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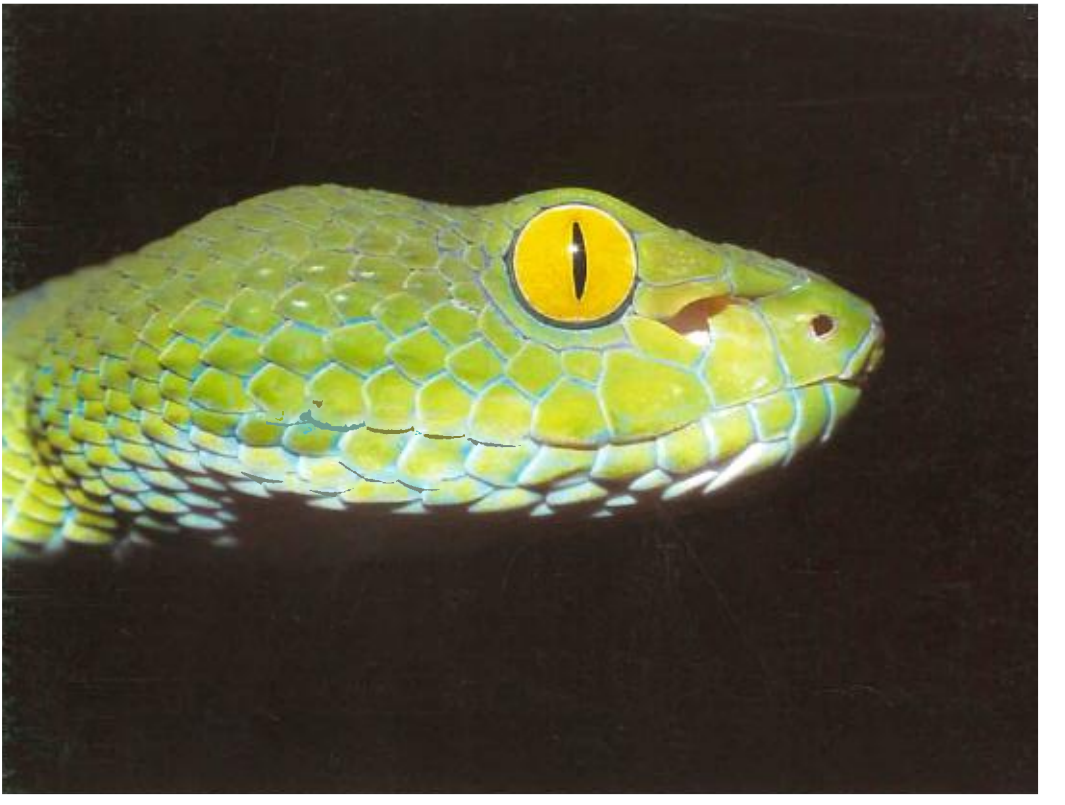
THE BRITISH HERPETOLOGICAL SOCIETY

BULLETIN



No. 39

Spring 1992

BRITISH HERPETOLOGICAL SOCIETY

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

Correspondence, membership applications, subscription renewals and purchase orders for the Herpetological Journal and British Herpetological Society Bulletin should be sent to the above address.

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

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

Meetings

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

Subscriptions

Will be printed in the next issue of the Bulletin.

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

The Bulletin is edited and produced by
John Pickett and Simon Townson

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

FRONT COVER

Large-eyed pit viper, *Trimeresurus macrops*, from Bangkok. Thailand. See Wolfgang Wüster page 19.

REMAINING SOCIETY MEETINGS FOR 1992

Council has decided to change Meeting arrangements from single-speaker events on weekday evenings to part- or full-day sessions, held less often but always at weekends and with several speakers on each occasion. The intention is that there will be at least as many talks as in previous years (and hopefully more) but at greater convenience to Members. Please let us know, at the end of the year, any views you develop as to the merits or demerits of this new system.

Below is an outline programme for 1992, with details of just the first few sessions. Details of the later ones will be published in future Bulletins as well in advance of the events as can be arranged. Look out for them!

MAY 30th (Saturday)	"Education and Conservation". A joint meeting betwen the Society's Education Committee and Conservation Committee. An Open Meeting for Adult Members, friends and Y.H.C. members, who are interested in the work of the Society in these areas, in Poole, Dorset. For more details contact the Education Officer on 0202 692378.
LATE MAY/ EARLY JUNE	Joint Conservation Committee and Education Committee Open Meeting, probably in Hampshire or Dorset.
LATE AUTUMN:	(1) Research Committee Meeting on "Conservation Biology", to be held at the Open University at Milton Keynes.
	(2) Autumn General Meeting, with talks on a range of topics.
NOVEMBER 8th (Sunday)	Captive Breeding open meeting to be held at the New Denham Community Centre, Oxford Road, New Denham, Uxbridge. 2pm to 6pm. There will be the opportunity for the sale or exchange of captive bred stock. Members requiring space should contact Terry Thatcher, Tel: 0865 739396. Further details in the next *Bulletin.*

THAMES & CHILTERN

Thames and Chiltern Herpetological Group exhibition. Saturday 11th July 10.30 am – 5 p.m. at West Herts College, Hempstead Road, Watford. Exhibits plus trade stands. For further details Tel: 0923 774277.

JOURNAL EDITOR'S REPORT 1991

In anticipation of the start of a new volume in 1992, volume 1 no. 12 was published in June 1991. From January 1992 onwards the *Herpetological Journal* will be published quarterly. Twenty-nine manuscripts from 17 countries were received in 1991. Although this is seven submissions less than the previous year, it continues to reflect the journal's international standing. Most authors were required to revise their manuscripts and the overall acceptance rate was 59%. During the year an editorial board was appointed for the first time and a complete reappraisal of journal production and finances was carried out. With the aid of a loan of £2000 from the Royal Society, the society has purchased publishing software which should enable us to produce the journal at a much reduced cost in 1992. Plans are also in motion to make the journal more attractive to both authors and subscribers, and to substantially reduce the time to publication of accepted papers.

Richard Griffiths

THE GERMAN JOURNAL *SAURIA* NOW ALSO IN ENGLISH

Sauria is known among terrarium-keepers for its high quality and useful information. It is (West) German and is published by the society Terrariengemeinschaft Berlin. Now it is also produced in an English version which will be good news for everybody who does not read German. This version is called:

SAURIA(E)

The first volume contains 176 pages (4 issues + supplement), price US$ 38.00. It is produced in South Africa since the two former leaders of the Berlin group, Thomas and Elke Ulber, have moved to South Africa. Subscription can be made to the following address:

HERPRINT INTERNATIONAL
P.O. Box 14117
Bredall 1623
R.S.A., South Africa.

Of course you can still subscribe to the German version for US§ 22.00 or DM 34.00. Address: TGB-Sauria, Peter Grossmann, Lepsiusstr. 53, D(W)-1000 Berlin 41, Germany.

Henrik Bringsøe
Esthersvej 7
DJ-4600 Køe
Denmark

MEMBERS' ADVERTISEMENTS

- **For sale or exchange:** captive bred male Amboina Box Turtle, *Cuora amboinensis*, 9 years old. £20 plus carriage. **Wanted:** adult female Amboina Box Turtle, adult male Asian Pond Terrapin, *Melanochelys trijuga*.
  Richard Inskeep, 26 Luxor View, Leeds LS8 5JT. Tel: 0532 493691.

- **Wanted:** Horned Frogs, *Ceratophrys aurita, ornata, cornuta* and hybrids; also African Bull Frogs, *Pyxicephalus adspersus*. Any size.
  Graham L. Gough, 36 Milton Grove, Latchford, Warrington, Cheshire WA4 1HY.
  Tel: 0925 814545 (day).

For sale: Large Reticulated Python, over 10 feet long. Will consider swap for small Indian or Burmese Python. Vince Ferguson. Tel: 0532 854385.

For sale or exchange: Captive-bred *Testudo marginata* D.O.E. CITES licenced. Mike Hine, Chelonia Herpetoculture, The Lodge, Normanby, North Yorkshire, YO6 6RH. Tel: 0751 32631.

OCCURRENCE OF *OPLURUS CUVIERI* (REPTILIA, IGUANIDAE) ON GRAND COMORO, INDIAN OCEAN

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The presence of the Malagasy genus *Oplurus* on Grand Comoro was first reported by Angel (1942) and later repeated by Savage (1952), Blanc (1971, 1972, 1977) and Paulian (1978). Recently, its existence on the island was questioned by Louette (1987) on the basis of a personal communication by W. Böhme.

However, in November and December 1989, lizards of the species *O. cuvieri* were indeed found to occur at Ivouini (Goula) in the North of Grand Comoro and at M'tsamdou (or Mutsamoudou) near Itsikudzi in the North East of Grand Comoro. Here, several individuals were seen on the rim of the cliffs near the sea. Not all the cliffs around Grand Comoro have been explored, and this species may be present elsewhere in similar habitat. It is however, not present in the interior of the island.

On Moheli and Anjouan, similar dry cliff sites were visited but no *Oplurus* were observed, nor were they known by the local inhabitants. As for the distribution of *O. cuvieri comorensis* given in Savage (1952), one has to interpret 'LComoro and adjacent islands' as a slip of the pen, as there is no material to support this generalisation.

The characteristics of the two individuals captured, one from each locality, are given in Table 1. These measurements do not reveal large differences from the Madagascar population. Most dimensions are on the lower end of the variation for the Comorian population as the specimens are not full-sized. Naked-eye estimations in the field give total lengths ranging from 25-30 cm for juveniles up to 50-55 cm total length for one larger specimen.

The described difference between var. *comorensis* and the *forma typica* of *Oplurus cuvieri* (Gray, 1831) – a senior synonym of *O. sebae* Duméril & Bibron, 1837 (see Savage, 1952) – is in the dorsal coloration (Angel, 1942; Blanc, 1977). The type-material of *comorensis* was mentioned as follows: Coll. Mus. 22-298-299 (donor: Marcel Avignon) indicated as 'types' and Coll. Mus. 08-84 (donor: Humblot) being the 'co-type'. (Types were not located by us). According to Angel (1942) two of three specimens of the type series of the Comoro population completely lack the black transversal banding invariably found between the shoulders of the Madagascar specimens. The third specimen showed dark chevrons on its dorsum and a straight black band bordered by white on both sides of the neck. This band, however, was interrupted dorsally.

In the Comoro-population, no indication of a black scapular band was seen in the field nor found in the two captured specimens. These specimens where observed alive for several months; colour changes ranged up to a very dark pigmentation of the entire animal with even the venter turning grey. In the brightest colour stages (well documented by photographs), however, the venter became yellowish and the dorsum light reddish brown, with the throat and cheeks displaying a light bluish colour. A black and white chevron similar to the one described by Angel became visible,and as it was always restricted to the region just above the shoulder, this marking never formed a cross-band. On the basis of this colour difference, the existence of an endemic subspecies *comorensis* Angel 1942 is accepted here. The arrival of this lizard on Grand Comoro must be due to a natural colonisation from Madagascar. Their ecological niche and their known distribution on the island illustrate their antrophobic nature and introduction by human transport can be excluded. As evolutionary changes are already detectable in size and in colour, the colonisation by *Oplurus* of the island probably antedates human occupation.

Arnold (1976) described fossil *Oplurus* from Aldabra, another island in the Malagasy area, (100.000 – 125.000 B.P.) and stated that his material agreed best with *O. cuvieri,* but he found some appreciable differences, for instance in size, suggesting total lengths of 570-680 mm. Only the fragmentary nature of the material prevented him from describing a distinguishable taxon.

The new material from Grand Comoro, discussed here, is unfortunately far from maximal-sized (compared to the other specimens seen in the wild and if compared by head-dimensions). Based on field observation however, one can assume that lizards of the Grand Comoro population are somewhat larger than the Malagasy ones, suggesting an intermediate position with the extinct Aldabra population. A detailed comparison of the Grand Comoro specimens with Malagasy material will follow, if they can be located and become available for study.

TABLE 1. Meristic and morphological data for *Oplurus cuvieri:* new material from Grand Comoro compared with data for the Madagascar population.

	KMMA/MRAC 90-1-R-153	KMMA/MRAC 90-1-R-154	*O.cuvieri* (Paulian, 1977)
Snout Vent length	114 mm	105 mm	ref: 120-129 mm 112-150 mm 115-130 mm juv: 50-69 mm
Tail length	185 mm	39 mm +79 mm	ref: 171-191 mm 156-206 mm 166-172 mm juv: 82-99 mm
Temporal shields (on line orbit-upper part tympanum)	10	10	8-10
Denticulate shields in front of tympanum	4	2	2-4
Tail annuli (2 scales)	33	8 + regenerated	(-)
Head Length	26.0 mm (external)	24.5 mm (external)	ref: 27.5-31 mm (cranial)
Width of Head	19.0 mm (external)	17.5 mm (external)	ref: 20.0-21.5 mm (cranial)

REFERENCES

Angel, F. (1942): Les Lézards de Madagascar. *Mém. Acad. malg. fasc.* **36.**

Arnold, E.N. (1976): Fossil Reptiles from Aldabra Atoll, Indian Ocean. *Bull. Brit. Mus. (N.H.)* **29** (2): 83-116.

Blanc, C.P. (1971): Les reptiles de Madagascar et des iîles voisines. *Ann. Univ. Madagascar* **8:** 95-178.

Blanc, C.P. (1972): Les reptiles de Madagascar et des iîles voisines. In: *Biogeography and ecology in Madagascar,* p. 501-614. Battistini, R. & G. Richard-Vindard (Eds.).

Blanc, C.P. (1977): *Faune de Madagascar.* vol. 45. *Reptiles, Sauriens, Iguanidae.* ORSTOM-CNRS, Paris.

