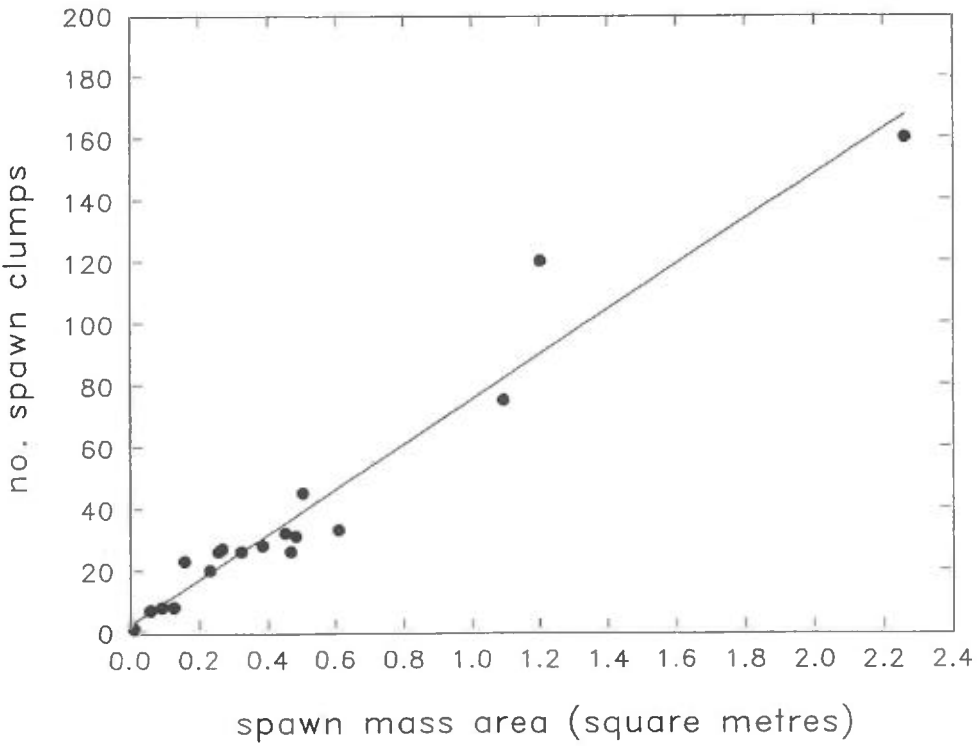

Fig. 1. Linear regression of the number of clumps in a spawn clump mass on the surface area of the mass. Regression line has been fitted using the equation: y=2.27+73x.

Clumps of eggs which are a few days old often have a covering of algae, and are readily distinguished from fresh clumps, which have an unswollen, 'cleaner' appearance. fresh clumps will absorb water and swell within a few days, and time should be allowed for this to occur before performing a spawn count.

ACKNOWLEDGEMENTS

We are indebted to the DICE students who acted as 'guinea pigs' for this project; to Leigh Gillet for suggesting suitable field sites; and to Lee Brady for assistance with the field work. This work was funded by the JNCC for whom S. D. Gibson was the nominated officer.

Plate 1. How many clumps?

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CLEOPATRA'S ASP

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Although most people know that Cleopatra died from the bite of an 'asp', there has not been agreement as to which species of snake that was. The name asp is today applied both to the Egyptian Cobra *(Naja haje)* and to the Saharan Horned Viper *(Cerastes cerastes).* The snake which Cleopatra applied to her bosom after having 'pursued conclusions infinite of easy ways to die' could, therefore, have been either of these species, or perhaps the Common Sand Viper *C. vipera* of North Africa.

Cleopatra VII was co-ruler of Egypt with her brother Ptolemy XIII from 51 B.C. until he ousted her in 48 B.C. Restored the following year by Julius Caesar, she accompanied him to Rome, returning to Egypt after his assassination in 44 B.C. Here she met Mark Antony, who abandoned his wife Octavia in order to live with her. The two were defeated by Octavian, who later became the Emperior Augustus, at the battle of Actium in 31 B.C. and both committed suicide in 30 B.C. Shakespeare's reconstruction of their story follows the romantic account in Plutarch's *Parallel Lives.*

During the late 17th Century a lively controversy revolved around the nature of the viper's bite. According to the famous Italian biologist Francisco Redi, its dangerous effects were caused by the yellowish fluid that flowed from the fangs. On the other hand, M. Charas, a French chemist, ascribed it to the snake's 'enraged spirits'. The latter view was the more popular and, in the final scene of *Antony and Cleopatra,* Cleopatra says to the asp:-

> 'With thy sharp teeth this knot intrinsicate of life at once untie.
> Poor venomous fool, Be angry, and dispatch . . . . '

Redi's opinion was based on scientific experiment and eventually prevailed. Charas was not completely wrong, however, for an irate snake usually injects more venom than does one whose anger has not been aroused. About the same time Edmund Spenser, the English poet, wrote of '. . . the stings of aspes that kill with smart'.

After the death of the Queen, one of Caesar's guards in *Antony and Cleopatra,* who made an examination of her apartments, exclaimed:-

> 'This is an aspic's trail, and these fig leaves
> Have slime upon them such as the aspic leaves
> Upon the caves of Nile.'

In this, Shakespeare introduced a common error of his day – that snakes were slimy: but a cave seems to be a more likely habitat for a cobra than for a desert viper. Moreover, the cobra was a symbol of royalty in ancient times and, during the Greco-Roman period, was used for the execution of favoured criminals. This is further evidence in support of the hypothesis that Cleopatra's asp was a cobra.

