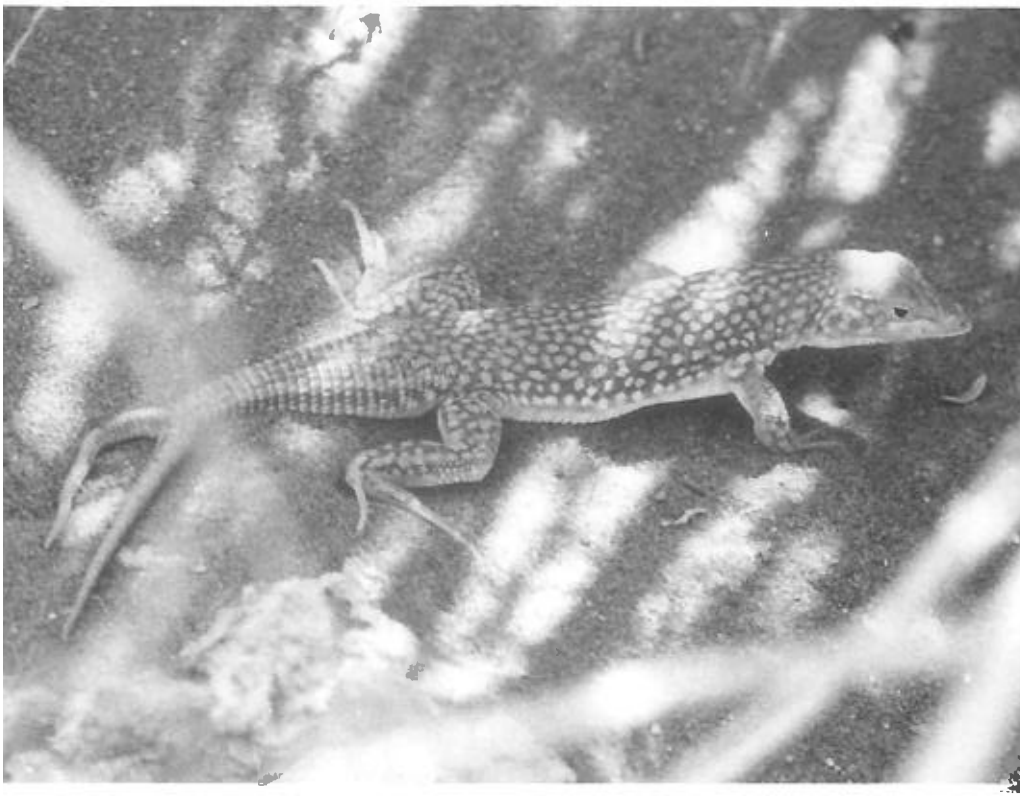
ISSN 0260-5805

THE BRITISH HERPETOLOGICAL SOCIETY

BULLETIN



No. 35
Spring 1991

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

Ordinary Members £15. Junior Members £5. (Junior Members do not receive the British Journal of Herpetology). Institution rates £25 (U.S. $40).
All subscriptions become due on the first day of January each year.

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

Aporosaura anchietae, a common sand-diving lizard of the dunes of the Namib Desert.
See "*A Note of the Reptiles of the Namib Desert*" by J.L. Cloudsley-Thompson, p.7.

GENERAL LONDON MEETINGS 1991

Meetings are held in the Lecture Theatre of the Linnean Society of London, Burlington House, Piccadilly, London W1, and start at 7.00 pm, ending at 9.00 pm, unless indicated otherwise.

May 23rd	Dr Robert Oldham (Department of Biology, Leicester Polytechnic): Nigerian Amphibia.
June 18th	Mr Geoff Clarke (Bere Regis, Dorset): Experiences in breeding snakes and other reptiles in captivity.
August 31st	*Care and breeding of amphibians and reptiles.* A special Saturday afternoon open meeting organised by T. Thatcher and S. Townson, to be held at **Birkbeck College, Malet Street, London WC1,** from 2.30 to 7.00 pm. There will be the opportunity for the sale and exchange of members' captive-bred stock and commercial displays of books and vivarium equipment. Further details in the next *Bulletin.*
October 10th	Dr Michael Lambert (BHS Chairman): Some African herpetofauna and the impact of Tsetse control insecticides on lizards in Zimbabwe.
October 26th	Philippe de Vosjoli (President, American Federation of Herpetocultralists) : Hepetoculture, conservation and the role of the private sector. This is a special Saturday afternoon meeting organised by S. Townson on behalf of the Captive Breeding Committee, to be held at **Birkbeck College, Malet Street, London WC1,** from 2.30 to 7.00 pm.
November 20th	Mark Day (Gambian Dwarf Crocodile Rescue Project, University of Bristol): Herpetofaunal wading through West Africa.

JOURNAL EDITOR'S REPORT, 1990

GENERAL MATTERS

Publication ran smoothly in 1990, with Vol 1 Nos 10 and 11 appearing on schedule. In total these contained one review article, fifteen full papers, three short notes and twelve book reviews - 115 printed pages, a slight increase (c.6.5%) over the previous two years.

COSTS

These increased rather more than expected in 1990, presumably due to the effects of inflation. The two editions came in total to around £5,600, a 27% increase over the £4,400 needed in 1989. Institutional membership (still about 150) and reprint charges brought in about £4,000, leaving the Society with a net bill (excluding postage) of £1,600. This was far too high, and ran counter to my expressed intention last year of reducing the Society's financial input from ordinary membership subscriptions. My excuse is that the greatly increased costs (much higher than the national average inflation rate) caught me unawares. However, in 1991 the Journal costs will definitely be reduced as part of a new financial package currently under discussion by Council.

PAPERS SUBMITTED

The good news is that the Herpetological Journal continues to attract a healthy number of high quality papers. 36 were submitted in 1990, a 16% increase over 1989 and the highest number since the Journal changed its name. Only three years in the past fourteen have seen a greater number of submissions to the BHS Journal, all during the heady days of the early 1980s with a peak of 40 submissions in 1982. The evidence suggests a slow but steady increase in popularity of the Herpetological Journal among scientific herpetologists, something which can only be beneficial to the standing of the Society as a whole. Acceptance rate in 1990 was 72% (ie. 26 papers), with UK submissions falling back to 11 after rather higher figures (14 and 15 respectively) in 1988 and 1989.

My gratitude once again to the referees of 1990, who were:

Dr R. Avery, Prof. A. Bellairs, Dr J. Castanet, Mr K. Corbett, Dr C. Cummins, Dr J. Davenport, Dr M. Diaz, Dr H. Fox, Dr R. Griffiths, Dr A. Hailey, Dr T. Halliday, Prof. G. Haslewood, Dr M. Lambert, Dr C. McCarthy, Mr R. Meek, Dr R. Oldham, Dr I. Spellerberg, Dr H. Strijbosch, Dr J. Van Gelder, Mr E. Wade and Dr. D. Yalden.

Trevor Beebee
January 1991

THE HERPETOFAUNA RECORDERS' MEETING, 2nd FEBRUARY 1991

This event held at Leicester Polytechnic, home of the common amphibian and reptile surveys funded by the Nature Conservancy Council, has become a popular annual event attended by in excess of 100 herpetologists from all over Britain. This year's meeting was notable in that for the first time the BHS was a co-host of the meeting, although Society members have been prominent among the lists of speakers in the past. The meeting was an entertaining and encouraging one, particularly for the enthusiasm shown by many of the participants for their individual conservation exercises.