Louette, M. (1987): Poissons dulçaquicoles, batraciens, reptiles et mammifères de l'archipel des LComores. *Ya Mkobe,* **3:** 4-7. (version corrigé par l'auteur, tableau 2 du manuscrit ajouté).

Paulian, R. (1978): Esquisse du peuplement zoologique de l'archipel des Comores. *Mém. Mus. Natn. Hist. Nat. A (Zoologie)* **109:** 19-26.

Savage, J. (1952): The correct generic names for the iguanid lizards of Madagascar and the Fiji islands. *Copeia* 1952 (3): 182.

AMPHIBIANS FROM A SECOND CENTURY ROMAN WELL AT TIDDINGTON SETTLEMENT, WARWICKSHIRE

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INTRODUCTION

Excavations at the Tiddington Roman Settlement in 1981 and 1982 produced amphibian remains that were wet-sieved from infillings of a 2nd century well (feature 131 of this locality). Palmer (1981) has provided a general account of the Tiddington Roman Settlement which is situated on the southeastern side of the River Avon, about 1.5 km east of modern Stratford (SP216555).

The well also produced fishes, birds, and numerous mammalian remains which are the subject of an unpublished paper by Dr. Jelle W.F. Reumer of the Natuurmuseum, Rotterdam.

Three to 5 litre samples from the well were sieved for plant remains onto 4 mm, 1 mm and 0.3 mm mesh sieves. The 1 and 3 mm portions were then sorted for plant remains and the skeletal elements picked free. The rest of each sample was then sieved into a 2 mm sieve. The vertebrate bones were then sorted out both macroscopically and by using a 4x microscope.

Only three species of amphibians were identified amongst the hundreds of amphibian bones recovered from the Roman well. These taxa are listed below with reference to criteria for their identification.

SYSTEMATIC PALAEONTOLOGY

Triturus helveticus (Razoumowsky) or *vulgaris* (Linnaeus) Palmate or Smooth Newt

This form is represented by a single right humerus from unit 6/1 of the Roman well. *Triturus helveticus* and *T. vulgaris* differ from the other British species *T. cristatus* in that the *crista ventralis* of the humerus is shorter and the shaft narrower (Holman and Stuart, 1991, Fig. 2). I am unable to separate the humeri of *T. helveticus* and *T. vulgaris* from each other.

***Bufo bufo* (Linnaeus)**
Common Toad
Bufo Bufo remains were found in five of the ten samples from the well that contained amphibians and were identified mainly on the basis of ilia and sacra. *Bufo bufo* is separable from the other British species, *B. calamita*, on the basis that its ilium has a lower, less triangular dorsal prominence and lacks the elongate ventral ridge on the shaft that occurs in *B. calamita* (Holman, 1989). Bohme (1977) has discussed the identification of European species of *Bufo* on the basis of sacra.

***Rana temporaria* Linnaeus**
Common Frog
Common Frogs were found in nine of ten samples from the well that contained amphibians and were also identified mainly on the basis of ilia and sacra. Holman (1985) has shown that the ilia of *Rana temporaria* differ from other European species in having the ilial blade (vexillum of Bohme, 1977) depressed anteriorly. Hallock, Holman and Warren (1990) have discussed identification of *R. temporaria* on the basis of sacra.

DISCUSSION

Amphibian occurrence and abundance in samples from the 200 AD Roman well at Tiddington is shown in Table 1. Numbers of individuals in Table 1 are expressed as a minimum number of individuals in each sample. A "minimum number" reflects the most numerous unpaired or left or right element of a given taxon in each sample. *Rana temporaria* is abundant, *B. bufo* much less so, and *Triturus* is rare.

Possible Access to the Well Trap. – Access to the well trap might have been facilitated by the human inhabitants of the area who had cleared large portions of land to grow cereals (Moffett, in press). These deforested patches must have provided habitat for the Field Voles which comprised about 16% of the mammalian fauna of the well (Reumer, n.d.); and should have provided places for *Rana temporaria* to wander, especially during periods of rain or other moist times of the year.

Possibly the fact that the more terrestrial Common Toad might have been more shy of drop offs than the Common Frog may account for the fact that *B. bufo* was much less abundant.

But it may be that the relative abundance of the two species merely reflects local population success based on a variety of factors.

Relative Abundance of Common Frogs and Common Toads in Flandrian and Historic Ancient Sites. – In eight of the nine Flandrian and historic ancient herpetological assemblages in Britain that I am aware of, *Rana temporaria* is more abundant that *Bufo bufo* (Table 2).

But of more interest, perhaps, is the fact that *B. bufo* and *R. temporaria* comprise most of the herpetofauna of these ancient assemblages. This is noteworthy because these two species (with the possible exception of the Smooth Newt) are the most common herptiles in Britain today (*vide* Cooke and Scorgie, 1988).

This leads to various speculations which are beyond the scope of this paper. Moreover, such speculations will need to be documented by finds of additional and well-dated ancient herptile assemblages. But it might be tempting to suggest that modifications caused by the human settlement in the Tiddington area had already caused some depletion in the other herpetological populations.

TABLE 1. Amphibian Occurrence and Abundance in Samples from Well 131*

SAMPLE	4	5/1	5/2	5/3	5/4	5/5	5/6	5/7	6/1	6/2	n	%
Triturus sp.	0	0	0	0	0	0	0	0	1	0	1	1.3%
Bufo bufo	1	0	0	0	1	1	1	1	3	0	8	10.3%
Rana temporaria	11	1	2	5	3	0	13	7	26	1	69	88.5%
	12	1	2	5	4	1	14	8	30	1	78	100.1%

*Based on Minimum Number of Individuals

TABLE 2. Relative Abundance of *Bufo bufo* and *Rana temporaria* at Ancient British Sites*

	Bufo bufo	*Rana temporaria*	Other Herptiles
Ightham, Kent Flandrian Fissures (Holman, 1985)	12 (2.7%)	391 (87.1%)	46 (10.3%)
Warton, Lancashire Flandrian Sinkhole (Holman, 1987)	3 (14.3%)	16 (76.2%)	2 (9.5%)
Chudleigh, Devon Flandrian Cave (Holman, 1988)	124 (68.1%)	36 (19.8%)	22 (12.1%)

Tiddington 200 AD Roman Well (This Paper)	8 (10.3%)	69 (88.5%)	1 (1.3%)
Repton, Derbyshire Various Sites (Raxworthy et al., 1990):			
8th century	2 (100%)	0 (0.0%)	? (0.0%)
8th-9th cenutry	63 (100%)	0 (0.0%)	? (0.0%)
9th century	64 (97%)	2 (3.0%)	? (0.0%)
14th-15th century	16 (66.7%)	8 (33.3%)	? (0.0%)
16th century	2 (66.7%)	1 (33.3%)	? (0.0%)

*Based on Minimum Numbers of Individuals at Each Site

ACKNOWLEDGEMENTS

I wish to thank Dr. Jelle W. F. Reumer for sending the herpetological specimens for me to study and for allowing me to see his unpublished manuscript on the mammal remains from the Roman well site. I also wish to thank Nicholas Palmer for encouraging me to present this report to the herpetological community.

REFERENCES

Bohme, G. (1977). Zur bestimmung quartarer Anuran Europas an Hand von Skelettelementen. *Wissenschaftliche Zeitschrift der Humboldt-Universitat zu Berlin, Mathematik, Naturwissenschaft.* **26:** 283-300.

Cooke, A. S. and Scorgie, H.R.A. (1983). The status of the commoner amphibians and reptiles in Britain. *Nature Conservancy Report, 1983.*

Hallock, L.A., Holman, J.A. and Warren, M.R. (1990). Herpetofauna of the Ipswichian Interglacial Bed (Late Pleistocene) of the Itteringham Gravel Pit, Norfolk, England. *Journal of Herpetology* **24:** 33-39.

Holman, J.A. (1985). Herpetofauna of the late Pleistocene Fissures near Ightham, Kent. *Herpetological Journal* **1:** 26-32.

Holman, J. A. (1987). Additional records of British Pleistocene amphibians and reptiles. *British Herpetological Society Bulletin* **19:** 18-19.

Holman, J.A. (1988). Herpetofauna of the late Devensian/early Flandrian Cow Cave Site, Chudleigh, Devon. *Herpetological Journal* **1:** 214-218.

Holman, J.A. (1989). Identification of *Bufo calamita* and *Bufo bufo* on the basis of skeletal elements. *British Herpetological Society Bulletin* **29:** 54-55.

Holman, J.A. and Stuart, A.J. (1991). Amphibians of the Whitemoor Channel Early Flandrian Site near Bosley, East Cheshire; with remarks on the fossil distribution of *Bufo calamita* in Britain. *Herpetological Journal* **1:** 568-573.

Moffett, L.C. The corn-drying kilns from Tiddington. (In press, *Warwickshire Museum Annals).*

Palmer, N. (1981). Tidington Roman Settlement – an interim report on excavations 1980-1. *Warwickshire Museum Annals* **24:** 17-24.

Raxworthy, C.J., Kjolbye-Biddle, B. and Biddle, M. (1990). An archaeological study of frogs and toads from the eighth to the sixteenth century at Repton, Derbyshire. *Herpetological Journal* **1:** 504-509.

Reumer, J.W.F. (n.d.). The small mammals from Tiddington Roman Settlement.

THE AMPHIBIANS AND REPTILES OF THE LEPINI MOUNTAINS (LATIUM, CENTRAL ITALY): CHECKLIST AND PROVISIONAL ATLAS*

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* The present work was written in equal parts by the authors

ABSTRACT

The checklist and a provisional atlas of the amphibian and reptile species occurring in the Lepini Mountains (Latium, central Italy) are reported. Eleven species of amphibians and seventeen species of reptiles have been found in the study area. These species represent 85% of the entire central Italian herpetofauna. One species (*Testudo hermanni*) seems to be recently extinct probably due to over-collecting and habitat perturbance, and at present occurs in semi-natural conditions only (specimens introduced by man). The dominant species are *Salamandrina terdigitata, Triturus carnifex, Triturus vulgaris, Bufo bufo, Rana italica, Rana* sinklepton *esculenta, Lacerta viridis, Podarcis muralis, Podarcis sicula, Chalcides chalcides, Hierophis viridiflavus,* and *Natrix natrix.* From the biogeographical point of view, the most interesting species are *Salamandrina terdigitata, Bombina variegata, Rana italica, Podarcis sicula, Chalcides chalcides, Elaphe quatuorlineata,* and *Coronella girondica.*

INTRODUCTION

The herpetological fauna of Latium, as well as the distribution of the amphibian and reptile species in this large region of central Italy are yet poorly known. Recent literature records on the subject are scarce (e.g., Capula and Bagnoli, 1983; Bagnoli, 1985; Carpaneto, 1986; Capula, 1989; Bonifazi and Carpaneto, 1990), and no atlas dealing with the herpetofauna of Latium has been so far published.

The present paper provides the checklist and a provisional atlas of the amphibians and reptiles found in the Lepini Mountains, a montane area located in the southwestern part of Latium (Fig. 1). The Lepini Mountains are characterized by peculiar bioclimatic, faunistic, and vegetational characteristics (see, e.g., Pratesi and Tassi, 1972; Franzini, 1982; Zerunian and Sciscione, 1984; Corsetti, 1990; Forlenza and Corsetti, 1990), and will become a regional natural park (Segre, 1974; Corsetti, 1979, 1983).

DESCRIPTION OF THE STUDY AREA

The Lepini Mountains are a Mesozoic Massif located 40 km SE of Rome, extending for about 40 km southwards, between the Pontina Plain and the Apennine chain (Roma, Latina and Frosinone province). These Mountains have a surface area of about 800 km^2 and culminate in Mount Semprevisa (1536 m.a.s.l.) (Zaccheo, 1989).

The geological substratum is mainly constituted of Cretaceous limestone, with marly limestone in the superficial layers (Segre, 1974). Surface watercourses are scarce and torrential; the most important ones, i.e. The Amaseno and Sacco creeks, mark respectively the southern and the northeastern boundaries of the study area (see Fig. 1).

The climate is a typical Mediterranean one, with mild rainy winters and dry, warm summers (Giacomini, 1958).