Bites by vipers are followed by severe pain and swelling in the region of the injury. Blood-stained serum may ooze from the fang marks and enter the subcutaneous tissues causing discolouration of the skin. Clotting of the blood is inhibited so that there may be haemorrhage of the lungs or intestine, and the patient coughs up blood or passes it through the rectum. Small purple spots often appear beneath the skin

where the blood has leaked from damaged vessels. Later, areas of tissue become gangrenous and are sloughed away. When death occurs, it is usually due to failure of the heart or respiration. Although cobra venom not infrequently also causes severe local damage, there is little pain at the site of the injury. That is why criminals who were executed by the bite of a cobra were regarded as receiving a 'favour', and Cleopatra is more likely to have chosen a cobra than a viper as the instrument of her death.

The venoms of most snakes contain a variety of both neurotoxins and blood poisons, but the former tend to predominate in Elapidae, the latter in Viperidae. Moreover, neurotoxins may also act on the blood system, while blood poisons can have side effects on the nervous system, so that the effects of both are complicated. Nevertheless, muscular weakness, as well as depression of the breathing and of the heart, are more characteristic of the effects of elapid venom, and death usually follows much sooner than in the case of viperid poisoning. Finally, the Egyptian Cobra is much larger and produces more venom that does the Horned Viper. Consequently, its bite is the more likely to be fatal – an important consideration to anyone determined to die.

THE CONSERVATION OF THE ENDEMIC GRASS SNAKE *NATRIX NATRIX CYPRIACA* IN CYPRUS

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INTRODUCTION

A pattern affecting historical extinctions for birds and mammals is that they are concentrated on islands (Diamond, 1984). For birds, 171 species and subspecies have gone extinct since 1600, and over 90% of these extinctions have occurred on islands. For mammals out of 115 documented historical extinctions, 36 percent of these have occurred on islands. Although reptiles have lower rates of extinction than birds or mammals (Case and Cody, 1987), similar pattern of extinctions are observed for them as well (Case *et al.* 1992).

This pattern is in part an unsurprising consequence of island populations. They are small and isolated; thus they cannot recover from local extirption following environmental pertubations or long-term climatic changes by immigration from other areas (MacArthur and Wilson 1967; Leigh, 1981).

Cyprus is the third largest island in the Mediterranean, with an area of 9,251 km^2. It is a 15 million year old island of oceanic origin which has never been connected to the mainland (Boekschoten and Sondaar, 1972). As a result, all terrestrial mammals or reptiles of the Pleistocene or later date would have had to reach the island by swimming, drifting on floating vegetation or wood, or to have been imported by humans.

Cyprus has a rich endemic fauna, but similar to many other islands, also a high rate of extinctions. Twelve of the 21 recorded mammalian taxa are extinct, including 60% of the endemic species and 20% of the subspecies (Hadjisterkotis and Masala, in preparation). Four avian taxa are extinct of which one was considered by some authors as endemic (Flint and Stewart, 1983). No extinct reptiles are known in Cyprus, although the endemic Grass Snake *(Natrix natrix cypriaca)* was considered as extinct since the 1960s (Teschner *et al.* 1992). Presently, this snake is an isolated endangered species. In this note we review the status of this snake, present some factors which might be limiting for the population, and suggest measures for its conservation.

THE HISTORY OF THE GRASS SNAKE IN CYPRUS AND ITS LIMITING FACTORS

There is only one endemic species of snake on Cyprus *(Coluber cypriensis)* which is rare (Schätti 1985), and only one endemic subspecies, the Cypriot Grass Snake. The Grass Snake, was first mentioned as (water-snake) by Dr. J. Sibthorp, who visited Cyprus in 1787 (Cobham 1908). Boulenger (1888) in his list "On Reptiles and Batrachians from Cyprus" lists the Grass Snake as *Tropidonotus natrix.* This snake was not common in Cyprus, however it was believed that after the early 1960s

it was extinct. A recent literature review on this snake since 1930, was presented by Teschner *et al.* (1992) after the rediscovery of the snake.

The Cypriot Grass Snake presents an amazing variety in colour patterns in what seems to be a mixed population. Although more research is necessary it seems that the genetic (type) composition of this population is unique and must be an endemic species or subspecies of *Natrix natrix*. It is certain that this population is of much scientific interest and more research is necessary to understand its taxonomic status (Teschner *et al.* 1992). However, the major problem which this snake is facing is extinction. The population is estimated to be at least 80 individuals and is restricted to a single artificial dam. The estimate was based on the number of snakes seen by walking around the dam, and might be underestimated. The area of this dam is 9,600m^2, and is 46 m deep. Searches by the junior author at nearby dams during the last two years had negative results. Also, from 1985 to 1989, during Ph.D. research on the Cyprus mouflon by the junior author at Paphos Forest, he had the opportunity to walk across the river beds of several valleys while searching for mouflon carcases. These were the valleys Limnitis, Koufoplatanos, Stavros tis Psokas, Ayia and Sarama. During these walks no Grass Snakes were observed.

A danger that this snake might face in its habitat is predation from the introduction of trout (*Salmo* spp.) into the dam by the Fisheries Department to "improve" local fishing. Trout are regular predators on snakes particularly on juveniles and are a major threat for Grass Snakes (Bohme, personal correspondence). Endemic island species are vulnerable to extinction, because they have been isolated on islands lacking predators for long periods of time and have presumably become relatively defenseless to introduced predators (Case *et al.* 1992).

Introduction of non-native fishes and invertebrates to "improve" local fishing has been a worldwide phenomenon for well over a century (Courtenary and Stauffer 1984; Moyle 1986). Introduced fishes occasionally replace native species in natural habitats through competition or predation, but most replacement occurs in altered environments that provide the introduced fishes an ecological advantage.