There were two themes for the meeting, habitat management and introduced species with a total of 16 short talks. Unfortunately the meeting was denied two further talks by experienced herpetologists Tom Langton and Paul Edgar due to ill health and car trouble respectively. A number of displays were also set up outside the meeting room, of which the BHS contribution was a great success, raising a total of £300 towards our conservation work.

After an opening address by the Head of Applied Biology, Professor Malcolm Elliott, Mary Swan started the meeting by updating the progress of the national reptile and amphibian surveys. The former is still at an early stage with a further years field work to go, but preliminary distribution maps were shown, the main purpose of which was to highlight which parts of the Country needed further survey effort. Unfortunately the amphibian survey still needs further work in a number of counties, including Kent and West Sussex, but a considerable amount of data has been gathered elsewhere. Consideration is now being given to the monitoring of a representative sample of sites across the country to assess any changes in the national status of the various amphibian species.

This talk was followed by two talks on managing natterjack toad habitat. Brian Banks concentrated on the breeding ponds. When the natterjack was first found to be endangered in the 1970's this was thought to be largely due to the frequent desiccation of their breeding

ponds. Deepening the breeding ponds, however, after a few successful years tended to become less productive due to increasing numbers of predators and common frogs and toads. It is now considered best to avoid constructing artificial scrapes where this is possible, but if not the upper fringes of saltmarshes or the interior of large dune systems offer the best locations, providing that the dunes are not too nutrient poor. A more artificial method has been tried at some sites, by controlling water levels precisely in scrapes to eliminate any undesirable predators and competitors. Jonty Denton described the results of his research on the terrestrial habitat requirements of the natterjack. The animals seem to prefer open habitat dominated by low growing mosses, turf, or bare sand, avoiding ranker vegetation such as mature heather. This may be because they are unable to hunt in rank vegetation. Common toads on the other hand show a preference for more overgrown habitats. The animal is long lived, one specimen up to 15 years old has been found at one site, and this probably enables the animal to survive several unfavourable breeding seasons.

The final talk of the morning session was by Nick Gibbons who has tried to prevent excessive toad mortality caused by a major new road scheme in the Thetford area. A concrete pipe placed under the road failed to be used by migrating toads, possibly because it was too cold and dark, but more recently installed toad tunnels were more successful. The ACO toad fences have proved to be rather easily damaged by children running over them and the design could be improved by providing more support at the joints. After several damaging projects in the area, including road and sewer destruction, the toads still survive and appear to have an increasing area of breeding pools.

Arnold Cooke of the NCC gave a talk on the effects of a development by Persimmon Homes on a crested newt site in Peterborough. The housing development incorporated a nature reserve area for the great crested newt, with the reserve split between two sites. These are connected by a short length of concrete pipe, which has been used by newts, probably the first new tunnel in Britain. The animals have abundant terrestrial habitat in gardens on the new estate, and the residents have been encouraged to take an interest in the reserve. Unfortunately the development affected the water table causing more frequent desiccation of the pools, but a tap has solved this 'problem'. In fact it is to some extent a beneficial factor since sticklebacks colonised one of the pools and were shown to be very adept at eliminating crested newt larvae. After several years it appears that the newt numbers have not been affected significantly by the development, as judged by annual newt counts. The crested newt theme was continued by Rick Parker who has enthusiastically been restoring ponds in the Wigan area, many of which have been used as translocation sites. This work has been combined with terrestrial habitat improvement, such as the provision of additional hedgerows, areas of rough grassland around the pools and habitat bundles (piles of cut scrub etc). A programme of captive breeding has also been undertaken to provide stock for introductions. The final talk on great crested newts was by Rob Oldham and Mark Jeffcote who have been working on an expert system for crested newt management. Basically you feed data onto a computer describing the physical and biological state of a pond and its surrounds. Using the stored data bank from other sites an analysis of the value of the site for great crested newts can be obtained, as well as suggestions for management. Furthermore the print out gives an account of why each decision was made so that the reasoning behind the advice is available. Such information may be particularly valuable to land managers who do not have a herpetological back-ground.

The early afternoon session was completed with two talks on the use of school ponds as educational resources by Gareth Evans and Jan Clemons. It was demonstrated that ponds can have a wide use in the Curriculum, being used not just for science, but even in maths, English, geography and art. Once created they can also provide a valuable habitat for wildlife. The pupils at one of the schools were heavily involved in the design of their nature conservation area which won a national award.

The final session of the day concentrated on introduced species. Leigh Gillett gave an account of the recorded introductions of amphibians into Britain, a surprisingly wide-ranging group

of species. The majority of these introductions have not been particularly successful. Reasons for failure include the British climate, the liberation of animals that have a male biased sex ratio, and subsequent collection. The situation is confused by species such as the European tree frog which may dubiously be native.

A disappointing feature of the day was the shortage of reptile talks, the only predominantly reptile based talk was given by Graham Walters on the wall lizard. This species reaches the northern edge of its distribution in France and the Netherlands with scattered isolated populations of lizards. These animals have been introduced to some parts of Britain but have not been particularly successful, with problems experienced by the late hatch of the eggs. Introductions of the more colourful northern Italian forms of this species have been more successful as they are able to breed and hatch earlier than north-west European animals. A number of populations in London, the Isle of Wight and Sussex were described, as well as a native population in the Channel Islands. Frank Bowles then gave a talk on the potential for the establishment of a variety of species in Scotland where he thought that suitable habitat might occur, particularly if the greenhouse effect proves to be real. The talk was designed to be provocative, particularly to those of us from NCC in the audience!

One of the more successful introductions has been of the midwife toad, which appears to have arrived originally in a consignment of ferns and was subsequently spread to a number of gardens owned by the Breocklehurst family. Following publicity about the species in 1990 Helen Muir-Howie received further reports of the animal in Bedford where it appears to be well established in suburban areas, relying on garden ponds as breeding sites. The animal seems to be popular with the public and colonies are often kept secret to protect the animals. The final species account of the day was given by John Buckley concerning the pool frog in Norfolk where a population of this species occurs in pingos (ancient wetlands formed during the last ice-age). Releases of green frogs in the area have been well recorded in the past, but it is possible that this species is native as records of them appear to date back to the eighteenth century. The answer to this problem would be to analyse the sediments in the ponds where they survive to look for evidence of bones which can be distinguished with care from those of the common frog.

The meeting was concluded by Anthony Gent of the Nature Conservancy Council who outlined the law regarding introductions. A distinction was made between introductions (species released outside of their range), re-introductions (releases to sites where species had become extinct in the past) and translocations (releases within the known distribution range of a species). The reasons why introductions are considered to be a bad idea were outlined (competition with native species, introduction of disease, erosion of naturalness, predation on other species etc) and it was emphasised that this was illegal. It is the case that some introduced species such as the European treefrog are listed on Appendix II of the Berne Convention which requires signatory countries to protect them. There may therefore be a case to protect some populations of introduced herps but this is not NCC policy yet.

All in all this was an enjoyable meeting and Mary Swan is to be congratulated on having organised it.

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HOPE FOR HANKLEY

Hankley Common, Surrey, is one of the largest remaining single pieces of lowland dry heath. It is partly wooded and contains large stretches of habitat ideal for the smooth snake and sand lizard as well as for heathland birds, insects, spiders and plants. There is a golf course but the bulk of the land is owned by or leased to the Ministry of Defence (MOD) which uses it for troop training and exercises. Most of the area is a Site of Special Scientific Interest (SSSI), a designation that gives the Nature Conservancy Council (NCC) legal powers over what is allowed on it.