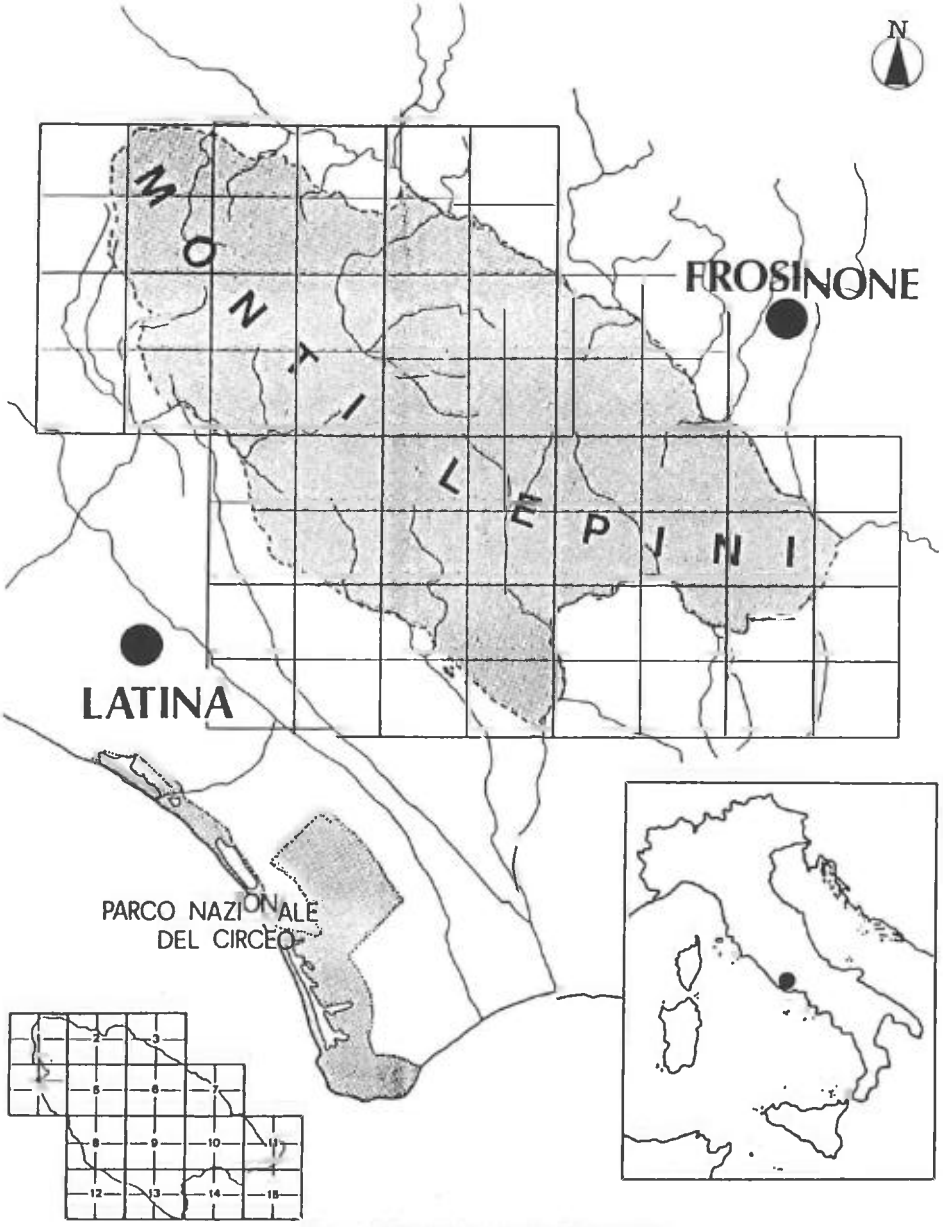

Fig. 1. Map of the Lepini Mountains

Between 200 and 500 m.a.s.l. the vegetation is mainly represented by the *Quercetalia ilicis* association, while between 600 and 1000 m.a.s.l. both the *Quercetalia pubescentis* and *Quercetalia roburi* associations occur, forming mixed wood. Above 1000 m.a.s.l. Beech wood (*Fagetalia silvaticae*) and montane pastures (resulting from deforestation) are present.

METHODS

The occurrence and distribution of each species in the study area was established by field investigations and from personal unpublished data. Field studies were carried out from 1982 to 1990 in the neighbourhood of the localities reported in Table 1. Amphibian and reptile

species were routinely searched for during the central part of the day (from 10.00 a.m. to 4.00 p.m.) in cool periods (spring and autumn), while during morning and crepusular hours (from 8.00 to 10.00 a.m., and from 5.0 to 9.00 p.m.) in summertime.

TABLE 1
Localities and codes of the 15 IGM maps utilized (for map localization see Fig. 1)

	Locality	1:25.000 IGM map
1	Artena	150 I SE
2	Colleferro	151 II SO
3	Anagni	151 II SE
4	Cori	158 I NE
5	Montelanico	159 IV NO
6	Carpineot Romano	159 IV NE
7	Supino	159 I NO
8	Sermoneta	159 IV SO
9	Roccagorga	159 IV SE
10	Giuliano di Roma	159 I SO
11	Ceccano	159 I SE
12	Sezze	159 II NO
13	Priverno	159 II NE
14	Roccasecca dei Volsci	159 I NO
15	Vallecorsa	159 I NE

Collecting was performed by hand or by dipnetting (e.g., in the case of species of the genera *Triturus* and *Rana*). The sex of each animal caught, together with its snout-vent length, were recorded. After collecting and checking sex, each animal was photographed and then released (all amphibian and reptile species except *Vipera aspis* are protected by a regional law in Latium).

Individual records were drawn separately for each species into 60 5x5 km squares, based on 1:25.000 IGM (Istituto Geografico Militare) cartographic system (see Fig. 1). Each square was filled out with a black circle in the case of one or more faunistic records in its area. Black circles of different size were used: a small circle (•) indicates one collecting locality; a medium circle (●) 2-4 collecting localities; a large circle (●) 5 or more collecting localities. For those species presently very rare (e.g., *Bombina variegata*) literature records before 1970 were also given. These records are indicated in the squares by an open circle (O).

RESULTS

The list of the Amphibians and Reptiles observed is reported in Table 2. The herpetofauna of the Lepini Mountains consists of 28 species, 11 of which are amphibians (3 urodeles, 8 anurans) and 17 reptiles (2 chelonia, 7 lizards, 8 snakes). These species represent the 85% of the entire central Italian herpetofauna.

TABLE 2
Species and locality records (locality numbers are according to Table 1)

Species	Locality
Salamandrina terdigitata	5, 6, 7, 8, 9, 10, 11
Triturus carnifex	5, 6, 7, 8, 9, 10, 13
Triturus vulgaris	5, 8, 10, 13
Bombina variegata	5, 6
Bufo bufo	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13
Bufo viridis	(literature record; locality not quoted)
Hyla arborea	4, 5, 6, 7, 8, 9, 10, 13
Rana dalmatina	7
Rana italica	1, 5, 6, 7, 8, 9, 10, 11, 13
Rana sinklepton *esculenta* (*Rana lessonae* + hybridogenetic *R. esculenta*)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13
Emys orbicularis	13
Testudo hermanni.	13 (probably extinct)
Hemidactylus turcicus	1, 2, 4, 8, 9, 13
Tarentola mauritanica	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Lacerta viridis	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Podarcis muralis	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
Podarcis sicula	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Chalcides chalcides	1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Anguis fragilis	5, 6, 7, 8, 9, 10
Hierophis viridiflavus	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Coronella austriaca	7, 8, 9, 11
Coronella girondica	8
Elaphe longissima	5, 6, 7, 8, 9, 10, 13
Elaphe quatuorlineata	4, 5, 6, 7, 8, 9, 10, 13
Natrix natrix	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Natrix tessellata	(literature record: "Amaseno River")
Vipera aspis	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 13

Bufo viridis and *Natrix tessellata* were not found within the study area, but they are fairly common in the territories bordering the western and the southern part of the Lepini Mountains (e.g., the Pontina Plain and the Amaseno River) (Franzini, 1982; Capula, 1989). Therefore they were included in the list (Table 2), although not mapped.

Salamandra salamandra was never found during our investigations, but it must be stressed that this species has been quoted for the Lepini Mountains (without any locality specification) by Prates and Tassi (1972). Another species surprisingly not observed in the study area was *Triturus italicus*. Although occurring in the southern part of Latium, namely in two mountain systems close to the Lepini Mountains, i.e. the Ausoni and Aurunci Mountains (Lanza, 1983; Capula, 1989; Bonifazi and Carpaneto, 1990), this urodele was never encountered, and we think it is probably absent in the study area.

As shown in Fig. 2, *Salamandrina terdigitata, Triturus carnifex, Triturus vulgaris, Bufo bufo, Hyla arborea,* and *Rana italica* were widespread, occurring from low altitudes to the montane belt. The green frogs are represented by two coexisting forms (*Rana* sinklepton *esculenta*), i.e. the non-hybrid *Rana lessonae* and the hybridogenetic hybrid *Rana esculenta* (Uzzell et al., 1977; Uzzell and Hotz, 1979), which are also widespread.

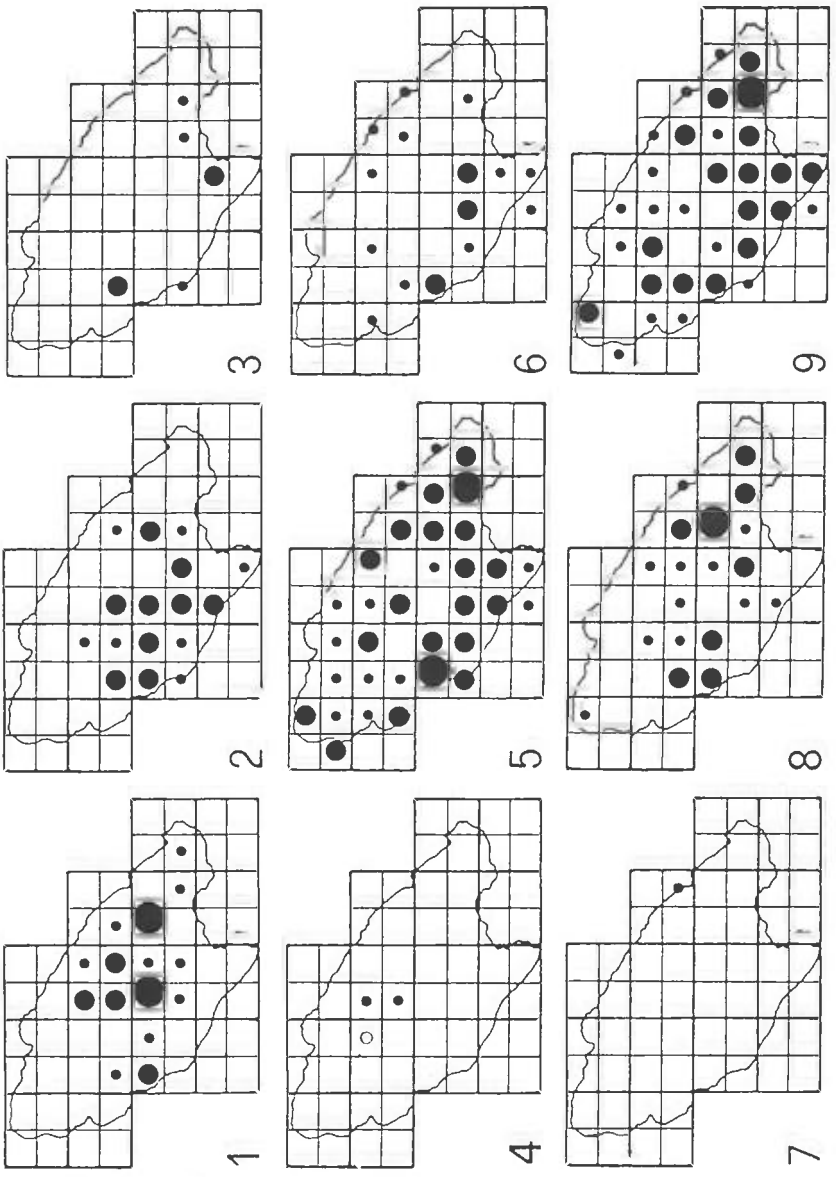

Fig. 2. Locality records of amphibians occurring in the Lepini Mountains.
1 = *Salamandrina terdigitata*; 2 = *Triturus carnifex*; 3 = *Triturus vulgaris*; 4 = *Bombina variegata*; 5 = *Bufo bufo*; 6 = *Hyla arborea*; 7 = *Rana dalmatina*; 8 = *Rana italica*; 9 = *Rana* sinklepton *esculenta* (*Rana lessonae* + *hybridogenetic Rana esculenta*).

Salamandrina terdigitata was shown to have rich populations in the Lepini Mountains, particularly when compared to those from the adjacent areas of Latium (Capula, 1989) (Fig. 3). This species was found in 32 localities of the study area, and in some of these it was observed laying eggs during winter (December and January) (Capula and Corsetti, in preparation). On the other hand, *Bombina variegata* and *Rana dalmatina* were observed in a few localities only, appearing to be very localized. This is possibly due both to the scarcity of suitable reproduction habitats (e.g., swampy broad-leaved woods), and to habitat disturbance related to human activity (water pollution, fire, agricultural activity, etc.).