Trout fishing is a popular sport in Cyprus, and is the attraction of a large number of fishermen to the dams. Cypriots recognize the ecological importance of snakes, however, most of the people believe that only black snakes are not poisonous. As a result they tend to kill any snake which does not look like a *Coluber jugularis*, i.e., is not completely black. As a result many fishermen who might encounter a Grass Snake at the lake throw stones at it trying to kill it.

The conservation of this small and isolated population of endemic Grass Snake is a must, so we will not be responible for the loss of another island species.

SUGGESTIONS FOR CONSERVATION

The continued existence of this rare aquatic snake will depend on the establishment of aquatic areas managed specifically for their endemic reptilian resident, free from introduced non-native fishes.

No more trout should be introduced into the dam inhabited by Grass Snakes, and the existing fish should be removed.

All fishing activities in the area should be forbidden in order to keep people away from the dam.

A leaflet should be published by the Department of Fisheries of Cyprus informing people about the existence of Grass Snakes in the dams of Cyprus. This leaflet should be given to the fishermen together with their fishing license, informing them that these snakes are not poisonous and that they should be protected.

A number of Grass Snakes should be transferred to nearby dams in order to establish new populations.

Water quality should be monitored to avoid negative effects from pollution on the snakes, or on the frogs *(Rana ridibunta)* in the area, which is the main food item of this serpent.

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THE AUSTRALIAN STONECROP *CRASSULA HELMSII* PROBLEM

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B.H.S. Librarian

Further to the reference to New Zealand stonecrop in the B.H.S.C.C. 'A policy on the translocation of the Common Frog', *B.H.S. Bull* 46. p. 32, several members have requested information on what this plant looks like. In some parts of the country it has become a major problem for aquatic and adjoining ecosystems. The following information has been produced from information provided by Dr. F.H. Dawson, mainly from (Dawson & Warman, 1992) the English Nature/Institute of Freshwater Ecology leaflet *'Crassula helmsii* Focus on Control'. For persons already with the plant in their ponds the leaflet has a section on control methods, these are out of the scope of this article.

It seems likely that there has only been one introduction responsible for this widespread invasion as there is very little morphological variation in Britain when compared with the range of forms seen across Australia. The plant does not seem to support aquatic invertebrate life as well as the native species so a monoculture of this species is detrimental to the overall species present.

I have noticed that ponds which have the tendency to dry out seem to dry out quicker when they become subject to *Crassula* invasion, this could possibly be due to water loss by transpiration from the mass of leaves at the surface being faster than simple evaporation from the water surface.

The plant has already been accidentally introduced into a B.H.S. reserve pond for Natterjack Toads, it is thought by a member on mud on his wellington boots and has now spread to three other of the reserves ponds so one has to be extremely vigilant. Herbicides have been tried without success, growth is checked but the plant has not been killed. In Dawson (1994) he states 'Causes of expansion and invasion by this plant include (i) human activities, e.g. transfer on fishing nets, during transfer of fish, emptying aquaria, botanists and zoologists during surveys and pond clearance; and (ii) movement of wildlife, e.g. ponies in the New Forest and southern England. Passive drift has occurred along canals and drains, but not yet along rivers'. In the Summary he states 'The present distribution based mainly upon information from vice-county recorders indicates that the spread of the plant has been less from natural factors, e.g. animals, than from human activities. There have been deliberate introductions although passive distribution with other water plants, recreational and associated activities, particularly fishing and fish transfer, and the reintroduction of amphibians and reptiles seem to be common, albeit nearly unconfirmable, modes of spread'. Perhaps this article may reduce the spread by some humans, those of the B.H.S.

INTRODUCTION

Crassula helmsii (T. Kirk) Cockayne, Australian Swamp Stonecrop, often known as *Tillaea recurva* to the water gardener or aquatic supplier, is a plant native to Australia and New Zealand which has rapidly expanded its distribution in Britain over the last two decades.

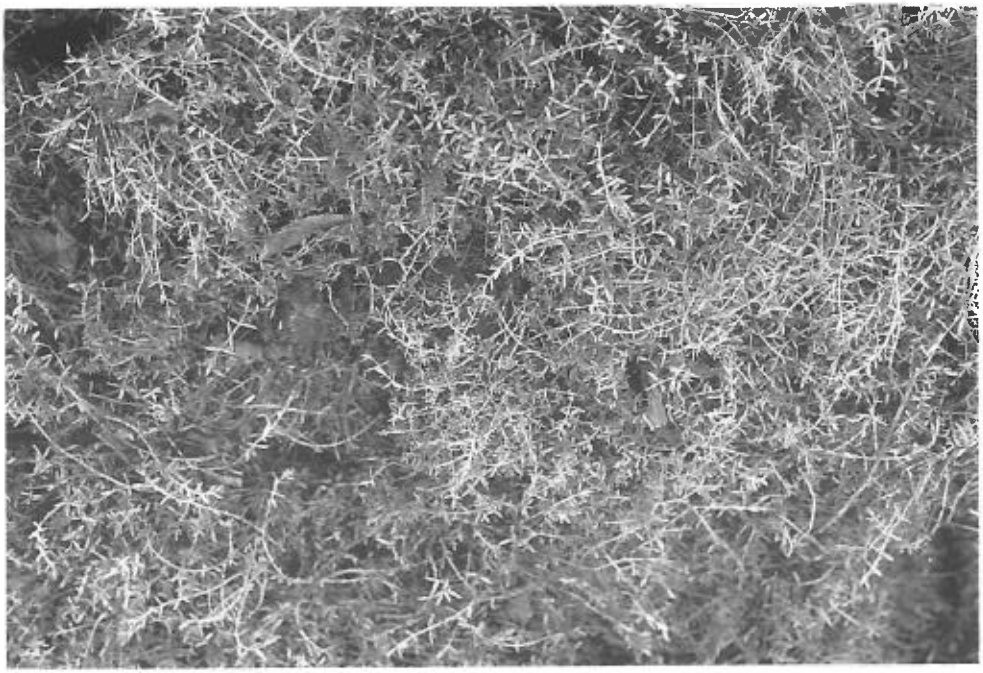


Plate 1. *Crassula helmsii* from drying pond. New Forest

Plate 2. *Crassula helmsii* with flowers. New Forest.