The public has wide rights of access to the Common except occasionally when military operations contradict. There is much recreational use especially for walking and horse riding, although the MOD has the means and uses them to prevent destructive activities such as motorcycle scrambling. There is normally a full-time Warden. The terrain is extensively broken up by wide sandy fire-breaks. From the BHS standpoint, the Common's importance is that it contains all 6 native reptile species: smooth snakes occur and sand lizards are present in many separated areas with at least two large populations. Conservation of these is thus for BHS a matter of the greatest concern.

According to a MOD memorandum dated 27th January 1981, HQ SE Disrict consented to the formation of a Conservation Group to cover the Hankley and nearby Thursley areas. The inaugural meeting of this Group took place at Longmoor Training Camp on 15th April, 1981, under the Chairmanship of Lt. Col. A.S. Harvey, Camp Commandant, with Lt. Col. C.N. Clayden, then MOD Conservation Officer, as Secretary. Archaeology, Deer, Herpetology and Ornithology were represented as well as Forestry (Property Services Agency), Senior Estate Services and the NCC. At later meetings, Botany, Entomology, Arachnology, Mycology, the Surrey Wildlife Trust and the Elstead Parish Council were also represented. The Hankley/ Thursley Warden (then R.P. Flynn) was present: his successors continue. Meetings have since been held twice-yearly in Spring and Autumn: they are well-attended and there is excellent practical discussion. Lt. Col. Clayden originated this type of MOD conservation activity: throughout he has issued Agenda and Minutes and has insisted on proper records incorporated into a Dossier of the Common. His military philosophy could be described in the words of the old song "Accentuate the positive", that is, use our best efforts to save what is good first, with a lower priority to restoring damaged sites. For the BHS Conservation Committee involved in what, in truth, is more than it can accomplish this maxim is highly pertinent.

Lt. Col. Harvey remained as an excellent Chairman until his retirement in 1987. Whilst insisting that military training must take precedence, he has been able to spare areas of known sand lizard concentrations: two of these have actually been fenced, an awesome feat as anyone who has tried to erect a fence on Common land will know. Lt. Col. Clayden retired as Secretary to the Group at its meeting on October 12th, 1990 and was presented with a token of its warm esteem for him and recognition of his servies.

The present Longmoor Commandant Lt. Col. W.J. Briggs, who is an enthusiastic supporter of conservation, agreed to act as the new Secretary.

The first BHS representatives on the Hankley/Thursley Conservation Group were Keith Corbett and Geoff Haslewood. For the fourth meeting held on 4th November 1982, Tony Braithwaite attended and continues to this day. He lives close to the Common and is a keen observer especially of reptiles on it. His gentle, friendly but persuasive manner and ability to get on with others, together with his intimate knowledge of the habitat and readiness to take on any task in the interests of conservation have made him invaluable to the Group. Without him its history might have been very different for of course there are conflicts, especially between the forestry interests and those wishing to preserve and increase the open heath. Tony presents an image of BHS essential if damaging and counter-productive resentments are to be contained.

A new chapter in Hankley's history began with the attendance of Brian Banks as NCC representative from April 1987. This coincided with a national agreement between NCC and MOD which gave nature conservation priority over forestry and agriculture on Army ranges notified as SSSIs: following this Brian began to prepare a detailed Management Plan for the Common. This Plan divides the SSSI into 61 compartments each of which is briefly described and the work recommended for it noted, with a priority rating 1 to 3. Acceptance of such a comprehensive and detailed project required meetings of a working party on which also Tony and the various Common interests were represented. Agreement was finally reached in Spring, 1990. One result of this is that many areas of self-sown pine and birch will be cleared to become open heathland. As this is sand lizard habitat, the BHS Conservation Committee will be responsible for these clearances, giving priority to areas where there are already known rare reptile populations; on the remainder of the heath the work will be undertaken by the MOD, BTCV or contract labour.

For perhaps the first time in its history, Hankley Common has a well-documented dossier of the fauna and flora it harbours, together with practical proposals that should result in their preservation. With the support of the present MOD Conservation Officer, Col. J.H. Baker, there is a good prospect that the rare reptiles especially can be kept and increased as long as damaging fires can be prevented. The BHS can be pleased and proud at the part its members have played in this important conservation exercise. The Conservation Committee should make sure that BHS continues to be represented by active members on this Group.

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ONE-DAY COURSE ON THE BIOLOGY OF REPTILES AND AMPHIBIANS

WEDNESDAY 12 JUNE 1991

THE DURRELL INSTITUTE OF CONSERVATION AND ECOLOGY, UNIVERSITY OF KENT

This one-day workshop is intended to provide an introduction to reptile and amphibian biology for keen amateur herpetologists, students, laboratory technicians, zoo personnel and veterinary staff. The emphasis will be on practical techniques of use both in field and laboratory. Course tutors include John E. Cooper, FRCVS, Margaret E. Cooper, LLB, David Galbraith, PhD, Richard A. Griffiths, PhD, Ian R. Swingland, PhD.

For further information send a SAE to Dr Richard Griffiths, DICE, University of Kent, Canterbury, Kent, CT2 7NX.

A NOTE ON THE REPTILES OF THE NAMIB DESERT

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The reptile fauna of Namibia is unusually interesting for two reasons. First, there are numerous endemic species and, secondly, many of these are well adapted to life in arid conditions. The age of the Namib desert is not known for certain: it might be more than 130 million or, possibly, less than 10 million years old. But the climate has probably remained fairly stable over the past 5 million years, so there has been plenty of time for natural selection to exert its influence on the herpetofauna of the region. The weather is mild, compared with that of most other deserts, on account of the upwelling of the cold Benguela Current which flows northwards from the Antarctic along the coast of south-western Africa. The mean annual temperature at Gobabeb (100km S.E. of Walvis Bay) in the central Namib Desert is 21.1°C; the mean annual minimum is 12.8°C; and the mean annual maximum is 29.5°C. The average annual rainfall is less than 28mm.

Although virtually rainless, the Namib Desert has a rich fauna that depends for food ultimately upon wind-blown detritus, and obtains moisture from the fogs engendered by the Benguela Current. Precipitating fog occurs at Gobabeb on an average of 40 days per year, and the relative humidity ranges from about 10%, when the dust-laden 'berg' winds blow from the East, to 100% when fog-laden winds blow inland from the coast. The fauna includes about 60 species of lizards, 33 species of snakes, and five tortoises or turtles – there are also 8 species of frogs. This compares with some 80 species of mammals (including gemsbok, springbok, zebra and baboons), 75 species of birds (including ostriches, sandgrouse and larks), over 100 species of beetles, 90 of spiders, 32 of Solifugae, and 21 species of scorpions.

One of the most common lizards of the dunes to the south of Gobabeb is the day-active, sand-diving, *Aporosaura anchietae*. The fork-tailed specimen illustrated (see front cover) was photographed at Sossusvlei in November 1989, among the largest sand dunes in the world – said to reach heights of 300m or more. *A.anchietae* can disappear beneath the surface of the dunes with surprising speed. It is well known for its habit of raising diagonally opposite feet from the hot sand in rapid succession. An omnivore, *A.anchietae* supplements its diet of insects with the seeds of *Trianthema hereroensis*, selected from the wind-blown detritus which accumulates at the base of the dune slip-faces. *T.hereroensis* is a perennial dunes plant, adapted to absorb fog moisture directly through its leaves. *A.anchietae* also makes use of the fog, drinking up to 12% of its body weight from drips condensing on vegetation or on the dune sand. This water is stored in its enlarged bladder.