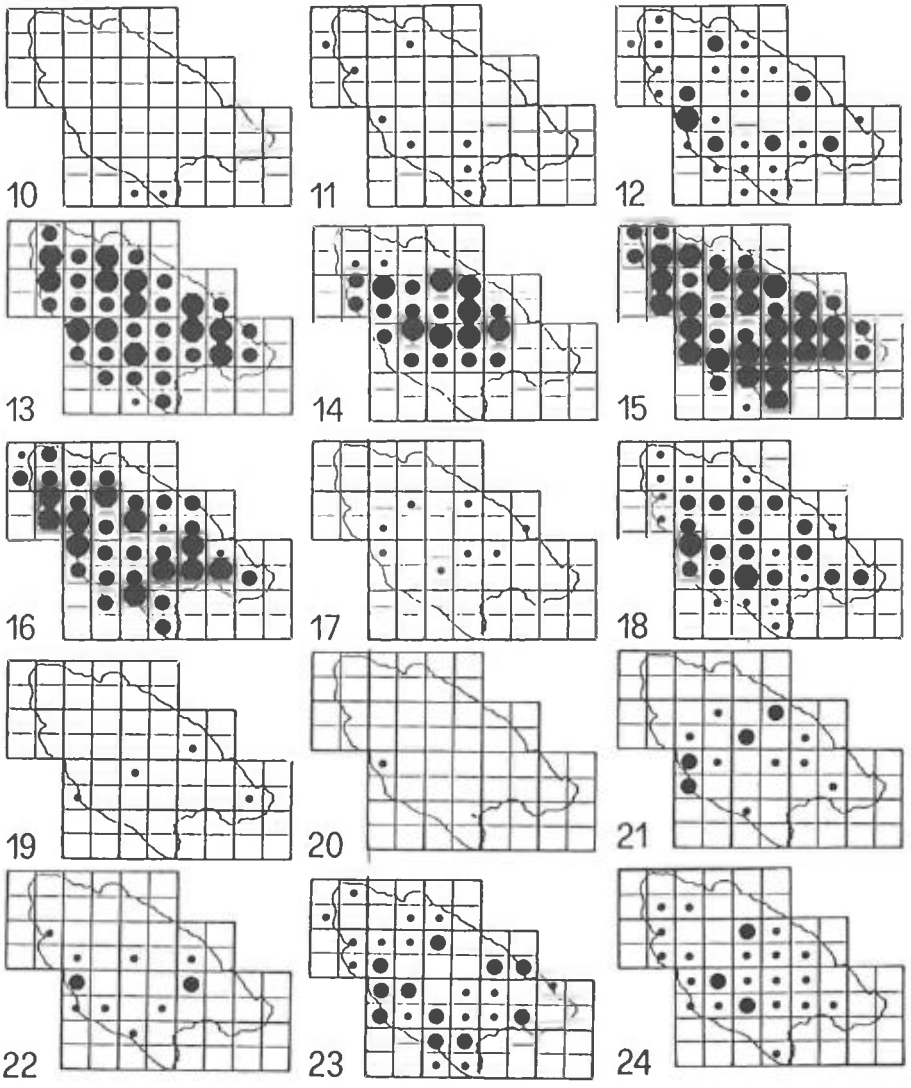

Fig. 4. Locality records of reptiles occurring in the Lepini Mountains.
10 = *Emys orbicularis;* 11 = *Hemidactylus turcicus;* 12 = *Tarentola mauritanica;* 13 = *Lacerta viridis;* 14 = *Podarcis muralis;* 15 = *Podarcis sicula;* 16 = *Chalcides chalcides;* 17 = *Anguis fragilis;* 18 = *Hierophis viridiflavus;* 19 = Coronella austriaca; 20 = *Elaphe longissima;* 22 = *Elaphe quatuorlineata;* 23 = *Natrix natrix;* 24 = *Vipera aspis.*

Among reptiles, *Tarentola mauritanica, Lacerta viridis, Podarcis muralis, Podarcis sicula, Chalcides chalcides, Hierophis viridiflavus, Narix natrix* and *Vipera aspis* were fairly common (Fig. 4). *Hemidactylus turcicus, Anguis fragilis, Elaphe longissima* and *Elaphe quatuorlineata* were also common, but rather localized. *Hemidactylus turcicus* was observed in the vicinities of human buildings only, while *Tarentola mauritanica* was found in different habitats, either on buildings and delapidated walls or in rocky areas.

Elaphe quatuorlineata occurred almost exclusively in dry and sunny *Quercus ilex* woodlands, smooth slopes with *Cytisus scoparius*, and semi-cultivated areas with olive groves, while *Elaphe longissima* was encountered either in fresh and wet woodlands or in dry and sunny rocky areas (e.g., old ruins, smooth slopes with *Cytisus scoparius*).

Emys orbicularis, Coronella austriaca and *Coronella girondica* seemed to be uncommon and very localized (e.g., one specimen only of *Coronella girondica* was observed during 8 years of investigation). The latter species appears to be rare and very localized also in most of central Italy (Capula, 1989; Luiselli and Rugiero, 1990). Their scarcity could be due to the lack of suitable environmental conditions, but we can not exclude an insufficient sampling.

As for *Testudo hermanni*, it seems to no longer occur in the study area. This species was known from a single site located in the southwestern part of the area, about 200 m a.s.l., but since 1975 it has not been observed. Over-collecting and habitat disturbance could have been responsible for its rapid decline. Although some specimens (introduced by man) were observed by us in semi-domestic conditions, it must be considered to be probably extinct.

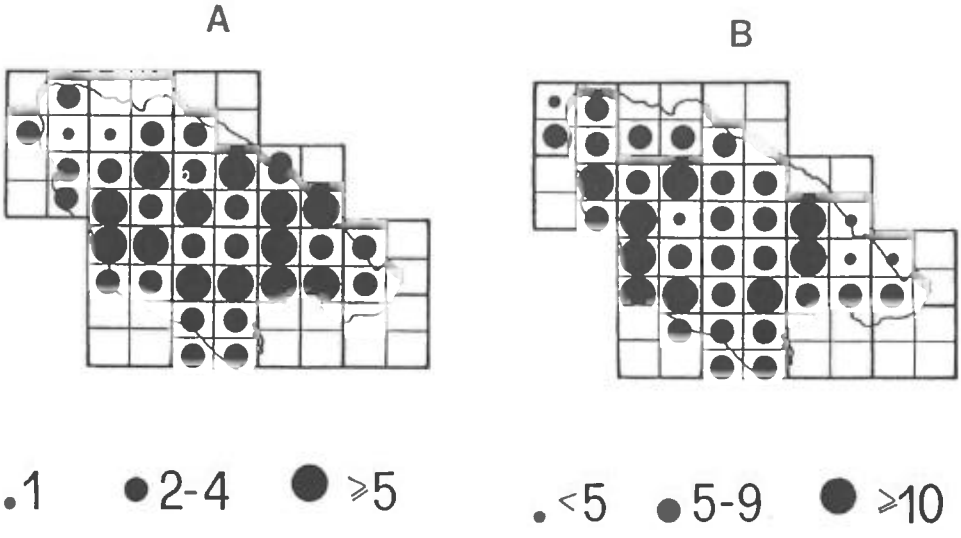

Fig. 6. Relative abundance of amphibians (A) and reptiles (B) in the Lepini Mountains. Each of the 60 5x5 km squares is filled out with a black circle whose size indicates the number of collecting sites.

DISCUSSION

The amphibians and reptiles occurring in the study area can be assigned to four main biogeographic categories, acording to La Greca (1964) (Table 3). The analysis of these categories shows that the herpetological assemblage of the Lepini Mountains is largely characterized by European species (60.7%), i.e. those species of Pleistocene immigration, and Mediterranean species (Holomediterranean and Apennine) (21.4%), i.e. thermophilous and endemic Italian species. The most interesting amphibians and reptiles, from a biogeographic point of view, are *Salamandrina terdigitata, Bombina variegata, Rana italica, Podarcis sicula, Chalcides chalcides, Elaphe quatuorlineata* and *Coronella girondica*.

TABLE 3
Chorological categories of the amphibians and reptiles occurring in the Lepini Mountains (chorological categories are according to La Greca, 1964)

Eurocentralasiatic species	*Bufo bufo, Bufo viridis,* *Hyla arborea, Natrix natrix,* *Natrix tessellata*
European species	*Triturus carnifex, Triturus vulgaris,* *Bombina variegata, Rana dalmatina,* *Rana* sinklepton *esculenta,* *Emys orbicularis, Testudo hermanni,* *Podarcis muralis, Lacerta viridis,* *Anguis fragilis, Hierophis viridiflavus,* *Coronella austriaca, Coronella girondica,* *Elaphe longissima, Elaphe quatuorlineata,* *Vipera aspis*
Holomediterranean species	*Salamandrina terdigitata,* *Rana italica, Podarcis sicula,* *Chalcides chalcides*

Salamandrina terdigitata is the only species of a genus endemic to the Apennines, and it can be retained as a paleoendemism. This species seldom occurs above 900 m a.s.l., and it can be considered as the most thermophilous Italian urodele (Lanza and Poggesi, 1971).

Rana italica is another amphibian endemic to the Apennines. It was originally described by Dubois (1987) as a subspecies of *Rana graeca* (*Rana graeca italica*), but Picariello et al. (1990) and Capula (1991) have recently demonstrated that it must be considered as a full independent species.

The analysis of environmental factors influencing the diversity of the herpetofauna indicates that in the cases of both classes the heterogeneity of environments (e.g., the presence of flat areas, hill systems, mountain peaks, etc.), as well as the occurrence of different vegetational zones (Mediterranean evergreen scrub, deciduous woodland, relict Beech forest, pastures) are the main causes both for the distribution and richness of species (Fig. 6). These factors, together with the favourable geographical position within the Italian peninsula, allow the coexistence of both thermophilous (Holomediterranean and Apennine) and orophilic (European and Eurocentralasiatic) amphibian and reptile species, making this part of Latium one of the most important as far as the herpetofauna is concerned.

Apart from *Triturus alpestris, Rana temporaria* and *Vipera ursinii*, i.e. species which are known to occur only in a few localities in the central Apennines (Capula and Bagnoli, 1983; Capula, 1989; Capula and Luiselli, in press), most of the amphibian and reptile species up to now recorded from Latium have been found in the study area. This indicates that the Lepini Mountains constitute a region of high herpetological interest. The identification of critical habitats in this area of Latium is therefore urgently needed, and the creation of a regional natural park is highly recommended.

ACKNOWLEDGEMENTS

The authors are gratefully indebted to Paola Arduino, Salvtore De Stefani, Carmine Esposito, Giuseppe Forlenza, Pino Maggiore, Luca Nardi and Sergio Zerunian for friendly assistance.

REFERENCES

Bagnoli, C. (1985). Anfibi e Rettili della provincia di Roma. Roma, *Provincia di Roma, Ass. Sanitá e Ambiente, WWF Lazio.*

Bonifazi, A. & Carpaneto, G.M. (1990). Indagine preliminare sugli anfibi e sui rettili dei Monti Ausoni-Aurunci (Lazio meridionale). Roma, *Centro reg. Doc. Beni Cult. Amb. Lazio, Ass. Cultura, Reg. Lazio,* 1-47.

Capula, M. (1989). V. Anfibi e Rettili. In: Piano pluriennale regionale per la tutela e la difesa della fauna autoctona in via di estinzione (L.R. 48/82): 1-94, Roma, *Regione Lazio, Ass. Agricoltura, Dipartimento di Biologia Animale e dell'Uomo, Univ. La Sapienza.*

Capula, M. & Bagnoli, C. (1983). Il *Triturus alpestris* (Laurenti) e la *Rana temporaria* Linnaeus nell'Appennino centrale (Amphibia). *Boll. Mus. Civ. St. nat. Verona*, **9** (1982): 333-334.

Capula, M. & Luiselli, L. Distribution and conservation of *Vipera ursinii* (Reptilia: Viperidae) in Italy. *Proc. VI Ord. Gen. Meeting S.E.H.*, in press.

Carpaneto, G.M. (1986). Osservazioni preliminari sugli anfibi e sui rettili del Parco Nazionale del Circeo (Amphibia et Reptilia). *Atti Conv. Asp. Faun. Probl. Zool. P. N. Circeo,* Sabaudia: 145-155.

Corsetti, L. (1979). Appunti per una proposta di Parco Naturale dei Monti Lepini. *Boll. Italia Nostra,* Roma, **20** (176): 12-14.

Corsetti, L. (1983). La fauna. In: Carta di Monte Cacume, Coopsit, Patrica, *Comune di Patrica.*

Corsetti, L. (1990). Atlante ornitologico dei Monti Lepini. *Ypothekai, Boll. Cons. Bibl. Monti Lepini*, **5** (1989): 3-221.

Dubois, A. (1987). Notes sur les grenouilles brunes (Groupe de *Rana temporaria* Linné, 1758). IV. Note préliminaire sur *Rana graeca* Boulenger, 1891. *Alytes*, **4** (4)(1985): 135-138.

Forlenza, G. & Corsetti, L. (1990). Orchidee spontanee del Monte Cacume. Patrica, *Quaderno 1, Comune di Patrica e Museo di Storia Naturale.*

Franzini, G. (1982). Gli anfibi e i rettili del Comprensorio dei Monti Lepini. In: Contributi alla conoscenza della fauna dei Monti lepini e qualche prposta di intervento, Coop. Ecol. Anim. Appl., 50-78, Priverno, *Regione Lazio, XIII Comunitá Montana.*

Giacomini, V. (1958). Conosci l'Italia. III. La flora. Milano, *Touring Club Italiano.*

La Creca, M. (1964). Le categorie corologiche degli elementi faunistici italiani. *Atti Accad. naz. ital. Ent.*, **11**: 231-253

Lanza, B. (1983). Guide per il riconoscimento delle specie animali delle acque interne italiane. 27. Anfibi, Rettili (Amphibia, Reptilia). Roma, *C.N.R.*

Lanza, B. & Poggesi, M. (1971). Gli Anfibi e i Rettili delle Alpi Apuane. *Lavori Soc. ital. Biogeogr.* (n.s.), **1** (1970): 624-666.

Luiselli, L. & Rugiero, L. (1990). On habitat selection and phenology in six species of snakes in Canale Monterano (Tolfa Mountains, Latium, Italy) including data on reproduction and feeding in *Vipera aspis francisciredi* (Squamata: Viperidae). Herpetozoa, **2** (3/4): 107-115.

Picariello, O., Scillitani, G. & Cretella, M. (1990). Electrophoretic data supporting the specific rank of the frog *Rana graeca italica* Dubois, 1985. *Amphibia-Reptilia, 11: 189-192.*

Pratesi, F. & Tassi, F. (1972). Guida alla natura del Lazio e dell'Abruzzo. Milano, Mondadori.

Segre, A.G. (1974). I Monti Lepini. In: Una Parco Natuale nei Monti Lepini (AA.VV. eds.), 5-8, Latina, *Italia Nostra, Cons. Serv. Cutl.*

Uzzell, T., Günther, R. & Berer, L. (1977). *Rana ridibunda* and *Rana esculenta*: a leaky hybridogenetic system (Amphibia Salientia). *Proc. Acad. nat. Sci. Philadelphia*, **128** (9): 147-171.

Uzzell, T. & Holtz, H. (1979). Electrophoretic and morphological evidence for two forms of green frogs (*Rana esculenta* complex) in peninsular Italy (Amphibia, Salientia). Mitt. Zool. Mus. Berlin, **55** (1): 13-27.