Plate 3. Dry pond showing covering of *C. helmsii.* New Forest

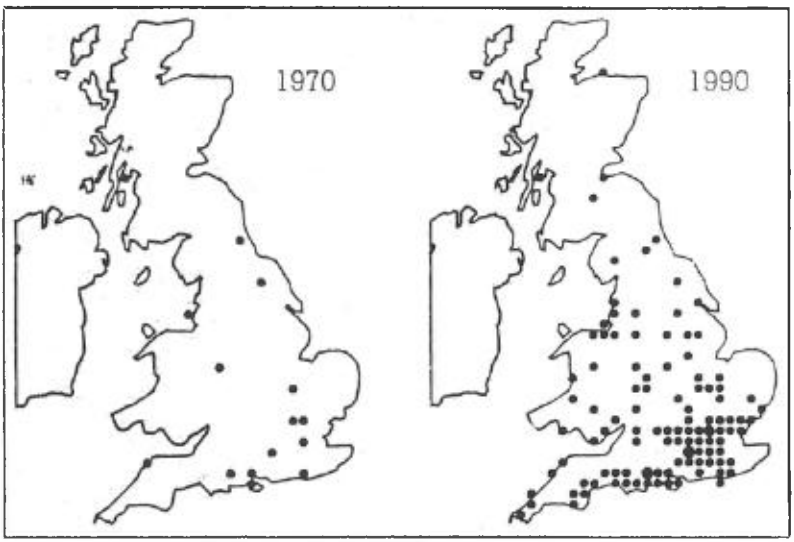
Since its initial invasion of Britain, this alien species has rapidly increased its distribution and by October 1991 had invaded c. 320 aquatic areas with the frequency of new sites being invaded still doubling about every two years. There are basically two forms of invasion; first that of a new site in a region or super county, secondly by a more local spread from established sites. This local or secondary invasion phase seems to take place rapidly and is well illustrated by the increasingly rapid spread of *Crassula* in the New Forest in Hampshire in the last 11 years following its availability at aquatic centres.

Primary introduction probably results from a wide range of human activities associated with water, including water gardening and fishing, whilst secondary introduction may also involve transfer by wildlife. Primary introduction has been accelerated because *Crassula helmsii* is generally available from aquatic centres as an 'oxygenating plant' for ponds, whilst secondary introduction has been aided by the high viability of extremely small fragments which can be transported with mud or by wildlife to establish themselves at new sites.

Much of the success of *Crassula helmsii* in any one situation related to its vigorous growth which continues throughout the year without a die-back period during winter, and to its ability to colonise a variety of different habitat types. *Crassula helmsii* has been found in acid to alkaline waters of ponds and lakes; experimentally it will grow well in flowing waters and it is also known from semi-saline sites. It has also been recorded growing on damp ground from above 0.5 metre above water level and to water depths of over 3 metres.

Unfortunately *Crassula helmsii* does not appear to be just another invading aquatic plant, since it is quickly able to dominate aquatic areas, outcompeting native species. No site once dominated has returned from near total dominance.

From this evidence it is important that the spread of this plant should be restricted and indeed halted as soon as possible.