Not all Namib Desert lizards are opportunistic feeders: *Meroles cuneirostris*, another sand-diving species, is exclusively insectivorous. On the gravel plans to the North of the dry Kuiseb River bed, *Meroles suborbitalis* replaces *M.cuneirostris* and *M.reticulata*, while *Mabuya variegata* and *Chondrodacytlus angulifer* are also found. Species restricted to the river bed, which floods only in years when there is heavy rain in the Khomas Hochland inland, include *Zygaspis quadrifons, Mabuya capensis* and *M. occidentalis*. The terrestrial chameleon *Chamaeleo namaquensis* (Plate 1) is restricted to the dunes, as is the translucent nocturnal gecko *Palmatogecko rangei*. The latter has webbed feet enabling it to run on, and dig deep burrows into, the compact sand of the dune slopes, where it shelters during the day. The large *Pachydactylus bibroni* (Plate 2) of the river bed is also nocturnal. *P. laevigatus* and *Lygodactylus capensis* occur in the same locality, while three species of rock gecko, *Rhoptropus afer, R.barnardi* and *R.bradfieldi* are common on the gravel plain. In the early evening, a chorus of barking geckos can be heard: *Pteropus kochi* is found in the river bed, and is joined by *P. carpi* and *P. garrulus* in the plains to the North.

Snakes, naturally, are much less conspicuous than lizards. Burrowing worm-snakes, *Leptotyphlops occidentalis* and *L.scutiformis*, occur on the gravel plain, where the horned adder *Bitis caudalis* (Plate 3), *Psammophis notostictis* and *Rhamphiophis* (±*Dipsina*) *multimaculatus* are also recorded. Characteristic of the dunes are side-winding vipers, *Bitis peringueyi*, and back-fanged whip snakes, *Psammophis leightoni* – looking like shoots among clumps of dune grass. The puff adder *Bitis arietans* and the spitting cobra *Naja nigricollis* are also reported to be encountered occasionally in the Kuiseb River bed.

The Namib Desert is characterized by numerous plant and animals species specially adapted to the harsh and unrelenting environments of sand, rock, or clay. Among vertebrates, certain lizards best illustrate these unique adaptations, by their anatomical modifications for sand swimming which, coupled with small size, enable them to shuttle between sunshine and shelter, and to escape from hungry predators.

Warmest thanks are due to Dr Mary Seely, Director, Desert Ecological Research Unit of Namibia and to the Directorate of Nature Conservation for permission to work in the Namib-Naukluft National Park. The expense of my visit was subsidised by a Leverhulme Emeritus Fellowship for which I am most grateful.

Plate 1 *Chamaeleo namaquensis*

Plate 2 *Pachydactylus bibroni*

Plate 3 *Bitis caudalis*

SCAVENGING BY THE MADEIRAN LIZARD *LACERTA DUGESII*

J LUNN

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The note by Bullock and Jury (1990) concerning the feeding habits of *Ameiva fuscata* and the role of herbivory in its diet, prompts the following.

On numerous occasions between 4 and 16 July 1985, whilst on holiday in Madeira, I was struck by the unusual habit of scavenging by the Madeiran Lizard *Lacerta dugesii*. At both a swimming pool and bar in Funchal I first noticed lizards eating crumbs of bread and cake which had been accidentally dropped to the floor by customers. The habit seemed to be opportunistic, lizards only eating items on chance encounters, although once located, they thoroughly searched the vicinity to consume every possible food item. However, I tested lizards by purposefully dropping food onto the floor, namely pieces of bread, cake, cold chicken, ham and tomato, and it was apparent that at least some individuals had become habituated to scavenging. The animals would run quickly from up to three metres distant to the site of the dropped food items, some quite large (up to three centimetres long), which after location by tongue flicking, were consumed whole. At times, contests over items took place between individuals which were invariably won by the larger animal.

The environs of the bar especially seemed to support a high density of lizards, up to ten being counted at once when food was available. The only 'natural' prey I saw eaten was a small moth *(Heterocera)* which was initially chased with great agility by a medium sized lizard, but was eventually caught and consumed by a larger animal following a confrontation.

In a comprehensive study of the gut contents of about 1700 Madeiran lizards, Sadek (1981) noted a preponderance of invertebrate food items, although a varying proportion of plant matter including fruits, seeds, flowers, buds and leaves was also recorded. However, scavenging in the above sense was not commented upon, and indeed would have been hard to detect from an examination of gut remains since the above types of food would be almost totally digestible and leave no identifiable remains.

Scavenging and herbivory by this species, however, is well known to the inhabitants of Madeira and Porto Santo. G. E. Maul (in litt) states that they are considered as pests because of the destruction caused in vineyards when the grapes ripen. Then, many are killed by baiting kerosene tins with pieces of ripe tomato or banana. Further, they can often be observed on the beach in Funchal harbour scavenging, even tearing off pieces from the carcases of dead animals. The Madeiran lizard has also been observed to visit flowers of the indigenous *Echium nervosum* and introduced *Aloe arborescens* to take nectar (Elvers 1977).

Lacerta dugesii is closely related to the two African mainland species *L. andreanzkui* and *L. perspicillata* although it has also been considered a race of the wall lizard *L. muralis* (Arnold 1973, Elvers 1977). Most members of the genus are insectivorous, herbivory being quite rare and only recorded for Mediterranean insular species. Indeed herbivory is unusual in lizards generally, being mainly recorded in the families Iguanidae, Agamidae and Scincidae (Szarski 1962, Pough 1973), the reasons for it having been explored on morphological and metabolic grounds (Ostrom 1963, Szarski 1962, Pough 1973) rather than ecological or behavioural, although it is well known that many herbivorous species are insular.

One reason which may help to explain the herbivorous and scavenging tendencies of the Madeiran lizard is the absence of competition sometimes found on islands (Williamson 1981). There are no indigenous mammals, other reptiles or amphibians on Madeira though rats *Rattus*, mice *Mus* and frogs *Rana esculenta* have been accidentally or deliberately introduced and hence the only similar sized diurnal competitors are likely to be the few species of birds which occur. Cultivation of the islands must have brought a readily exploitable source of food and it is interesting to note that the tomatoes, grapes and bananas cited as food in Madeira follow

the trend of herbivorous species preferring soft pulpy tissues (Ostrom 1963).

Sadek also noted many feathers in the gut contents of lizards from Porto Santo and the Desertas – other nearby islands, and this may well be explained by the scavenging habit of animals which are able to take advantage of the numerous bird mortalities which must occur here during the breeding season.

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KEEPING AND BREEDING THE MIDWIFE TOAD *(ALYTES OBSTETRICANS)* IN CAPTIVITY

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INTRODUCTION

The Midwife Toad *(Alytes obstetricans)* is a small, inconspicuous, nocturnal member of the family Discoglossidae which despite its unspectacular appearance is well worth keeping for its unusual breeding habits and musical mating call.

Surprisingly this little creature was at the centre of a scandal which caused bitter acrimony within the scientific establishment early this century. The then eminent Austrian biologist Paul Kammerer, a disciple of the Lamarckian principle of the inheritance of acquired characteristics in living organisms, initiated the controversy by claiming to have bred Midwife Toads in water which over successive generations developed nuptial pads. (This species normally mates on land and does not have nuptial pads). These traits were allegedly inherited by their ensuing progeny. The breeding experiment was summarised by Koestler (1971).

"By keeping the toads in an abnormally high temperature (25-30° C) and providing them with a basin of cool water, the animals were made to spend more and more time in the basin and eventually took to copulating in the water, but the eggs which the female ejected in the water swelled up at once and did not stick to the male's legs; they sank to the bottom of the basin where most of them perished. A few of these "water eggs" were saved and water-begotten *alytes* bred from them".