Zaccheo, L. (1989). I Monti Lepini. Roma, Newton Compton.

Zerunian, S. & Sciscione, L. (1984). Primi dati sulla riproduzione e lo sviluppo larvale di *Salamandrina terdigitata* (Lacépède) nei Monti leipini (Amphibia, Salamandridae). *Boll. Zool.*, **51** (suppl.): 117.

A NOTE ON *LACERTA DUGESII* IN MADEIRA

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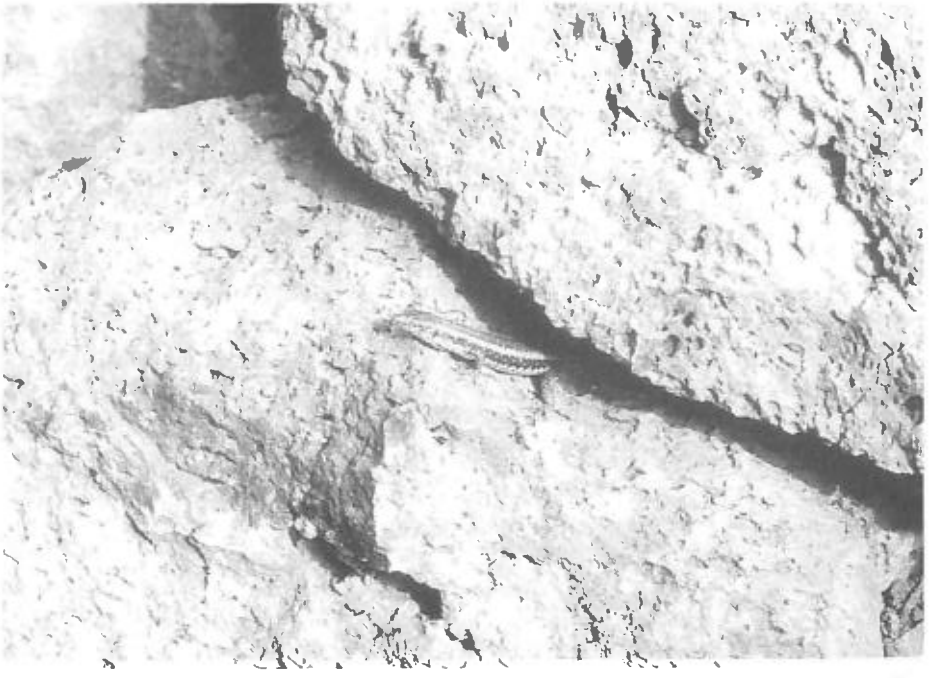
Lacerta dugesii (Milne - Edwards 1829) occurs on four oceanic island groups in the Atlantic, of which Madeira (32°N 17°W) is the largest component. Its geographical variation has been described by Cook (1979) and its diet, based upon the examination of the gut contents of about 1700 specimens from the Madeiran Archipeligo and Savage Islands, has been analysed by Sadek (1981). This consists of a variety of invertebrates and plant material, showing differences correlated with habitat and geographical distribution. The herbivorous and scavenging tendencies of the species have recently been commented upon by Lunn (1991). Cook *et al.* (1979) have shown that the body temperature of free-ranging *L. dugesii* is always higher than the shade temperature, and lower than the temperature of the rocks on which the lizards bask. Body colour is correlated with the hues of the background in the locality in which a lizard is found, but does not affect its temperature.

During a holiday in Madeira between 13 and 22 November, 1990, I made a few observations on a colony of *L. dugesii* in the garden of Reid's Hotel. Two or three times daily, I counted the lizards on the top and exposed side of an east-facing stone wall about 25 m long, 3 m high and 0.5 m wide; and on a rockery nearby, of similar width, 15 m long and facing south. Air temperature, during the times when the lizards were active, ranged between 20 and 26°C, but the cloacal temperature of a sample of animals averaged 30.6 (±0.48 S.E.) °C (n = 5). This supports the conclusions of Cook *et al.* (1979). Temperatures were measured with a Thandor Th 301 Digital Thermometer with a Thermocouple Type K).



Medium-sized *L. dugesii* emerging from its refuge on the wall.

The lizards disappeared from view almost immediately their environment became shaded from direct sunlight. Three size groups were apparent - small, medium and large. In all, 278 sightings were made, 76 on the top of the wall, 90 on the side and 112 in the rockery where only 13 sightings of small lizards were recorded. In contrast, 51 sightings of small lizards were made on the wall. Sightings of medium-sized lizards were 89 in the rockery and 84 on the wall; of large lizards, 10 in the rockery and 31 on the wall. Of the different size categories, 64 sightings were of small lizards, 173 of medium and 41 of large animals. These figures suggest lower survivial rates of small individuals in the rockery than on the wall. The three size groups probably represent the hatchlings of 1990, 1989, and 1988 or earlier, respectively.

REFERENCES

Cook, L.M. 1979. Variation in the Madeiran lizard *Lacerta dugesii. J. Zool. (Lond.),* **187:** 327-340.

Cook, M., Cook, L.M. & Hereward, F.V. 1979. Colour and heat balance in the lizard *Lacerta dugesii. Copeia. 1979;* 250-258.

Lunn, J. 1991. Scavenging by the Madeiran lizard *Lacerta dugesii. Brit. Herpetol. Soc. Bull.,* No. 35: 10-11.

Sadek, R.A. 1981. The diet of the Madeiran lizard *Lacerta dugesii. Zool. J. Linn. Soc.,* **73:** 313-341.

LETTER TO THE EDITORS

Dear Sirs,

Mark J. Borg and Patrick J. Schembri in "A Short Note on the Herpetofauna of Gozo" (BHS Bulletin No. 38, 1991) note that in my contribution of the same name in 1988 there were "certain inaccuracies and misconceptions" and go on to say that I had mentioned that *Bufo viridis* occurred in Malta.

I apologise for this error. Perhaps as mitigating circumstances I could refer them to Honegger's Council of Europe publication of 1978 in which he provides a table of distribution throughout Europe of the 46 threatened amphibians which he lists. Under Malta are listed just three species; *Bufo viridis, Podarcis filfolensis* and *Elaphe situla.* This would also seem to indicate that the latter is the most threatened of Malta's snakes.

I was surprised and pleased to note that *Chamaeleo chamaeleon* has been recorded in Gozo. Neither Arnold, Burton and Ovenden, nor Matz & Weber in their respetive field guides to European herptiles mention this, and I wonder whether its presence might be due to a recent introduction.

Yours faithfully,

Frank D. Bowles, 37 Albany Terrace, Dundee DD3 6HS

COBRAS AND OTHER HERPS IN SOUTH-EAST ASIA

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Outline of a talk of the same title given to the BHS on February 14th 1991.

South-east Asia has one of the world's most diverse herpetofaunas, but has received little attention from herpetologists, so that it is herpetologically less well known than almost any other part of the world. New taxa are still being described regularly, including venomous or large, conspicuous species, a recent example being a 2 metre long, brightly coloured species of *Boiga (B. saengsomi)* from the forests of southern Thailand. Many further, less conspicuous, taxa almost certainly still remain to be discovered. In view of the pace of environmental degradation, it is likely that many will become extinct without ever becoming known to science. Research into herpetofaunal diversity in this part of the world should therefore be a priority.

South-east Asia has a high rate of snakebite morbidity and mortality. The systematics of many groups of venomous snakes in this region are very poorly understood, which has hindered the development of effective treatment for snakebites. For the last five years, the work of our research group in Aberdeen has concentrated on the elucidation of the population systematics of some of the problematical groups, with the aim of providing taxonomic information which will allow the production of better, more specific, antivenoms for the treatment of snakebite victims in all parts of southern Asia.

Most of the fieldwork has been concentrated in agricultural areas, especially rice fields, where most of the medically important species occur. Despite the much lower species diversity in such habitats, compared with rainforests, a good selection of species can be seen in these man-made habitats, and their accessibility is better, so that they are super places for "herping". The following paragraphs will give a brief outline of some of the commonly seen herp species in such habitats.

In flooded rice fields, frogs are the most prominent herps to be seen, especially at night, when the choruses can be deafening. Common species include *Ooeidozyga lima, Rana limnocharis,* and *R. erythrea,* probably the most beautiful of the common frogs in the area. *Rana tigrina* is heavily predated by the local human population, and therefore less common. Other common anurans are found in villages, plantations and forests. The commonest of all is undoubtedly *Bufo melanostictus,* which is very similar to our *Bufo bufo. Kaloula pulchra* is a common microhylid in bushy or wooded areas and plantations, and all such areas have a complement of tree frogs, *Rhacophorus leucomystax* being the commonest.

No visitor to south-east Asia can fail to notice the commonest reptiles, the various house geckos, especially *Hemidactylus frenatus* and *Gehyra mutilata,* which seem to live on every single building in the region, often in large numbers. Their chattering calls in the evening, which have earned them the local names "chik-chak" in Malaysia and "jing-jok" in Thailand, are a reliable reminder that dinner-time for herpetologists is near. Another well known visitor to houses, with a call that inspired the name of the entire lizard family Gekkonidae, is the Tokay *(Gekko gecko).* Since this species is generally hated and killed on sight, it is usually confined to outbuildings; it is also commonly found on trees growing on the dikes of rice fields, and on roads at night.

Other common lizards include the skink *Mabuya multifasciata,* and various species of *Calotes.* In some areas, especially Penang, *Varanus salvator* is common. Their tracks may be seen in the sand on Penang's less frequented beaches, and sometimes large specimens are seen walking along village streets in broad daylight. They also frequent mangroves, where they dive into the sea when disturbed. In forested areas and parks, flying lizards *(Draco sp.)* are common, especially on large, smooth-barked trees, without much undergrowth between them. Their flight mechanism is a very effective anti-herpetologist strategy.

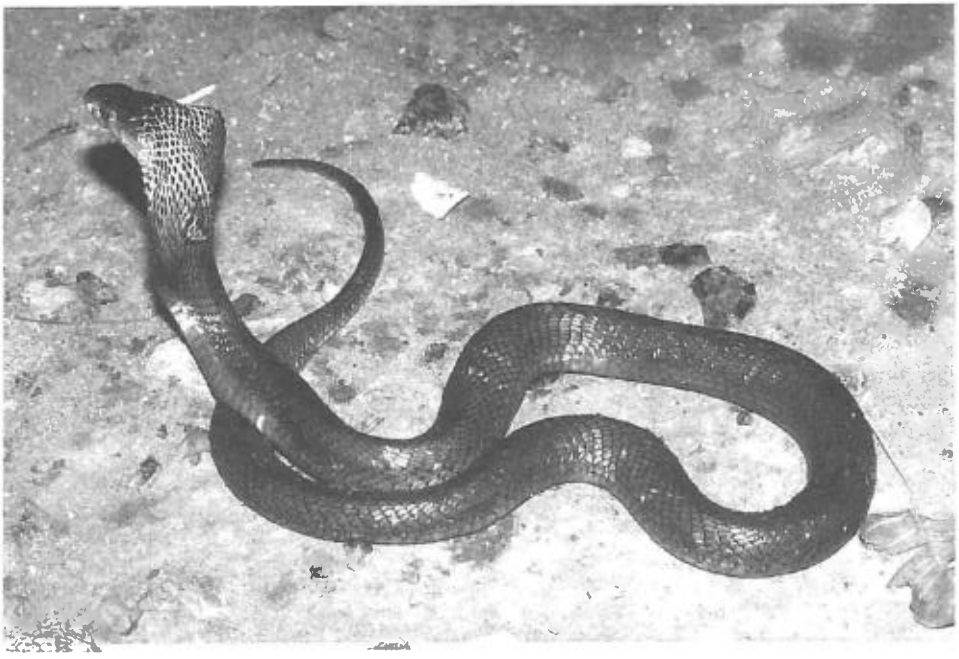

Fig. 1. Monocellate cobra, *Naja kaouthia*, from Lop Buri Province, central Thailand. This is the common cobra of wet lowlands in central and southerin Thailand.

Fig. 2. *Naja* cf. *atra*, Indochinese spitting cobra. Black and white colour variety, from Amphoe Ta Khli, Nakhon Sawan Province, central Thailand. Despite very obvious differences in colour pattern, behaviour, and size, this species has until now been generally confused with *N. kaouthia*.

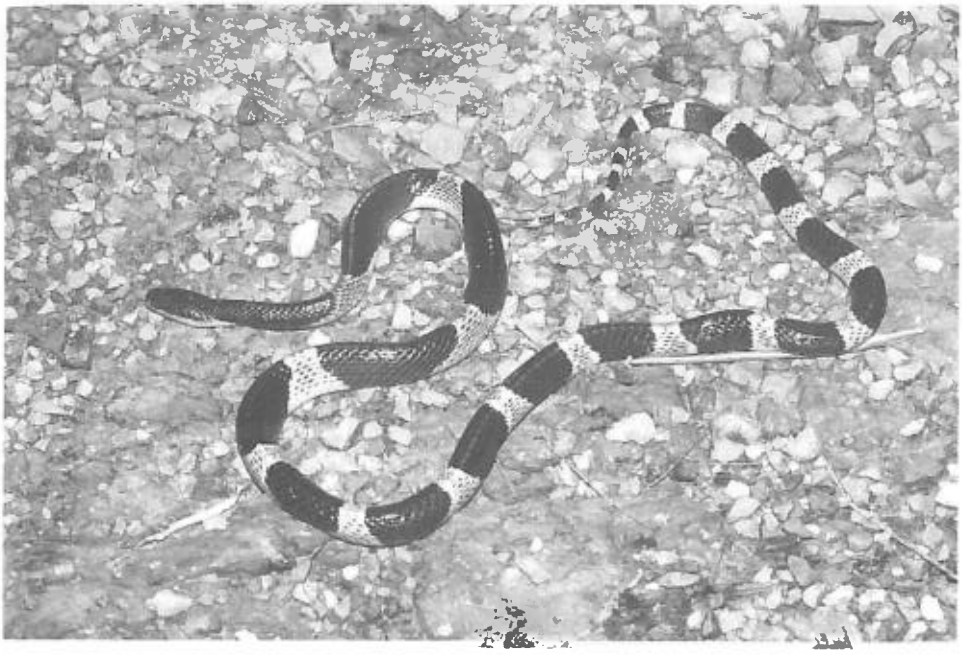

Fig. 3. Malayan krait, *Bungarus candidus*, from Nam Nao National Park, Phetchabun Province, north-eastern Thailand. This species is one of the main causes of snakebite death in Thailand, yet no antivenom is available to treat its bites.