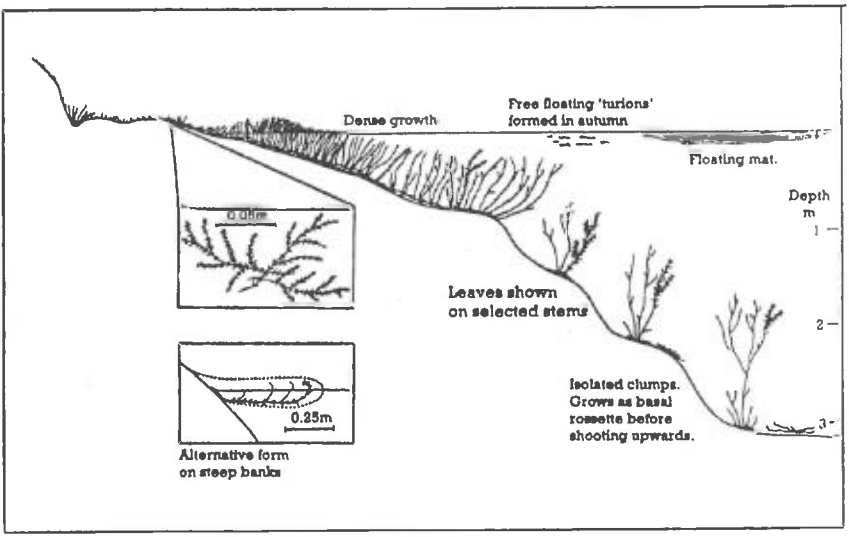


Increased recorded incidence of *Crassula helmsii* over 20 years

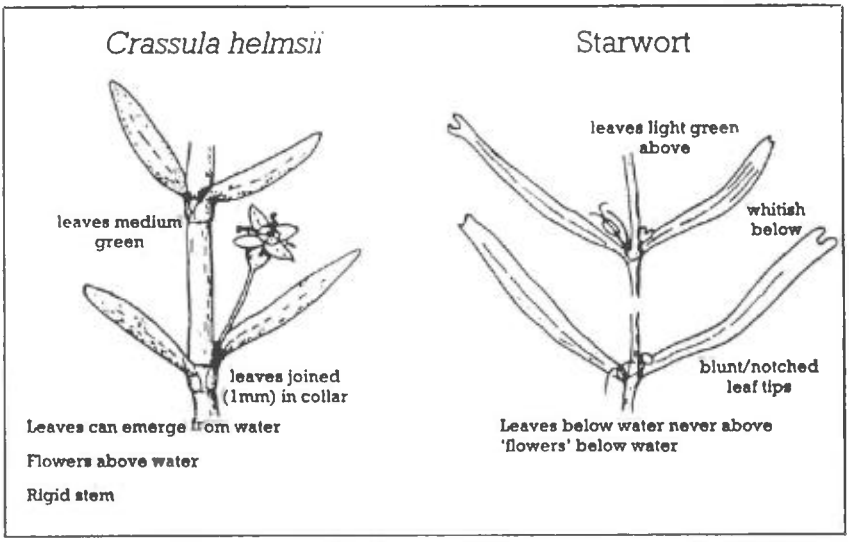
IDENTIFICATION

Crassula helmsii can be found in the field, growing on damp soil in or near water as short dense stands, mid to yellowish-green and succulent-like in appearance, or underwater in loose stands reaching the surface.

The stems have pairs of unstalked opposite leaves (4-24 mm) borne on rigid stems. The aerial flowers are small and white with 4 petals on short stalks arising singly at leaf axils in summer. The joining of the leaf bases into a c. 1 mm collar is a distinctive characteristic and allows the plant to be readily distinguished from other species, such as *Callitriche* spp. or Starwort, especially in their underwater forms. The leaf shape is simple and varies from long narrow near paralle, to very slightly elliptical with sharp or bluntish tip. The leaf tip is particularly useful in distinguishing the underwater form of the plant from *Callitriche* spp. which has notched leaf tips.



The growth form of *Crassula helmsii* in physically different situations



The distinguishing features of *Crassula helmsii* and Starwort.

CONTROL

Identification is an important first step in developing a control strategy and if there is any doubt over identifiction, information should be sought from the addresses given later. If samples are sent they should be dried and stored on herbarium-style sheets or may be sent by first class post, clearly labelled *'Fresh material. Store cool'*.

Any confirmed occurrence should be notified to one of the addresses overleaf.

Apart from identifying the presence of *C. helmsii* it is also important to identify any associated flora, in order that adequate precautions can be taken to safeguard particularly important or vulnerable species.

GENERAL POINTS

Remove fragments from boots and other equipment *before* leaving a site. All treated areas *must* be monitored by carefully examining several small areas for developing shoots or small buried rhizomes, looking both within the area previously occupied by the plant and within *adjacent* areas. Monitoring should be continued at *quarterly* intervals for up to *5 years* following apparent elimination of *Crassula helmsii* (no elimination has so far been fully successful).

FUTURE

An important element in the success against *Crasssula helmsii* will depend on the recording and monitoring of its spread, and of attempts to eradicate it. It is therefore important that any new occurrences are registered with either the IFE or the Biological Records Centre and that any observations regarding control methods are reported.

Contact for identification, technical advice and notification of occurrences:

Dr. F. H. Dawson
Institute of Freshwater Ecology
River Laboratory
East Stoke
WAREHAM
Dorset BH20 6BB
Tel. (01929) 462314

Alternative contact for identification and notification of occurrences:

Biological Research Centre
Institute of Terrestrial Ecology
Monks Wood Experimental Station
Abbots Ripton
HUNTINGDON
Cambs PE17 2LS

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THE SUCCESSFUL KEEPING AND BREEDING OF *ANOLIS CAROLINENSIS*

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INTRODUCTION

Anolis carolinensis is frequently seen in pet shops which sell reptiles. Anoles are easy to keep and breed, with the added bonus of very interesting, even entertaining, behaviour. They originate from Florida in the U.S.A. and are subtropical in their requirements. Their colour is usually green if conditions are correct and the lizards are not feeling stressed. They will turn brown under other conditions – it is an interesting aspect of their behaviour to see how normal fluctuations in conditions affect them (NOT experimenting on the lizards). Even though there has been a lot of research on anoles there is nothing quite like finding out for yourself.

Males are approximately 15cm long and are larger than females. Males also have larger heads, which seem disproportionately large if you are used to some lizards like lacertids, and slight swellings at the base of the tail near the vent indicating the reproductive organs. When a male spots another male (or a mirror held nearby!) he lowers a relatively large bright pink "dewlap" and bobs his head furiously. Within a minute or two his colour turns dark brown, with angry very dark brown patches behind the eyes. He also erects a small "crest" on his dorsal neck surface. Females also have these dewlaps and will display at males or females; however, their dewlaps are smaller and less pink. The lizards are streamlined, very agile and able to shin up most surfaces, including glass, having adhesive toe pads as well as claws. In many ways they are a "poor-mans" equivalent to day geckos in terms of price and colour, except of course that they are Iguanids (Family Iguanidae), not geckos, and have much more interesting behaviour.

VIVARIUM

There are many possible ways of housing these lizards, below is a diagram of the set-up which I have used this year. I obtained two females and one male in the spring of 1994. Males will display and fight in small vivaria continuously females are not as competitive with each other. It is very important that anoles are very healthy when bought. They must NOT be bony, especially the hips. They are so cheap that veterinary care is not an economic option. I found that they took a few days to settle in and start feeding.