The veracity of these experiments was hotly contested by members of the Neo-Darwinian School of Biologists. The two most vociferous sceptics of Kammerer's claims, Bateson and G.A. Boulenger, attempted the experiment themselves. Both fell at the first hurdle: neither were able to breed their specimens at all in captivity! The scandal was complete when the sole remaining preserved specimen with alleged nuptial pads was exposed as a fake. Kammerer subsequiently committed suicide in 1926 although the evidence submitted by Koestler points to him being the victim of the fraud rather than its perpetrator. Whatever else he did, Kammerer certainly achieved phenomenal successes in amphibian breeding, producing Midwife Toads to the seventh generation, a remarkable feat by any standards.

DISTRIBUTION AND HABITAT

The Midwife Toad occurs in south-west Europe from Portugal and Spain to France and Belgium, also in Switzerland and parts of Western Germany as far south as the southern slopes of the Black Forest. It favous hilly country and in the southernmost parts of its range can be found at altitudes of up to 2000 metres. Woods, gardens, dry-stone walls, quarries and rockslides are chosen habitats. It is particularly numerous on the extensive dune systems along the coastlines of northern France and Brittany.

There have been several attempts at establishing Midwife Toad colonies in Britain, most of which have been moderately successful: the first recorded introduction was at a nursery garden in Bedfordshire about the turn of this century. Two more colonies were established in Bedfordshire and from one of these colonies some individuals were transferred to a garden in York in 1933 and further individuals to another garden in Worksop (Nottinghamshire) in 1947. According to Lever (1977) the above colonies were still extant in the late 1970's.

A further colony was rediscovered in Northamptonshire in 1985 comprising survivors from a 1965 introduction (Blackwell, 1985).

CARE IN CAPTIVITY AND ACCOMMODATION

My Midwife Toads are kept outdoors all the year round in a cold-frame measuring 120 cm x 75 cm. The base has a layer of sandy soil to a depth of 30 cm. Several rotting Hawthorn branches obtained from a nearby hedgerow have been half-buried in the soil to provide hiding places for the toads and also for the woodlice, slugs and other invertebrates introduced as prey. There are also pieces of bark and large stones arranged in such a way that the toads can retreat underneath them. In one corner I have provided a small pond of butyl rubber 45 cm x 30 cm x 15 cm deep.

Midwife Toads like plenty of plant cover. Low growing vegetation also helps to keep the environment damp when watered daily. I recommend the following two plants which are excellent for vivarium ground cover:- *Sagina* (Pearlwort) and *Soleirolia* (mind-your-own-business). Pearlwort is a hardy perennial which grows to a maximum height of 4 cm. and forms a pleasing carpet of tiny moss-like foliage. During the early summer months it produces small white flowers. The golden variety, *S. subulata aurea*, is especially attractive. Mind-your-own-business is a half-hardy evergreen perennial which grows no taller than 5-6 cm, quickly forming dense mats of tiny leaves on stems which clamber over the bark and stones, thereby assisting the toads to enter and leave the water. Both the above plants are readily available from garden centres.

During the summer I completely remove the sliding-glass roof of the cold-frame to prevent the interior from overheating; fine wire-mesh netting is then used to cover the top to stop the depradations of cats and birds.

Midwife Toads are very hardy, well able to survive the coldest British winter. They will burrow down into the soil or under the rotting wood in November to reappear the following February. During the mild spells in winter they will emerge from hibernation, particularly after rain.

FEEDING

Hunting for food usually occurs just before dusk and continues until after nightfall. However, Midwife Toads will venture out during the day when it is raining, particularly after a dry spell, feeding on invertebrates which have also been induced out by the rain. Juveniles appear to be more diurnal than adults, at least in captivity, and are often seen abroad during the daylight hours even in dry weather. The adults spend most of the day hiding beneath the bark or under the soil. They resent being disturbed, quickly making for cover when exposed to daylight. Conversely they do not appear unduly concerned at being caught in torchlight at night, readily accepting mealworms or earthworms placed in front of them whilst in the full glare of the torch-beam. Boulenger (1912) relates how he witnessed their entire courtship and subsequent egg-laying procedure in the wild by the light of his electric lantern!

Their method of capturing prey is similar to that of other Discoglossids. Once they have spotted their intended victim they lunge at it, half jumping, half running. Small creatures such as spiders or woodlice are swallowed immediately. Midwife Toads can leap to a surprising height to catch an insect escaping up the side of their vivarium. The forelegs are used to control the struggles of larger prey such as earthworms and to force them into their mouth. A large variety of invertebrates will be taken by Midwife Toads; in addition to those mentioned above, beetles, non-hairy caterpillars, crane-fly larvae (leatherjackets), slugs and crickets are all readily eaten.

BREEDING

The first specimens I obtained were three newly metamorphosed juveniles given to me by Charles Snell in 1982. All three specimens proved to be males. They became sexually mature the following year, commencing their musical call in late March and continuing all Spring and Summer until late August. The note produced is a very pleasant single "Poo" repeated

every 2 or 3 seconds; it sounds rather like a tiny bell (hence the alternate name of Bell-Toad). Calling occurs most frequently from dusk to midnight but will also take place during the daytime in wet or overcast conditions. Although the sound produced is not loud or raucous it is high-pitched and can be heard from a considerable distance away. It is difficult to locate a calling male because the voice is "thrown"; this ventriloquial capability is presumably a defence strategy to confuse potential predators.

During 1985, 1986 and 1987 several BHS members kindly loaned or gave me more Midwife Toads for anticipated breeding but incredibly all the specimens received were males! In 1988 Simon Hartley loaned me his sole adult which arrived on 15th July. I immediately placed it in the cold-frame where nothing unusual happened until two nights later when the males began frenziedly calling about an hour before dusk. I went to investigate and observed all the males sitting in a circle with Simon's specimen in their midst. The largest male, while I watched, began to attempt emplexus with it, having to fight off the other males which were trying to dislodge him. All were in a very excited state. It was apparent by then that the new introduction was indeed a female!

I did not wish to disturb them unduly (disregarding Boulenger's experience) lest I should frighten them out of the courtship mood. However, I could not resist a further peep at them about an hour later when I saw the largest male in amplexus with the female. The unsuccessful males had all scattered and ceased calling. I noticed that amplexus was axillary and that the pair were some distance away from the pond during the procedure.

The following morning I found the male under a piece of bark with a string of pearly-white, moist, glistening eggs wound around his rear legs. There were about 15 or 16 eggs each approximately 3mm in diameter. From the nine spawnings I have obtained with this species, I have observed the average number of eggs per batch to be 22, but actual numbers have varied from 14 to 32.

Snell (1983) stated that after his Midwife Toads spawned the unsuccessful males became restless, wandering about their vivarium and attempting to climb up the sides. So far I have not observed such behaviour in my own males.

After a few days the eggs became a dirty off-white while gradually appearing leathery in texture.

TABLE SHOWING MIDWIFE TOAD SPAWNINGS 1988 AND 1990

Egg String First Observed	Number of Days Carried by Male	Tadpoles First Seen in Pond	Toadlets Observed Leaving the Water
	1988		
17th July	37	23rd August	May 1989
10th August	29	8th September	May-June 1989
24th August	53	16th October	June 1989
	1990		
14th May	29	12th June	July-August
3rd June	20	23rd June	August
7th July	38	14th August	Overwintering as tadpoles
*30th July	25	24th August	" " "
5th August	23	28th August	" " "
*24th August	36	29th September	" " "

* Produced by a second female which became sexually mature in July 1990. All other 1990 spawnings from Terry Thatcher's on-loan female.

They eventually became a rather murky brown colour; within 14 days the larvae were visible inside the eggs; their eyes could be clearly discerned. While the male was carrying the eggs he occasionally returned to the pond to moisten them in the water.