Commonly seen harmless snakes include various colubrids, such as Bronzebacks *(Dendrelaphis pictus)* and Vine Snakes *(Ahaetulla nasuta)*, usually found in bushes, various water snakes *Enhydris* sp.), and Striped Keelbacks *Amphiesma stolata)*. Some representatives of other snake families are also common, such as the Sunbeam Snake *(Xenopeltis unicolor)*, referred to as the "gasoline snake" in NE. Thailand, because of the iridescence of its skin, and the Pipe Snake *(Cylindrophis rufus)*.

Thailand and Malaysia have few large, good-natured, non-venomous snake species – most snakes capable of giving a good bite will do so with little provocation. Enthusiastic and commonly seen purveyors of scar tissue include the Indochinese Rat Snake *(Ptyas korros)*, which is often found sleeping in trees at night, and the Copperhead Racer *(Elaphe radiata)*, which has the particularly startling habit of striking high at the face of any perceived adversary, until exhausted, when it will save energy by playing dead. The main natricine bruiser is the ubiquitous Checkered Keelback *(Xenochrophis flavipunctata)*.

In terms of physical injury inflicted, the Kukri Snakes *(Oligodon)* are in a class of their own. Legend has it that these are small, inoffensive snakes, which are reluctant to bite. This is certainly not the case in the two most common Thai species, *O. cyclurus* and *O. taeniatus*, which are all too eager to sink their teeth into anything alive. A 20 cm specimen of *O. taeniatus* drew appreciable amounts of blood, and "large" (= 60 cm) *Oligodon cyclurus* can produce slash-wounds which bleed for hours, and leave permanent scars. These wounds are inflicted with the posterior maxillary teeth, which are large, flattened and blade-like. The maxillae of these snakes are extraordinarily mobile, and the teeth can slash any finger attempting to hold the snake by the neck in the usual manner, rather like the African Mole "vipers", genus *Atractaspis*.

Of the 25 or 26 species of front-fanged, venomous, land snakes found in Thailand and Malaysia, fewer than 10 cause widespread medical problems. Due to good medical care, the case fatality rate in these countries is relatively low. Nevertheless, many people do die from snakebite, and many more suffere severe bites, often resulting in permanent disability due to tissue damage.

Fig. 4. Banded krait, *Bungarus fasciatus*, from near Mae Ramat, Tak Province, western Thailand. Although not uncommon in many areas, this snake is very seldom involved in snakebite accidents. Yet, the only Thai *Bungarus* antivenom covers this species, rather than the much more dangerous *B. candidus*.

Fig. 5. White-lipped pit viper, *Trimeresurus albolabris*, from Amphoe Bueng Bun, Sisaket Province, north-eastern Thailand.

One of the taxonomically confusing groups of venomous snakes is that of the Green Pit Vipers (genus *Trimeresurus).* These are the most common venomous snakes in Thailand, and occur even in the centre of Bangkok. The various species look very much alike, but their distributions and medical importance differ greatly. The three most common Thai species are *Trimeresurus albolabris, T. popeorum* and *T. macrops.* These have been frequently confused in the literature. Thus, *T. macrops,* a species which, though common even within Bangkok, was only described in 1977, is referred to as *T. popeorum* in much of the literature, whereas the true *T. popeorum* is often mis-labelled *T. erythrurus,* a species not hitherto recorded from Thailand. *Trimeresurus popeorum* is a hill form, and is rarely involved in snakebite accidents. The most serious, though usually non-fatal, *Trimeresurus* bites in Thailand are inflicted by *T. albolabris,* whereas *T. macrops* seems to cause mostly trivial bites. However, the Thai green pit viper antivenom uses the venoms of both species, thus reducing its effectiveness against the more dangerous *T. albolabris.* Due to the confusion in the nomenclature of these forms, it is very difficult to interpret past medical or venom-related literature on these vipers.

Another pit viper causing many bites is the Malayan Pit Viper, *Calloselasma rhodostoma.* This snake is particularly common in rubber plantations. Due to its excellent camouflage, and its tendency to stay put when approached, it is responsible for a very large proportion of snakebite accidents within its range. Although the fatality rate is low, it is one of the principal causes of snakebite death in Thailand and Malaysia, due to the high number of bites. Survivors of bites may suffer severe necrosis in the bitten limb, sometimes requiring amputation. Our research group is currently working on a project on the biology of this species.

Russell's Viper is by far the most dangerous viperid found in this region, although it is fortunately restricted to a part of the central Thai plain and a few neighbouring areas. This species has a scattered relict distribution in south-eastern Asia, isolated populations inhabiting Burma, central Thailand, Taiwan, southern China, eastern Java, and a few smaller Indonesian islands.

It is a major source of snakebite death in most of these areas, particularly in Burma. There is considerable venom variation between different populations. For instance, the effects of a bite by this species in Burma show very different clinical symptoms than a bite sustained in Thailand. This species was until now subdivided into five conventional subspecies. Research by our group has shown that these are largely artifical, and therefore valueless (like most subspecies); there are in fact only two morphologically distinct taxa within Russell's viper, a western form from India and neighbouring areas, and an eastern form from Burma eastward.

Two genera of Elapid snakes are of medical importance in Thailand and Malaysia, the kraits *(Bungarus),* and the cobras *(Naja).* The other genera *(Ophiophagus, Maticora, Calliophis)* rarely cause snakebite accidents. It should be mentioned that, of the rarer Elapids, it is not just the King Cobra which is highly dangerous. *Maticora bivirgata* has killed human beings, and a bite by a 30 cm *Calliophis macclellandi* resulted in the death of a healthy adult man in 8 hours!

The two common species of *Bungarus* found in Thailand and Malaysia, *B. fasciatus* and *B. candidus,* further exemplify the problems posed by an insufficient understanding of the epidemiology of snakebites. In Thailand, an antivenom is produced only against the venom of the more conspicuous of the two species, *B. fasciatus,* which is common in the Bangkok area. There is no antivenom against *B. candidus.* Epidemiological research has shown that, whereas very few people are bitten by *B. fasciatus, B. candidus* is one of the principal sources of snakebite death in eastern and north-eastern Thailand. The *B. fasciatus* antivenom is useless against *B.candidus* venom, so that many people die due to bites by the latter species.

The main thrust of the research of our group has so far been directed at the resolution of the systematics of the Asiatic cobra species complex, which was until now particularly chaotic. In most classifications which have appeared in the western literature over the last few decades, all Asiatic *Naja* populations have been regarded as belonging to a single species, *Naja naja,* ten subspecies being recognised by most workers. This arrangement was widely felt to be unsatisfactory, but, until now, nothing has been done to resolve the problem.

Our understanding, or lack thereof, of the population systematics of these snakes has a number of important consequences for the treatment of snakebite patients. Most importantly, if all

Fig. 6. Pope's pit viper, *Trimeresurus popeorum*, from Ban Pala-U, Prachuap Khiri Khan Province, southern Thailand.

Fig. 7. Russell's viper, *Vipera russelli*, from central Thailand.

populations are subspecies of one species, one would by definition expect to find only one of these subspecies in any one locality; there would be no sympatry between different forms. Furthermore, where two such subspecies meet, one would expect some kind of hybrid zone between them, where one phenotype merges into an other. Where venom differences exist between supposed subspecies, one would expect the venom types to intergrade in such a zone.

Significant venom differences are known to exist between some cobra populations; for instance, it is known that antivenom against cobras from southern Malaysia (traditionally known as *N.n. sputatrix)* does not neutralize the venom of cobras from central Thailand (traditionally known as *N.n. kaouthia).* The conventional taxonomic arrangment would predict a hybrid zone somewhere along the Malayan Peninsula, where the venom types would intergrade.

Our work has shown that there are in fact eight or nine full species of Asiatic cobra, not ten subspecies of a single species. Many of the conventional subspecies were found to be entirely artificial, consisting of a randoim assemblage of populations which actually belong to two or three different species. In Thailand and Malaysia, there are three full species of cobra. The most common is the Monocellate Cobra *(Naja kaouthia),* a large (up to 220 cm) non-spitting species, which is common in central and southern Thailand, and northern Malaysia. In southern Thailand and northern Malaysia, *N. kaouthia* occurs sympatrically with *N. sumatrana,* the Equatorial Spitting Cobra. *Naja kaouthia* and *N. sumatrana* are the two species with different venoms mentioned earlier. However, rather than there being a gradual intergradation between venom types, as would be predicted by the conventional taxonomic arrangement, there is in fact a situation where, over several hundred kilometers of the Malayan Peninsula, two species, whose bites require different antivenoms, occur sympatrically. Since there is currently no polyvalent antivenom which covers both species, this is clearly of some relevance for the treatment of snakebite victims in the area.

In much of central Thailand, *N. kaouthia* occurs sympatrically with a highly variable group of small spitting cobras, which have been the subject of much taxonomic confusion. In a previous paper, we (Wüster & Thorpe, 1991) assigned these populations to *Naja atra,* but pointed out that more than one species may be involved. Current work suggests that the Thai spitters are indeed not conspecific with Chinese *N. atra,* so, until the affinities of this form are sorted out, I will refer to them here as *Naja* cf. *atra.* This is the only species to occur in northern and north-eastern Thailand, where it inflicts a good number of bites every year. In Thailand, only antivenom against *N. kaouthia* is currently available. There has so far been a conspicuous lack of comparative research into differences in venom composition between *N. kaouthia* and *Naja* cf. *atra,* so that nothing is known about the effectivenss of the Thai antivenom in the treatment of *Naja* c.f. *atra* bites.

These examples show how taxonomic confusion can seriously hinder progress in the treatment of snakebite victims. In any biological problem, the principal preconditon must be that one has to know what animals one is working with. Most of all, it must be emphasised that there are many other complexes of dangerously venomous snakes in urgent need of revision, using modern taxonomic methods, such as multivariate analysis of morphological characters, or molecular techniques. This is particularly the case when the species in question either all look the same (as in *Trimeresurus),* or when there is much superficial variation, which does not reflect systematic affinities, as in Asiatic cobras.

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REFERENCE

Wüster, W. & Thorpe, R.S. (1991). Asiatic cobras: systematics and snakebite. *Experientia,* **47,** 205-209.

MORPHOLOGICAL AND BEHAVIOURAL DIFFERENCES BETWEEN LARVAE OF VARIOUS RACES OF *SALAMANDRA SALAMANDRA*

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INTRODUCTION

The Fire Salamander *Salamandra salamandra* is a widespread urodele occurring from Western Europe to the Middle East and North Africa. Thirteen races are recognised (Klewen, 1991) based upon variations in body colouration, patterning and proportions, though considerable variation may occur within populations (Thorne, 1968; Klewen, 1991). The current study seeks to identify similar differences between the newly-born larvae of four races of salamander.

METHODS

Fire Salamanders produce live young in water, generally in the early months of the year. Colonies of four subspecies of Fire Salamander, namely *salamandra, terrestris, fastuosa* and *gallaica* are maintained in the author's collection and housed separately to prevent hybridisation. Environmental conditions are similar for each population and have been described elsewhere (Wisniewski & Paull, 1986; Wisniewski, 1987). Likewise, all animals receive food of similar quality *ad libitum* (Wisniewski, 1986).

During 1990 and 1991, all young produced were measured and examined for differences in colouration, body proportions and behaviour on the day of birth and further observations were made during development.

RESULTS

		Mean	Range	Sample
1. Body length (mm)	S.s.s.	34.0	33-36	99
	S.s.t.	30.4	24-34	23
	S.s.g.	31.5	29-35	86

No measures were taken for *fastuosa* as only three juveniles were produced.

2. Ratio body length to tail lenth

S.s.s. – Tail 0.5 total length
S.s.t. – Tail 0.3-0.5 total length
S.s.g. – Tail 0.5 total length

3. Proportions

S.s.s. – Fairly robust. Tail fin medium wide. Gills medium.
S.s.f. – Body massive and bull-necked. Tail fin very narrow. Gills stubby. Well developed at birth and close to metamorphosis.
S.s.t. – Often rather thin. Tail stubby and very broad at birth becoming more streamlined later. Gills luxuriant.
S.s.g. – Fat and usually robust. Tail fin medium. Head large. Gills luxuriant.

4. Colour

Determined to some extent by background colouration. However, colour was assessed after the larvae had spent at least two hours in a white container.

S.s.s. – Body pale clay. Dark markings on tail only.
S.s.f. – Hints of post-metamorphosis colouration present, or yellow and black colouration fully developed.
S.s.g. – Dark with lots of speckling on body and tail.

5. Behaviour/development

S.s.s.	–	Metamorphosis after three months.
S.s.f.	–	Metamorphosis within one day to three weeks after birth. Very fast and prone to leap from the water.
S.s.t.	–	Slow growing. Metamorphosis up to one year after birth.
S.s.g.	–	Fast growing. Metamorphosis after one to three months.