LIGHTING AND HEATING

UV light is essential. I keep UV light on all day all year round.

Summer: 12 hours light (low wattage light bulb and UV light)

Autumn and winter: Reduce time to 8 hours UV light and use a red light bulb which is thermostatically controlled to prevent vivarium from falling below about 15°C. I have found that temperatures below over long periods of night seem to be unappreciated by the lizards and they stop feeding and get out of condition.

Spring: Build up time back to 12 hours and about March/April go to the Summer regime. I reduce the time in the winter to assist next years breeding cycle but I am not sure if they could be kept all year round at the same photoperiod and still breed. My instincts tell me not.

All these figures are only my experience that there may well be better combinations.

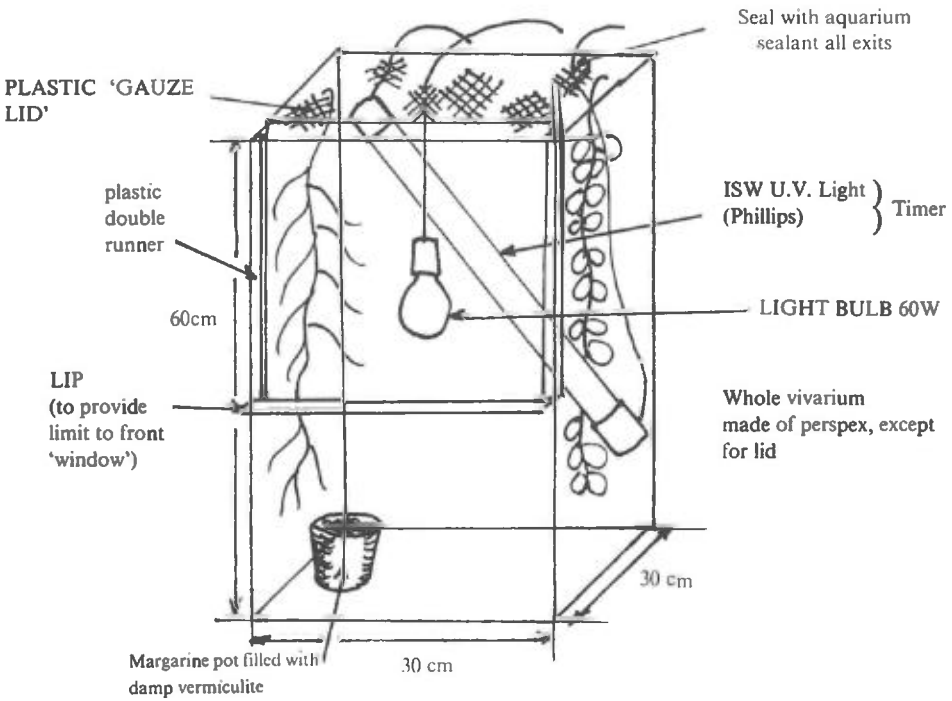

Fig. 1. For adults 1 male/2 females

FEEDING

a) Adults

I have fed the adults on crickets, insects and spiders caught by "beating bushes" with a stick with a bowl held beneath (bramble and holly are especially good for this), bluebottles (their favourites) and waxworms. Like many lizards they get fed up with eating the same food all the time. Food should be offered every day during the summer, but their appetite falls off during the autumn and winter but not completely if the temperature is maintained. I shake bought food in powdered cuttle fish bone. UV light is essential for effective breeding. I haven't ever found them interested in anything other than live food, but apparently some people have found they like fruit or even meat if waved in front of them. Personally I see little point in trying to get them to eat food which they will not take readily when there are other foods which they will!

b) Young

Fruit flies at the very start, sweeping from bush beatings as often as possible, baby crickets, small flies, micro-waxworms.

BREEDING

As in most lizards a period of less light and lowered temperatures are probably required, along with good feeding and plenty of calcium, vitamin D and UV light.

This year I found that the lizards mated regularly and that the females were laying one egg every 10-14 days. I provide an area of damp fine grain vermiculite for the purpose of egg laying. The rest of the vivarium is kept dry, except for a daily spray of calcium lactate enriched water. Anoles do not drink out of containers out of preference. Males show off their dewlap and head bob frantically, moving round the female, eventually pinning her down, if she is willing(!), by gripping the skin on the back of the neck – this usually leaves a small scar so you can tell if a female has mated even if you do not see it occurring.

INCUBATION

This is a diagram of my set up which has worked well with eggs of anoles, wall lizards and giant day geckos.

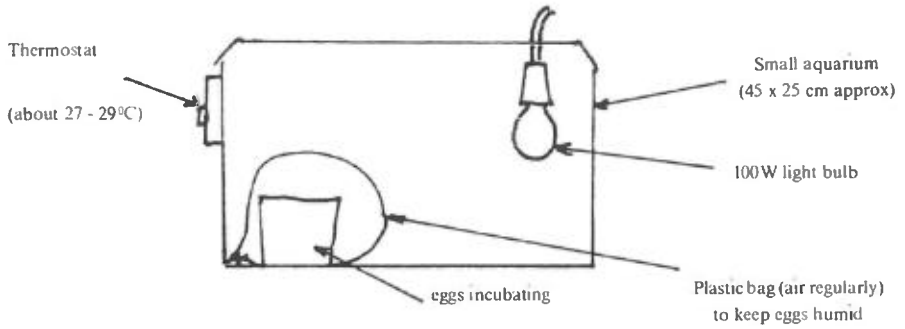

Fig. 2: Incubation

RAISING THE YOUNG

I have kept them in a small aquarium with a home made gauze lid. This keeps them dry enough, allows easy spraying, feeding and observation.