Male Midewife Toads know instinctively how to maintain optimum conditions for the eggs with regard to moisture and humidity. If they are taken away from the male they will amost certainly perish in a very short time.

In a normal batch of eggs there appear to be very few infertile ones or any that fail to develop for other reasons. There were never more than 3 per batch of my own that did not develop.

After a fairly variable period of time (see Table) the eggs are released in the water where the tadpoles break out to complete their development. By retrieving the discarded remainders of the eggs I was able to count exactly how many the male had been carrying and which (if any) had not produced larvae. The average overall length of the newly released tadpoles was 15-16 mm. An unusual feature of Midwife tadpoles is the position of the spiracle; on the ventral side towards the front of the body.

CARE OF THE TADPOLES AND JUVENILE TOADS

I removed the tadpoles to an aquarium tank where they were fed on goldfish-flakes and freeze-dried tubifex worms. By late October I had in excess of 70 tadpoles from three separate spawnings (as shown in the accompanying table). The largest individuals from the first spawning had reached an average overall length of 40 mm. I transferred their aquarium to an unheated spare room indoors during November where they spent the winter months.

They fed and grew well throughout the Winter but development was arrested when their rear legs began to "bud". Average length in April 1989 was 55 mm; when they were put out in a large shallow pond (180 cm x 95 cm x 6 cm) in a greenhouse to complete their development. They were 65 mm in overall length with a body length of 22 mm before their tails started absorbing. The youngsters averaged 20 mm when metamorphosing, proportionately very large considering the dimunitive size of the adults. This meant they were quite easy to feed, accepting small mealworms, half-grown crickets and invertebrates collected by grass-sweeping with a bucket and net.

Up to this time I had not lost a single specimen: all had metamorphosed without mis-hap, but then disaster struck. One morning about two weeks after they had all metamorphosed (mid June 1989) I discovered several corpses in the pond. Assuming they had entered the water and being unable to get out had subsequently drowned, I searched the greenhouse for the remaining toadlets for transfer to a pond-free vivarium. To my horror I discovered several more corpses amongst the undergrowth and under the pieces of bark with which the floor of the greenhouse was decorated. However, many were still alive and well, these were all removed to the above-mentioned vivarium or sent out to various B.H.S. members. Of those transferred to the vivarium all except 2 were dead within another month. In all cases death was swift and symptomless, one day fit and well, the next day dead. Most were still in a sitting position when found dead, with their front legs still appearing to be taking their weight! Almost all of the toadlets I sent to other people suffered a similar fate too.

As if this were not enough of a catastrophe Simon Hartley's on-loan female failed to emerge from hibernation in 1989. Fortunately I had been given a few larvae in May 1988, which all metamorphosed successfully during August and September that same year, hibernating without mishap in a vivarium kept in an unheated outbuilding. These toadlets grew well but did not reach sexual maturity during 1989 so no breeding occurred, as no other female could be procured.

Terry Thatcher came to the rescue in 1990 when he informed me he had a Midwife Toad of indeterminate sex in his possession. He kindly sent me this specimen which was duly received in late March and introduced to my males. I was in luck again as it turned out to be a

female but actual spawning did not occur until 14th May, when the first string of eggs was observed.

As soon as the tadpoles were released in the pond they were removed to the same greenhouse pond as in 1988 to complete their development. Toadlets from this first spawning were metamorphosing by late July but were on average 12-15 mm long, somewhat smaller than their 1988 predecessors. I often caught sight of them sitting by the pondside or among the terrestrial vegetation during the daytime and when approached they would leap into the water, diving to the bottom in true Edible Frog style!

These 1990 youngsters have so far remained healthy and disease free. The largest had reached about 22 mm by late October when they commenced hibernation. I have kept a dozen for myself with the remainder given to various B.H.S. members.

The tadpoles from the last four spawnings will have to be overwintered indoors; at the time of writing this article (December 1990) I have lost just one tadpole which was found dead in early December. Those remaining are of varying sizes, the largest 50 mm and the smallest 25 mm in overall length.

CONCLUSION

Midwife Toads are undemanding, hardy little creatures which thrive in captivity, breeding regularly if conditions are favourable. Their life-history is unique among European Anurans as no others engage in parental care of their offspring. Because of this the larvae receive a "Head Start" which ensures a high survival rate.

In captivity they will happily co-exist with other small amphibians such as *Bombina variegata* and *B. bombina*. Mine share their enclosure with *Lacerta vivpara* and *Anguis fragilis* in addition to the above two species.

I am hopeful that many more captive colonies can be established in Britain.

ACKNOWLEDGEMENTS

I am indebted to Mick Carmen, Elizabeth Cole, Simon Hartley, Colin Melsom, Charles Snell and Terry Thatcher all of whom kindly gave or lent me their own Midwife Toads; also to Patrick Thorp for invaluable information and advice freely given.

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PRECOCIOUS NEWTS

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INTRODUCTION

A method has been developed for captive rearing Great Crested Newts *(Triturus cristatus)* which resulted in attainment of sexual maturity at 12 months. Great Crested Newts in the wild have been reported to mature at 3-5 years age (Frazer 1983, Oldham 1986, Wisniewski 1989). The Great Crested Newt is now protected under the provisions of The Wildlife and Countryside Act 1981. Despite this legislation breeding sites continue to be lost. It was felt that the development of a practical method for the captive rearing of *T. cristatus* would form an essential element of a successful conservation programme.

The limited published literature on the captive rearing of *T. cristatus* advocates release, into the wild, of larvae which have grown to a appreciable size in late summer (BHS 1983).

The objective of the programme was to rear *T. cristatus* from egg to mature adult with subsequent release of breeding pairs. The inherent advantages of adult release were considered to be:

1. Adults are less vulnerable to predation.
2. Overwintering losses of adults are relatively few compared to juveniles.
3. It is thought that the newly metamorphosed newts are the main colonizers of new ponds. Hence it was thought that sexually mature newts would be more likely to remain in the pond they were introduced to.
4. Most importantly, juveniles may take 3-4 years from release date to achieve maturity; during this time they are susceptible to many mortality factors.

METHOD

Sterilized aquarium gravel was placed in two identical tanks, of dimensions 0.45m x 0.3m x 0.6m, to a depth of 4cm. Twenty Twisted Vallis *(Vallisneria spiralis* form *tortifolia)* plants were rooted at equal spacing in each tank. This plant has the advantage of being both a good oxygenator and a favoured substrate for oviposition. Each tank was filled with tap water and left to equilibrate for 14 days. Then four breeding pairs were introduced into tank (a) and oviposition followed for a period of 10 days. From this approximately 20 *T. cristatus* eggs were placed in tank (b) with their respective plant host. Further plant hosts were removed from tank (a) so that approximately 100 *T. cristatus* eggs remained in tank (a).

After approximately 14 days the first eggs hatched. Of the 100 eggs in tank (a) 51 successfully hatched. Nine of the 20 eggs in tank (b) successfully hatched.

FEEDING REGIME

In both cases the range of food was identical. Initially Daphnia and White Worm were supplied but later the diet was widened to include Common Earthworm. However the volume of food introduced into tank (b) was maximum possible allowing for tank hygiene, where-as in tank (a) the feeding regime was significantly less.

METAMORPHOSIS

For the purposes of comparisons the newts were considered to have metamorphosed on leaving the water. To facilitate this two-storeyed polystyrene rafts were added. It was considered that

the moist humid conditions provided by this structure would prevent desiccation by providing the necessary humid terrestrial conditions.