DISCUSSION

The results suggest some differences between the larvae of the four races, the most distinctive being *fastuosa* in which the young are born at a point close to metamorphosis, sometimes with full adult colouration. In the other races, colour differences are rather subtle and probably not a reliable distinguishing feature.

Newly-born larvae of *terrestris* are noticeably blunt-tailed with very wide tail fins. The tail is rather short and this contrasts with the adults which are no more or less short-tailed than *salamandra* or *fastuosa*. However, adult *gallaica* do have very short tails, yet the larvae show no sign of this feature.

Larvae of *gallaica* are fat and robust (a feature also characteristic of the adults). Body length is probably an unreliable feature as such a wide range of sizes can be found in one batch of larvae. Mean length may also vary considerably from year to year. Thus, for *terrestris* the mean length of 1990 larvae was 26mm, whilst for 1991 larvae it was 33mm.

Perhaps more subtle differences between larvae of the various races exist, but these have not been identified by the current study.

REFERENCES

Klewen, R., (1991). Die Land salamander Europas, Teil 1. *Die Neue Brehm-Bucherei.* 208pp.

Thorn, R., (1968). *Les Salamandres d'Europe, d'Asie et d'Afrique du Nord.* Paul Lechevalier. 376pp.

Wisniewski, P.J. & Paull, L.M., (1986). Breeding and rearing the European Fire Salamander *Salamandra s. salamandra. Int. Zoo. Yb.* 24/25. 223-226.

Wisniewski, P.J., (1986). The Fire Salamander: A brief summary of the species and a review of ten years' observation with particular reference to food intake. *The Herptile* **11,** 1. 37-41.

Wisniewski, P.J., (1987). Captive husbandry of the Fire Salamander. *ASRA Monograph* **2,** 1. 11-15.

A NOTE ON *VARANUS PANOPTES RUBIDUS* (STORR 1980) IN WANJARRI, WESTERN AUSTRALIA

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Varanus panoptes rubidus was described in 1980, from material previously assigned to *Varanus gouldii* (Storr 1980: 276-277). Between 23-25 February 1991 I observed several specimens feeding on carrion at Wanjarri, Western Australia and was able to take measurements from two adults and a juvenile.

Wanjarri (or Kathleen Valley) is an abandoned cattle station situated 110km south of Wiluna on the Agnew-Wiluna Road (27° 25' south, 120° 40' east). Predominant vegetation is Mulga, with many stands of dead trees. The ground is sandy, but so hard packed by cattle that it is impossible to trace spoor on it. The cattle have recently been removed and the farm is now under the control of Conservation and Land Management of Western Australia. The only other monitor I found here was a *V. caudolineatus* 112 mm SVL, (135 mm tail, 14.5g weight) in the stump of a dead Mulga tree at 0740 in the morning.

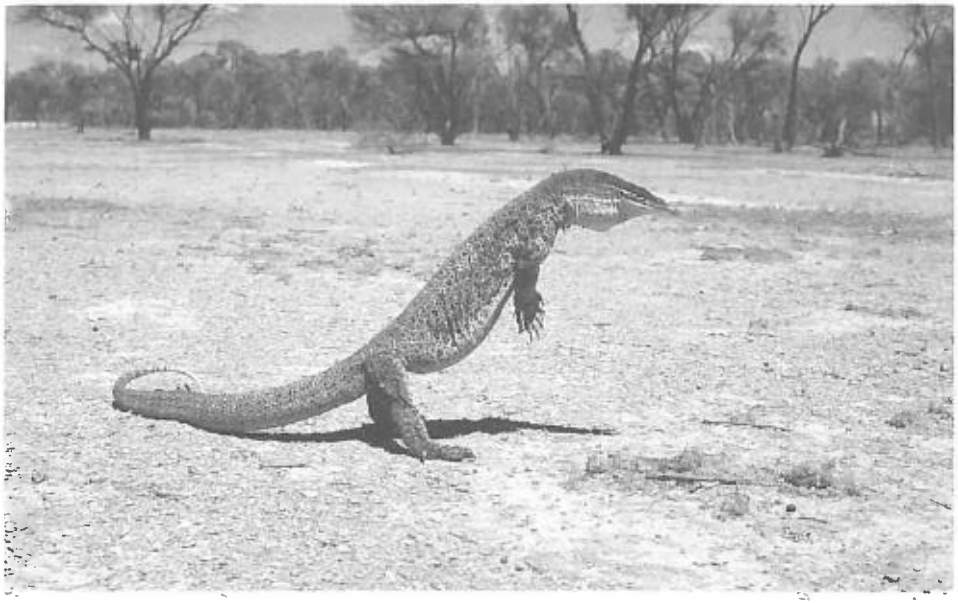
At least four (possibly five) adult (over 1 metre) *V. panoptes rubidus* were seen in an area of less than .25 km^2 over 48 hours. They were always seen alone, and only seen in the mornings (between 0720 and 0950 hrs.) and in the late afternoon (after 1630 hrs). When encountered two specimens were caught, one was not disturbed and two were chased into burrows. When disturbed the monitors would usually hold their ground for between 30-120 seconds, with the body and throat inflated and mouth open, hissing loudly. After this period they would walk to the shade of a bush, and resume their defensive posture for a while, before walking to another bush. The monitors never stopped moving in the open, and when pursued moved directly from one bush to another, eventually breaking into a run of between 40-120 metres to shelter in a burrow. Two animals chased in the same direction on the same morning took refuge in the same burrow. The second remained below ground for just 20 seconds before bursting out and running directly to another burrow 20 metres away. This was the only interaction observed between monitor lizards, although *V. panoptes rubidus* have been known to congregate at Wanjarri to feed on carrion and bipedal combat has been observed at these meetings (Calm Kalgoorlie, personal communication). The only animal that behaved in a different way when approached was a specimen that had been caught the previous night and had spent the night in a tub of water. When released in a cleared area it made no attempt to run away but immediately assumed a bipedal posture and made several lunges at me with its mouth wide open. I have observed identical lunges (in which the lizard falls short of its annoyer and never tries to bite) in *V. bengalensis nebulosus* and *V. griseus caspius*, but I have never seen the latter assume a bipedal stance. After more than 20 minutes of standing in open sun the lizard ran bipedally for about 3 metres, dropped onto all four legs, rushed to the nearest tree and climbed to the top. In all other cases monitors used burrows as refuges. Of those known to have been used by *V. p. rubidus* three were excavated under buildings and two were dug under bushes. All holes had entrances of about 15 cm in diameter, but no further measurements were possible.

SIZE

Two adults from the farm and a juvenile caught in Spinifex *(Triodia)* several kilometres away were measured and weighed. The juvenile measured 205 mm SVL, tail length 336 mm and weighed 89g. The adults measured 640 mm and 560 mm SVL, tail lengths 905 mm and 792 mm, weights 5000g and 1750g. The heavier animal was very robust and had a noticeable distention of the belly. It may be the largest *V. panoptes rubidus* yet recorded. Its head measured 82 mm from snout to the posterior edge of the ear. The lighter animal was extremely thin, it had no fat deposits in its tail and the caudal vertebrae were clearly visible through the skin. Because of the huge amount of food that was apparently available (see below) it was presumed that this animal was either a new arrival in the area or was suffering from a chronic disease.

FOOD

A well driven by a windmill had operated, probably for many years, at Wanjarri and had recently failed. The current drought in Western Australia combined with the drying up of the well had led to the death of many kangaroos. At least 11 corpses of both Red and Grey Kangaroos *(Macropodus rufus* and *M. fuliginosus)* were found around the farm buildings. Some were in dense shade, others in direct sunshine. They were in various states of decay, ranging from fresh through putrefying to desiccated. Strangely, monitor lizards were only seen to feed from a single corpse lying at the side of a farm building in a sheep enclosure; three were found feeding from it at different times and another was found less than 20 metres away. This corpse had attracted more flies, and therefore contained most maggots, and was in a state of high putrefaction. It had been eviscerated and the monitors were seen feeding from the abdominal wall and the neck. When feeding on large items of carrion *Varanus panoptes rubidus* tears at the carcass with the front claws, freeing pieces of meat which are then picked up in the mouth and swallowed. None of the other carcasses examined showed any signs of having been eaten by monitor lizards.



Varanus panoptes rubidus

photo: D. Bennett

Although feeding on carrion has not previously been reported in *Varanus panoptes rubidus* it is not at all surprising that this takes place. Other large Australian Varanids are reported to be carrion eaters; *V. gouldii* (White 1952) and V. varius (Kennerson 1980). However it is unusual for large numbers of animals to die in the same place over a short period of time. In areas outside mankind's influence it must be a very rare occurrence. This superabundance of food is probably the reason for such a high number of adult lizards being found in such a tiny area. But why was only one corpse eaten when so many were available? Possibly it is easier for smaller monitors to feed on a carcass that has already been eviscerated by a larger one and thus provides many surfaces for feeding from, but all the animals in this study were large adults. Perhaps *V. panoptes rubidus* has a preference for meat at a particular stage of decomposition, but studies elsewhere have found that monitor lizards prefer fresh corpses to rotten ones when given the choice (Auffenberg 1981: 192-193), and Ward and Carter (1988) reported that *V. varius* will eat carrion at all stages of decomposition. Another possible explanation is that thermoregulatory considerations made this the most desirable food item. If many animals were feeding from the same carcass some order of hierarchy is likely to have been established, and this may explain the presence of extremely fat and extremely thin animals in the same area.

The taxonomy of the "gouldii" group of monitors (i.e. *V. panoptes panoptes, V. panoptes rubidus, V. gouldii gouldii, V. gouldii flavirufus* and *V. rosenbergi* is still rather cloudy, and further complicated by the confusion regarding their nomenclature (Bohme 1989). The largest specimen in this study could not be distinguished by its pattern alone, which had almost completely faded, and was only definitely assigned as *V. panoptes* because it had 223 rows of scales at midbody. Had this number been a little smaller it would have been impossible to distinguish the animal from *V. gouldii flavirufus* using the available keys.

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REFERENCES

Auffenberg, W. (1981). *The Behavioral Ecology of the Komodo Monitor.* University Presses of Florida, Gainesville.

Bohme, W. 1989. Bonn, September 0-22 (1989): The Identity of (Grey 1938) and the Nomenclature of the *V. gouldii* Group. *Abstracts of the International Symposium on Varanids.*

Kennerson, K. (1980). Carrion Diet in the Lace Monitor *Varanus varius. Herpetofauna* **12**(1):36.

Storr, G.M. (1980). The Monitor Lizards (Genus *Varanus* Merrem, 1820) of Western Australia. *Rec. West. Aust. Nat.* **8**(2): 237-

Ward, D.L. & Carter, D.B. (1988). Carrion Feeding in *Varanus varius* – Notes from a Field Study. *Herpetofauna* **18**(2):22

White, S.R. (1952). Destruction of Nesting Birds by Reptiles. *West. Aus. Nat* 3(5): 119-120.

OBSERVATIONS ON THE TERRITORIAL AND REPRODUCTIVE BEHAVIOUR OF *SALAMANDRA LANZAI* AND CONSIDERATIONS ABOUT ITS PROTECTION (AMPHIBIA: SALAMANDRIDAE)

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A new species of alpine salamander, *Salamandra lanzai*, has been recently described by Nascetti *et al.* (1988) (Fig. 1). Similar in colouration to the typical *S. a.atra* (uniformly black), it differentiates from this, among other things, because of genetic and morphological features (see Andreone *et al.*, 1990a). Another similarity between these two species is that both are viviparous (Andreone & Sindaco, 1989), a character that most probably is a convergent adaptation to life at high altitude.

Actually its known distribution embraces only a narrow area of the Cottian Alps (and, perhaps, the Maritime Alps), in Italian (Piedomont) and nearby French territories (Andreone & Sindaco, 1989).

Being present in alpine meadows over 1500 m a.s.l. the active life of *S. lanzai* is conditioned by meteorological conditions, and therefore by the long permanence of snow.

In fact its main period of activity lasts only for the "alpine summer", beginning at the end of May and finishing usually in late September – early October, varying according to the particular climate of the year.

On the occasion of a visit made during September 1990 in one of the localities in which the species lives, some observations were made on the territorial and reproductive activities of this salamander. So, lacking altogether basic information about its biology I think it is interesting to refer to them.

The area of observation is an alpine moor and nearby rocks at about 2020 m.a.s.l., sited in the upper Po valley, "terra typica" of the holotype (see Nascetti *et al.*, 1988) (Figure 2).

The only other amphibian species present in this habitat is the common frog *Rana temporaria*.

If the space of a few hundred metres, during a storm, at least 60 individuals were observed, sexed and immediately released. In particular looking in an area with a radius of about 10 metres it was possible to identify about 5-6 salamanders. Nearby all the salamanders were males; only three females and no youngsters at all were observed. The high number of active animals was probably due to the particular meteorological conditions (rain, high humidity), since on other occasions a considerably lower number of animals was usually observed.

It is interesting to point out how the salamanders came out from their hiding-places (cavities under great rocks) and climbed over elevated places, where they stayed quite motionless, keeping raised the fore part of the body and looking with particular attention all around (Figure 3).

For several reasons I interprete this as a territorial and sexual behaviour. In fact, on one occasion I observed one couple in amplexus: the male moved staying under the female and embracing her forelegs with its own. In this behaviour *S. lanzai* is therefore similar to *S. salamandra* and *S. atra* (Fachbach *et al.*, 1975).

On another occasion I observed two fighting males in embrace, rubbing their heads one against the other. When one male tried to escape the other one quickly followed and embraced it again.

Taking into account these observations it is likely that, considering the high number of observed males, together with mating and territorial behaviour, *S. lanzai* most probably has a breeding period occurring in late summer.