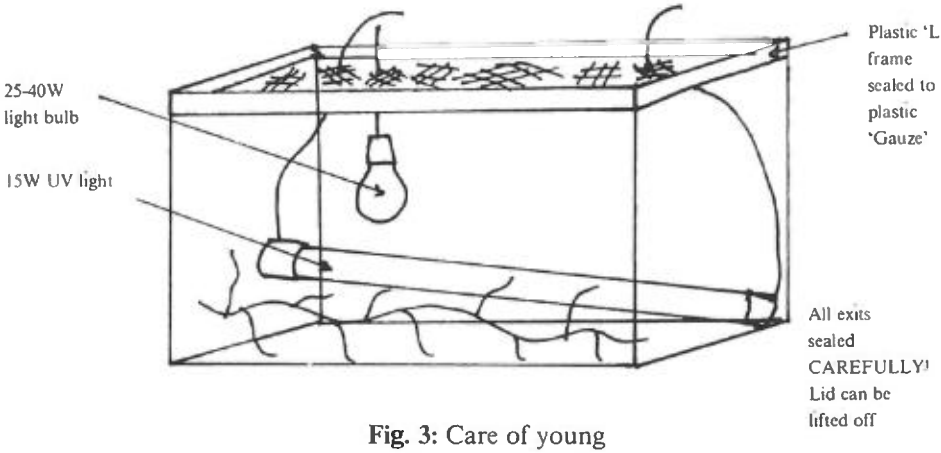

Fig. 3: Care of young

OTHER NOTES

Since I found that the lizards needed to be kept dry most of the time I have had good success. Out of 20 eggs laid this year, 19 hatched successfully, only one failed. It failed early on, going mouldy and had no obvious embryo in so may have been infertile.

The last two eggs hatched out in November and had no incubation for the last three weeks. The room had a maximum temperature of 20°C and a minimum of 15°C. One of these last eggs produced twins.

The most difficult part has been feeding the lizards as it has been quite wet and therefore difficult getting enough wild food. The young seem less keen on crickets than wild food which they really go at. Very quickly the young can eat medium/ fairly big sized or just hatched flies (bigger than house flies, smaller than large bluebottles).

THE STOMACH CONTENTS OF A GRASS SNAKE, *NATRIX NATRIX*, IDENTIFIED FROM SKELETAL REMAINS

CHRIS GLEED-OWEN

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INTRODUCTION

During the preparation of a Grass Snake, *Natrix natrix* (L.), for an osteological collection, its stomach contents were retrieved. The snake had been found run-over in the York area during 1994. It measured 570mm in total length and its sex was not determined. The semi-digested stomach contents were macerated in a glass beaker with a 2% aqueous solution of the plant enzyme papaine, maintained at 38°C within a heated waterbath. After 24 hours the resulting broth was decanted, leaving a residue of disarticulated bones which were carefully rinsed using tap water and retained in a 500um sieve. The bones were then identified and separated, whilst still wet, under a low-power (x10) binocular microscope. Specific identification was carried out using modern comparative osteological material and SEM photographs of British specimens. Some of the criteria used to differentiate the vertebrae, femora and humeri of the British newts are set out by Holman and Stuart (1991), comparative osteology of the European anurans is addressed by Böhme (1977). Detailed osteological studies of the Anura and Urodela (Duellman and Trueb, 1994; Ecker, 1889; Francis, 1934) are also of use in specific identifications.

SKELETAL MATERIAL

The resulting collection of skeletal elements constitutes the remains of one Common Frog *(Rana temporaria* L.) and one Great Crested Newt *(Triturus cristatus* Laurenti), representing the Grass Snake's last meals. Though some of the bones were partially digested, their condition was sufficiently good to allow specific identification.

The identified remains are placed in left, axial and right columns according to their position in the body and are arranged in the following groups: cranial/hyomandibular; vertebral; pectoral/forelimbs; pelvic/hindlimbs; unidentified elements.

Order: Anura
Family: Ranidae
***Rana temporaria* Linnaeus, Common Frog**

Material	*Left*	*Axial*	*Right*
Prootic-exoccipital	1		1
Parasphenoid		1	
Dentary			1
Hyoid			1
Atlas		1	
Trunk vertebra		7	
Sacrum		1	
Scapula	1		
Pre-coracoid	1		1
Humerus	1		1
Tibiofibula	1		1

Ilium	1		1
Ischium		1	
Urostyle		1	
Femur	1		1
Tibiofibula	1		1

Metapodials/phalanges (12)

Order: Urodela
Family: Salamandridae
***Triturus cristatus* (Laurenti), Great Crested Newt**

Prootic-exoccipital	1		1
Parietal	1		1
Frontal	1		1
Nasal			1
Parasphenoid		1	
Orbitosphenoid	1		1
Quadrate			1
Squamosal	1		
Pterygoid	1		
Maxillary		1	
Vomer	1		1
Dentary	1		
Artiulcar	(1)		
Hyoid			
Atlas		1	
Trunk vertebra		18	
Sacrum		1	
Caudal vertebra		24	
Ribs	(6)		
Scapula			1
Humerus			1
Radius			1
Ulna			1
Puboischium	1		1
Ilium	1		1
Femur	1		1
Tibia	1		
Fibula	1		

Metapodials/phalanges (5)
Unidentified hyobranchial elements (2)

DISCUSSION

The proportions and appearance of the bones indicate that they belong to only one individual of each species, this is supported by the near-equal balance of left and right elements in the above lists. The newt skeleton is largely complete, although its left forelimb may have become detached whilst being eaten as its bones were

not retrieved. Most of the minute phalanges are absent, having not survived digestion whilst in the snake's stomach (careful treatment with papaine does not damage even very small bones). Several of the more delicate cranial elements were not found and may also not have been digested fully, especially if broken during mastication. Additionally, the newt my have been eaten head-first with digestion commencing there earlier. Conversely, the finely-sculptured caudal vertebrae were in excellent condition. The frog skeleton is of an immature specimen, the sex not apparent from its osteology. Though its bones are larger, they appear to have undergone more severe attack. Many of the cranial elements are absent and some of the long bones are reduced to splinters. thus it appears that the frog was eaten some time before the newt and spent more time undergoing digestion in the snake's stomach. It is not clear if the frog was eaten whole, but it is likely that the missing cranial elements had probably been passed through already.