In addition it proved necessary to roof over the tanks with tightly fitting glass, with any gaps plugged with plasticine in order to prevent newt escape. Feeding was achieved by means of a 8cm diameter hole cut in the centre of the glass. Not only did it successfully prevent escape but humidity was also sustained by this method.

RESULTS

The larvae in tank (a), as expected, took 12 weeks to metamorphose. In contrast the larvae in tank (b) successfully metamorphosed after only 8 weeks. However very little difference was apparent in the relative sizes of the young newts immediately after metamorphosis.

Interestingly, incidents of larval aggression and cannibalism (tail nibbling) were not observed in tank (b) unlike tank (a) where extensive damage of limbs and tails was routinely observed.

Surprisingly the sustained high volume feeding regime of tank (b) resulted in markedly accelerated growth rates of the juveniles.

By Spring, 36 weeks from egg hatch, the newts in tank (a) had achieved a mean length of 9cm with a maximum length of 9.5cm. By this time the newts in tank (b) had grown substantially to a remarkable mean size of 12.7cm with a maximum length of 13.5cm. Moreover the newts in tank (b) were exhibiting characteristics associated with sexual maturity: Appearance of crests, development of breeding colouration and courtship behaviour was observed.

Captive newts not allowed to hibernate do not come into breeding condition (P. Wisniewski 1989). It was felt that in view of the sexual behaviour exhibited by the captive reared newts in tank (b) external stimuli would promote further maturation. Therefore on the 14th May 1989 2 females and 4 male newts from tank (b) were released into a purposely selected garden pond. The pond was previously surveyed to confirm both the absence of Great Crested Newts in this pond and neighbouring ponds. Previous survey data revealed the nearest Great Grested Newt colony was some 3.5 kilometres distant.

To assist newt recognition distinctive belly patterns were photographed and morphological dimensions recorded.

On the 8th June 1989, some 3½ weeks after release, Great Crested Newt eggs were detected on Water Forget-me-not *(Myosotis scorpioides)*; these were confirmed by Rick Parker of the LTNC Great Crested Newt Group. The following day a male newt was recaptured and identified as being one of the tank (b) specimens using the belly pattern photographs. On examination the newt was found to have a crest of 1.2cm in height. A female was observed laying eggs on Water Forget-me-not *(Myosotis scorpioides)* on 20th June 1989, recaptured and confirmed as an individual from tank (b) from her belly pattern.

Water Forget-me-not *(Myosotis scorpioides)* containing Great Crested Newt eggs was transferred to an indoor tank. To confirm viability of eggs these were reared as previously described.

DISCUSSION

These remarkable observations have obvious implications for Great Crested Newt conservation. Using the techniques described it is possible to minimize the many mortality factors Great Crested Newts experience in developing from egg to adult, which in natural conditions would otherwise take 3-5 years.

The application of these techniques on a national basis would ensure the rapid establishment of new Great Crested Newt colonies. Thus it is possible to introduce Great Crested Newts into areas that current distribution maps clearly show to be deficient in this species. However a thorough assessment of both the proposed introduction pond and the surrounding terrestrial

habitat should be made to ensure the conditions are suitable for Great Crested Newts. It is thus theoretically possible to connect areas of high pond density (which are preferred by Great Crested Newt) through the use of 'Pond-ways' that are occupied by Great Crested Newt. Such a scenario enables continuity between populations facilitating genetic exchange.

ACKNOWLEDGEMENTS

The successful completion of this paper bears witness to the assistance of Robin Grayson, Andrew Mullaney and Rick Parker (members of LTNC Great Crested Newt Group).

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THE HERPETOFAUNA OF THE SOUTH-EAST PELIGNA REGION (ABRUZZO, ITALY)

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FOREWORD

The present paper is a first, concise, contribution to the knowledge of the SE Peligna Region herpetofauna. The information is part of a general work about reptiles and amphibians of the Marsica, the Peligna and the Caraceno Regions (Abruzzo, mid east Italy) (see also Bruno 1973, 1984, 1988) actually in evolution and upgrading.

Some authors believe the boundaries of the ancient Pelgna Region were (Fig. 1), in the north, the Aterno River and the Morrone Mountains; in the south, the Serra of Bocca Chiarano, Mount Greco, and the Sangro River (between Castel di Sangro and Pizzoferrato); in the west

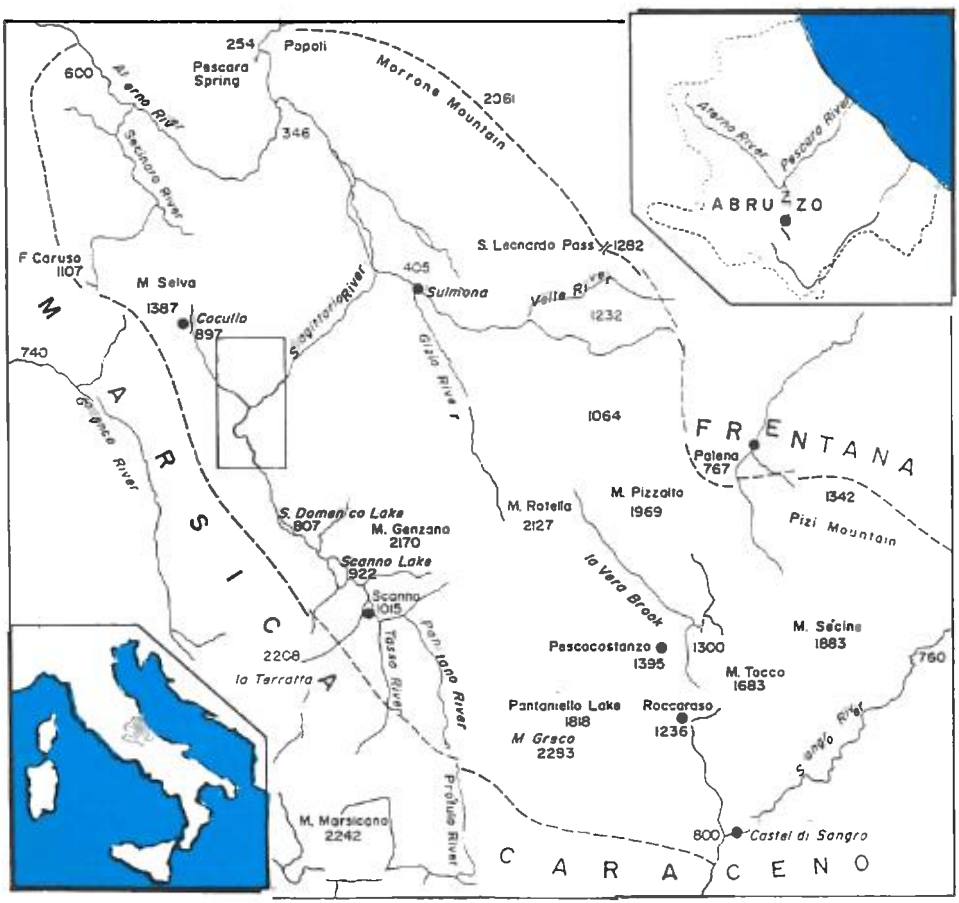

Fig. 1 – Map of the old Peligna Region. The study area is shown by the full grey rectangle.

the Profluo-Tasso-Sagittario-Pezzana Valleys and the Forca Caruso Pass; in the north-east the Secinaro River, and in the east the San Leonardo Pass (Mount Maiella), Palena and the Pizzi Mountains. Other experts, instead, believe the old northern boundaries went from Sepino to Popoli and, along the Pescara River, up to its confluence with the Nora River. The NE boundary was extended from that confluence to Lanciano Pass and to the western slope of the Maiella Mountain (see for example Cramer, 1826; Bosnier, 1902; Abbate, 1903).