In a recent paper (Andreone *et al*, 1990b) it was pointed out that during the early phase

of activity (July) several youngsters were observed, together with a few males and a greater number of females, while at the end of the summer the majority of those collected were males.

It is therefore likely that *S. lanzai* may have a biennial reproductive cycle, with the mating activities at summer's end. So, the pregnancy lasts for the first year following mating and the young are born at the beginning of second year's summer (most probably in June). By the way it is obvious that further studies are necessary to confirm this hypothesis.

As previously said, *S. lanzai* is typical only of south-western Piedmont and nearby French territories. For this reason it should be considered rare and endemic, even if the status of each single population is not well known. Personally I believe that at the moment *S. lanzai* is not really endangered.

Firstly it must be remembered that it is an alpine amphibian (over 1500 m a.s.l.), living therefore in areas usually not affected by extreme antropization. Furthermore it does not breed in water but it bears well formed young directly on land.

By the way, its taxonomic status being unique there is the risk of collection and capture for scientific and museological purposes. On the other hand it must be emphasised that its capture is regulated by the regional law n.32/82, which forbids any capture of amphibians (excepting green frogs) in all territories of Piedmont, where the main populations actually known of *S. lanzai* live, the entity of French populations not yet being known at all.

The main risk concerns one population, that described in this article. This is because the alpine moor is afflicted by excessive car movements, as many people visit it in holidays and week-ends. Several cars and vans arrive in summer just in this area, and even if (fortunately) salamanders do not attract tourist attention, on wet and rainy days they move actively, just on the upper part of the asphalted road, and are easily killed by car traffic.

This area is proposed to become a regional park: one of the hypothised measures of habitat protection is to stop the traffic at a lower altitude and allow access only by foot. This simple action will certainly preserve the area from further alterations and will contribute to the conservation of one of the greatest Lanza's Salamander populations.

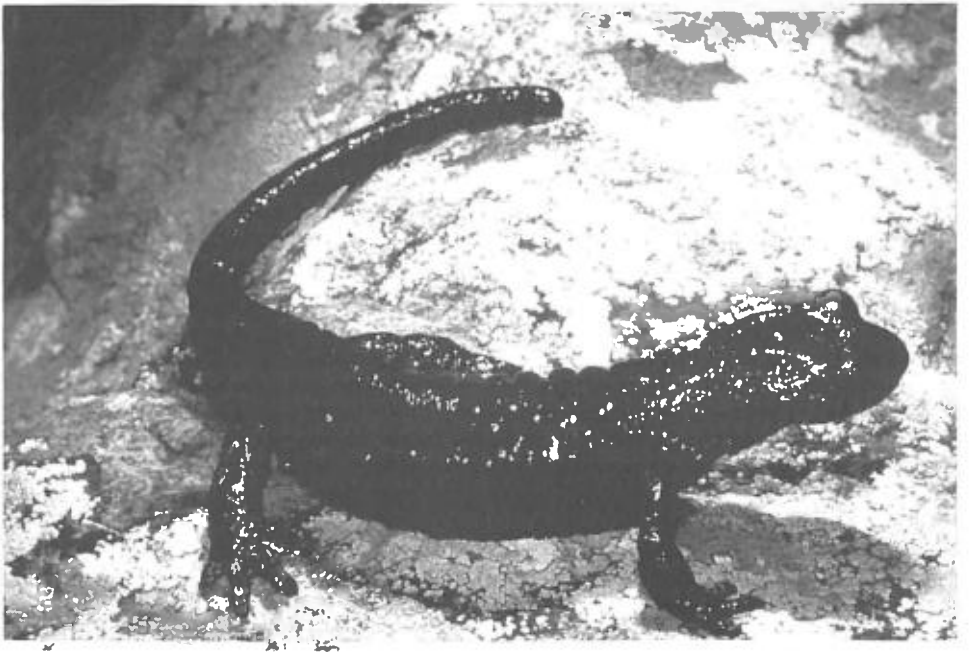

Plate 1. – Male of *Salamandra lanzai* (photograph by F. Andreone).

Plate 2. – Alpine moor at about 2020 m a.s.l. in south-western Piedmont (Cottian Alps, north-western Italy), habitat of *Salamandra lanzai* (photograph by F. Andreone).

REFERENCES

Andreone F., Capula M. & Nascetti G., 1990a: Considerazioni biogeografiche e tassonomiche su *Salamandra lanzai* (Amphibia: Salamandridae). In: XXVII Congress of Italian Society of Biogeography (S.I.B.), Torino, 19-22 September 1990, UTET: 10-11.

Andreone F. & Sindaco R., 1989: Materiali per un'erpetologia del Piemonte e della Valle d'Aosta (Amphibia, Reptilia). Riv. piem. St. nat. 10: 205-225.

Andreone F., Sindaco R & Morisi A., 1990b: Note sull'alimentazione di *Salamandra lanzai* (Amphibia: Salamandridae). Riv. piem. St. nat. (in press).

Fachbach G., Kolossau I. & Ortner A., 1975: Zur Ernährungsbiologie von *Salamandra s. salamandra* und *Salamandra atra*. Salamandra 11 (3/4): 136-144.

Nascetti G., Andreone F., Capula M. & Bullini L., 1988: A new *Salamandra* species from southwestern Alps (Amphibia, Urodela, Salamandridae). Boll. Mus. reg. Sci. nat. Torino 6 (2): 617-638.

THE CARE AND BREEDING OF JOHNSTON'S CHAMELEON, *CHAMAELEO JOHNSTONI*, IN CAPTIVITY

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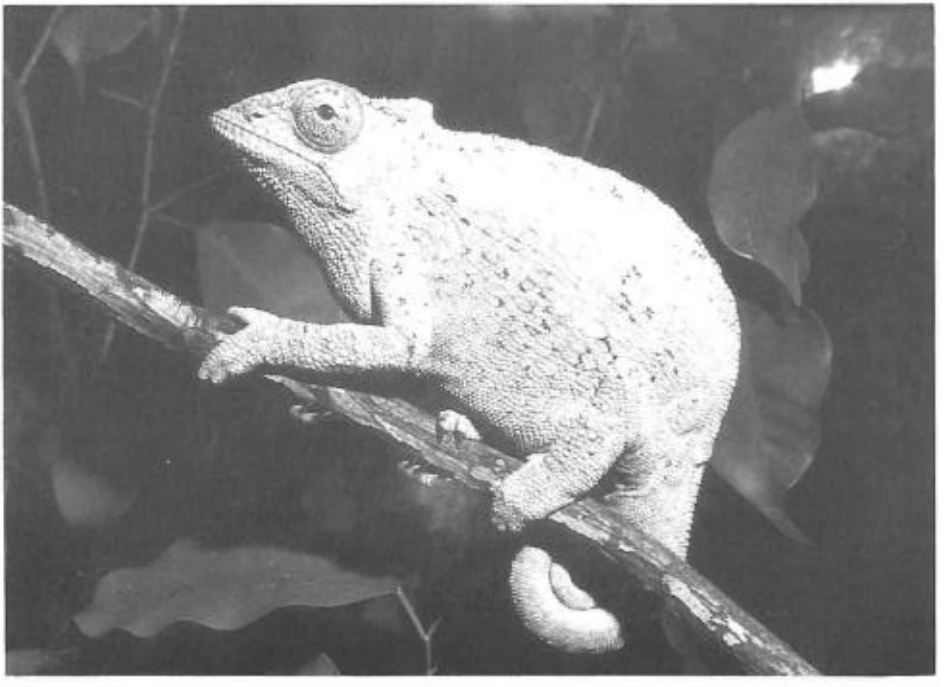
INTRODUCTION

This species is found at high altitudes, 2000 ft to 7000 ft in the montane regions of central Africa (Witte G.De. 1965). It possesses large, muscular limbs and a very strong grip, reputedly necessary to combat high winds in its natural habitat. I have been informed that specimens currently being imported into Britain are collected from Burundi, at an altitude of approximately 6,500 ft (2,000 m), and are thus specimens from the cooler and higher altitude range of this species.

DESCRIPTION

Chamaeleo johnstoni is an easily recognised species; the males possess three horns on their heads. Confusion often occurs between this species and *C. jacksoni*, however there are several distinguishing characters that easily differentiate the two. The dorsal crest in *C. johnstoni* is straight, whereas in *C. jacksoni* the dorsal is heavily serated. *C. johnstoni* is the more colourful species, often showing vertical bands on the flanks in slate grey and yellow. Female *johnstoni* also show, to varying intensity, orange lips. An important point to consider is that few, if any, *jacksoni* exist in this country since Kenya, their country of origin, ceased exports some years ago. Any three horned chameleons offered for sale in this country are extremely unlikely to be *C. jacksoni*.

C. johnstoni is a medium sized chameleon, both sexes reaching 110mm snout to vent, with a 90mm tail.



Adult female *Chamaeleo johnstoni*

ACCOMMODATION

I have housed this species in two quite different setups, both being successful. Gravid females are housed in a typical all glass vivarium, 120cms long x 40cms x 40cms. The floor is covered in a peat and leaf litter mix, which is piled up at one end to a depth of 20 cms, this providing a suitable laying area when covered with a few small branches. The rest of the vivarium is filled with branches, strategically placed to give various basking sites close to the heat and light source, some mention of which should be made. Heating is provided by an incandescent bulb, wattage adjusted to give the desired temperature. I also provide a source of ultra violet radiation, which I believe to be essential in captive lizards to enable them to produce their own vitamin D3. I use Actinic 09 tubes, 18" and 15 watts, situated vertically in the vivarium, allowing easy access for basking, and below any glass cover which would decrease the U.V. from the tube.

The other setup used was a planted 2.4 m x 1.8 m x 1.8 m (8' x 6'x 6') high greenhouse. The glass is covered with green-house shading, to avoid any excess over-heating, and the floor is of concrete flags. The plants are container bound for ease of moving. The best types of plant to use are the Buddleias and the Rhododendrons. Both these plant genera contain half hardy species suitable for the cold greenhouse that also provide colour and fragance on their own.

Juvenile *C. johnstoni*

ENVIRONMENTAL PARAMETERS

As has been previously mentioned, this species of chameleon is found in montane regions, and therefore requires a cooler temperature than one might expect. The specimens imported into Britain show signs of stress at a temperature of 85 deg F. Those specimens kept in the greenhouse show no ill effects at all with a night time temperature down to 45 deg F (7.2 deg C). Daytime temperatures should be around 75 deg F (23.9 deg C), with a drop of 10 deg F at night. A temperature difference of 5 deg F above or below this does no harm, however 80 deg F (26.7 deg C) should be a maximum. The humidity needs to be quite high with this species, around 75%. This means a daily spraying of the enclosure used, and drinking

water should be offered at this time, using a syringe, offering droplets to the chameleon's mouth. This is necessary as chameleons will not drink from standing water. One alternative is to use a water pump to create a simple waterfall, water being pumped from a reservoir to the top of a long piece of cork bark or slate. The water flows down this, and is "visible" to the chameleon which will drink at will. The water flows back into the reservoir for recirculation, but should be replaced with fresh water at regular intervals. The water used should be at the same temperature as the environment, so as not to chill the chameleon.

FEEDING

Food consists in the main of crickets, dusted with a mineral/vitamin powder. These can be placed in a smooth sided bowl from which they cannot escape but which the chameleon can feed from at will. Other food items include flies, hatched from maggots obtained from fishing tackle shops, locusts, wax worms, mealworms, and even pink mice. All food items should be fed a nutritious diet themselves as this will ultimately be utilised by the chameleon.

BREEDING

The gravid female searches out a nest site prior to laying, and suitable areas should be available in the vivarium. These consist of mounds of moist peat and leaf litter to a depth of at least 20 cms and in a secluded position within the vivarium, such as the corners. The female digs a pit the depth of her body and lays 2 or 3 eggs then moves up out of the pit a little and fills substrate around the eggs. This is repeated until the eggs are laid and the female then covers the tops of the eggs with substrate, leaving behind the eggs in a "tube", stacked on top of each other.

The eggs should be removed to be incubated in a controlled environment, taking care to mark the orientation of the eggs. They should be transferred to a suitably moist media; the best seems to be "vermiculite", but only covered with the media to 50% to allow inspection of the developing egg. The eggs are quite large in comparison to the size of the female, around 20mm diameter and only slightly oval. This large size results in a low number of eggs, usually 10 to 12, though they can number upto 20.

The incubation temperature for the eggs should be around 75 deg F (21 deg C). A little below this seems to do no harm, even to 65 deg F (18.3 deg C), but the temperature should not go above 75 deg F, as this has proved detrimental to the developing embryos.

The eggs are reported to take around 100 days incubation (Schmidt, W. et al 1989) however I have had eggs hatch 10 days earlier at 85 to 90 days, but the incubation temperature increased to 85 deg F in the latter quarter of incubation due to a fault on the temperature regulator. Some eggs did not hatch although they reached full term, and when opened revealed fully developed young. This is almost certainly due to the erronously high incubation temperature.

The young are quite large at hatching, 30 mm snout to vent, 45 mm total. Rearing the young chameelons has so far been relatively easy and problem free given that the temperature regime indicated above for adult speciemns is strictly adhered to.

Feeding presents no problems as the young will take house flies and fruit flies, even within 4 hrs of hatching! The young grow quickly, and are soon feeding on crickets and other larger items. They can reach adult size in as little as 12 months.

Chamaeleo johnstoni has proved a very interesting and spectacular species which can be successfully bred and raised in captivity.

REFERENCES

Schmidt, W., Tamm, K. & Wallikewitz, 1989. "Chameleons Drachen unser zeit" Terrarien bibliothek,

Witte, G. De., 1965". "Les Chameleons de L'Afrique centrale" Mus. R.Afr.Cent.

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