Both prey species are recorded from the York area (Arnold, 1973; Arnold and Burton, 1978) and this case serves as an unexpected example of how one species can offer surrogate data on the presence of two others in its locale. The skeletal remains also bear a first-hand testimoney to the snake's dietary habits. Frogs and Great Crested Newts are regularly preyed upon by Grass Snakes (Frazer, 1989; Smith, 1969) and this example was no exception. The author would like to hear from any members who find a dead snake on which a similar study could be carried out.

ACKNOWLEDGEMENTS

The Grass Snake was kindly forwarded by Mr. David Astley (York). Professor Tim Halliday (Open University, Milton Keynes) contributed newt specimens for the author's reference collection. Dr. David Keen commented on the script. This work forms part of a project financed by Coventry University.

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A NEW RECORD OF THE AESCUPLAPIAN SNAKE, *ELAPHE LONGISSIMA* (LAURENTI), FROM THE PLEISTOCENE OF BRITAIN

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The Aesculapian snake, *Elaphe longissima,* is a large, slender constrictor that presently occurs from southwestern Europe eastward into Turkey and northern Iran. Isolated records, north of the continuous range of the species, exist in Germany (Arnold and Burton, 1978, map 112). Ditmars (1931) referred to the allegation that *Elaphe longissima* was brought into Europe by the Romans to be kept in temples erected to Aesculapius, the god of medicine, and that the isolated records of this species in Germany reflected these introductions.

The fossil record, however, shows that during the warmer periods of the Quaternary, *Elaphe longissima* invaded areas far north of its present range on the European continent (Szyndlar, 1984) and in Britain (Holman et al., 1990; Ashton, et al., 1994). Thus, it appears that modern northern colonies of *E. longissima* are best regarded as remnants from past warmer climates rather than as Roman introductions.

The present report deals with a new Pleistocene record of *Elaphe longissima* from near West Stow, Suffolk. This brings the total number of British Pleistocene records of this species to three, all from late middle Pleistocene sites in England (Fig. 1).

The New Site: Beeches Pit, West Stow, Suffolk

The Beeches Pit lies in an abandoned brickyard near West Stow, Suffolk (National Grid Reference TL 798719). A preliminary report on the site (Preece et al., 1991) discussed its remarkable mollusc fauna, as well as its fishes and 12 species of mammals. Both the moluscs and the mammals suggest a late middle Pleistocene age and a temperate climate.

Elaphe longissima is represented at the Beeches Pit site by two trunk vertebrae (University College London, Institute of Field Archaeology – Sample 8, Trench 2, Unit 1) collected in 1991 by Simon Parfitt of the institute and identified in 1992 by J.A. Holman. Characters used to identify individual vertebrae of *Elaphe longissima* were given by Holman et al. (1990). Szyndlar (1984) also discusses the identification of this species on the basis of vertebral remains. Associated with the snake at the Beeches Pit site were remains of *Triturus* sp., *Rana* sp., and *Anguis fragilis.*

Previous Records of *Elaphe longissima* in Britain

Elaphe longissima was reported from the Cudmore Grove site, Essex, (NGR TM 068146) on the basis of three trunk vertebrae (Holman et al., 1990). This site also represents the late middle Pleistocene, and is thought to have had a warmer climate than present one, based on the pollen spectrum and the faunal remains. The herpetofauna at the Cudmore Grove site consisted of at least 14 species, half of which are continental forms that do not occur in Britain today.

Elaphe longissima was recently reported from the lower Palaeolithic East Farm, Barnham site, near Thetford, Suffolk (NGR TL 875787), by Ashton et al. (1994).

Fig. 1: Pleistocene localities of *Elaphe longissima* in Britain. 1, East Farm, Barnham, Suffolk. 2, Beeches Pit, West Stow, Suffolk. 3, Cudmore Grove, Essex. All of these sites represent the late middle Pleistocene.

This site also represents the late middle Pleistocene. Vertebrae representing *Elaphe longissima* from the site were identified by J.A. Holman in 1993 and 1994. Twelve species of amphibians and reptiles were listed by Ashton et al. (1994) from the site and more species are yet to be recorded. Several continental herptiles that do not occur in Britain today have been identified at East Farm, Barnham. The fauna at this site indicates warmer conditions than occur there today.

REMARKS

Arnold and Burton (1978) state that *Elaphe longissima* is usually found in dry habitats such as sunny woods and shrubby vegetation, but that it also may be encountered on old walls, ruins, and haystacks. They report, that in the northern part of its range, this snake may be in special localities such as sheltered, south facing slopes on light soils. Thus, it would seem that the recovery of *Elaphe longissima* fossils from the three British sites would indicate not only a somewhat warmer summer climate than occurs in these areas today, but the likely presence of dry, sunny habitats.

ACKNOWLEDGEMENTS

I wish to thank Nick Ashton and Simon Parfitt for allowing me to study the *Elaphe longissima* vertebrae from the Beeches Pit site.

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