This region was inhabited in antiquity by Superequani, Corfiniesi and Sulmonesi peoples, gathered in the Peligna Confederation (see also Devoto, 1931, 1971; Pace and Scarascia, 1977; Sgattoni 1979). It was considered by some latin writers (see also Q.F. Oratius 65-8 A.C., P.N. Ovidius 43 A.C. - about 17 D.C.) to be the coldest region in Central Italy. The Conca Peligna , a plain located between Pettorano and Popoli and between the Pacentro and Cocullo hills, was an exception to this; for that reason, and for its fertility, it was called by Torcia (1793) "la vera Tempe d'Italia" (the true Tempe of Italy).

Among Italic Regions the Peligna is probably the best known among european naturalists and humanists for its being the most important area for snake hunters and for the celebration, at Cocullo, of the San Domenico festival. This is a popular tradition with a famous Snake Procession which takes place every first Thursday of May (see for example Alicandri-Ciufelli, 1971; Angelucci w.d., Anonymus 1932, 1949; Bruno 1971, 1983, Bruno and Maugeri 1990, Bucella 1962, Canziani 1928, Chiari 1975, Chiocchio w.d., Cianfarani 1950, Clarcke Smith 1928, D'Antonio 1976, De Angelis 1961, De Nino 1889, De Lisio 1895, D'Ignazio 1971, Finamore 1890, Gianeristofaro 1978, Harrison 1907, Letta 1972, Nola 1974, 1976, 1986, Pansa 1938, 1957, Plensio 1982, Profeta 1968, 1976, 1984, Simboli 1991, Torcia 1793).

Some authors believe Hercules was the main divinity among the Peligna Region peoples (see for example Bruno and Maugeri 1990, Mattiocco 1973, w.d., Nola 1976, 1986, Profeta 1976, 1984, Wonterghen 1973) but this is open to debate.

In fact from palaeolithic times the Peligna Region was subject to the migration of peoples coming from different territories and belonging to different civilizations (see for example Abbate 1903, Balzano 1927, Besnier 1902, Chierici *et al* 1963, Cramer 1826, De Magistris 1902, Devoto 1931, 1971, Fondi 1970, Furrer 1924, Pace and Scarascia 1977, Ricci 1984, Sgattoni 1979). The Peligna Region seems to have been colonized in the second millemmium B.C. by Minoican-Cretan peoples who introduced the religion of Rhea (or Magna Mater). About 1000-800 B.C. the Peligni Region was occupied by Pheonicians (many geographical names come from the Phoenician language) which introduced the cult of Mitra and Astarte. During Roman times the more popular divinity was Hercules. This cult was introduced from Magna Graecia. The snake cult seems not to be connected with that of Hercules, because it is closer to the african and asiatic cults. That means the snake cult existed before that of Hercules, and continued to be practised with it. Once, the snake cult was more widespread than today in central and south Italy. When the Catholic Church took the place of paganism the snake cult was maintained and the pagan divinities were replaced with San Domenico in Central Italy, and San Paolo in the South.

For further information on the Natural History of this part of Abruzzo see also Bruno (1984, 1985), Colantonio (1978), D'Antonio (1976), Del Re (1835), Di Carlo (1972), Furrer (1924), Ilg (1940), Montelucci et al (1973), Naviglio (1984), Piccirilli (1911), Pratesi and Tassi (1972), Scacchi (1899), Tanturri (1853) and Zuffardi (1913).

Herpetological reports on the Peligni Region can be found in, for example, Altobello (1930 a,b), Bruno (1973, 1984), Bruno and Maugeri (1990), Mangili (1985) and Naviglio (1984).

INTRODUCTION

The study area (fig. 2) covers the Anversa degli Abruzzi municipal territory and the very eastern part of the Cocullo municipal one, total area 22 km² (see the military maps 1: 25.000 scale, IGM, Tab. 146 II SW and SE and 152 I NW and NE).

All the mountains considered in this study are formed by calcareous rocks (Parotto and Praturlon 1975).

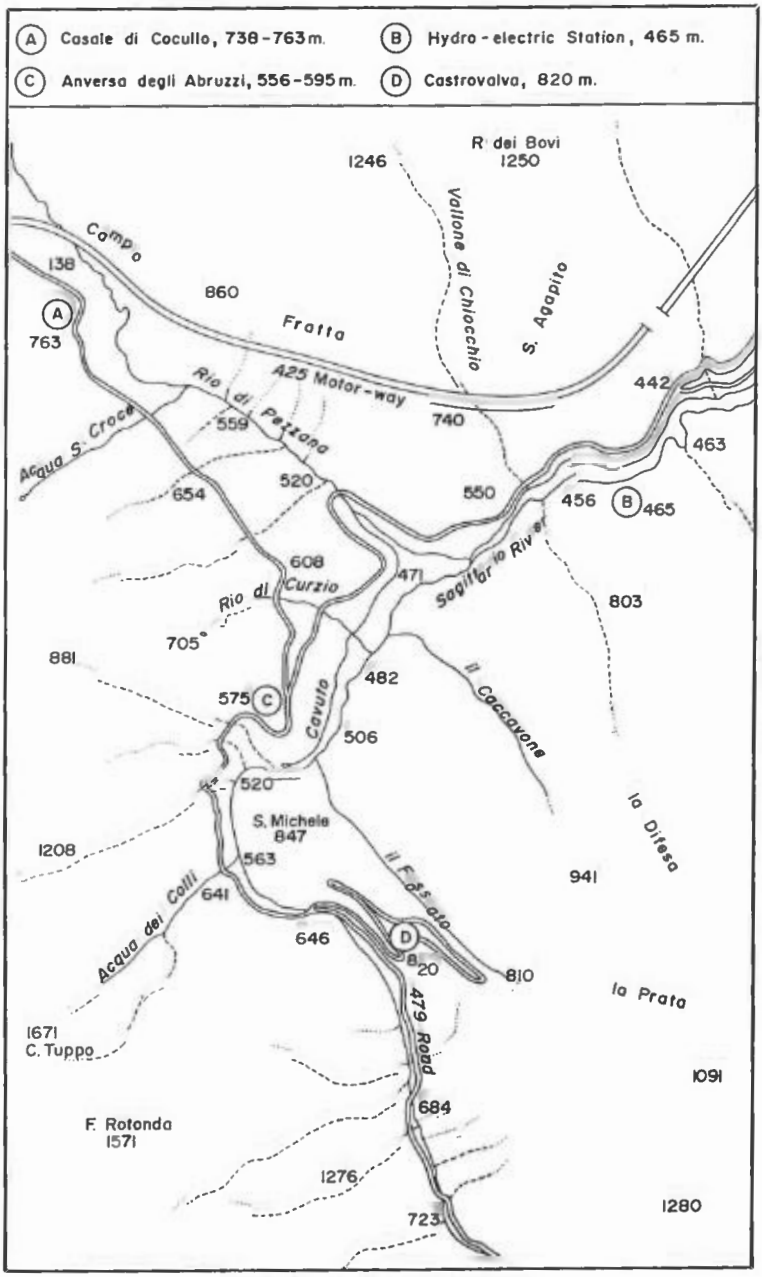

Fig. 2 - Map of the study territory

The hydrographic network is not very well developed; besides the Sagittario River, which flows in the bottom of the valley, very few other rivers with an approximately constant flow all through the year, such as Rio di Pezzana, Caccavone, il Fossato, l'Acqua dei Colli, and the Curzio and Acqua Croce springs are present.

Once (see Perrone 1990) the river flows were more abundant than today because of the changes due to the San Domenico dam, built in 1929 by the Italian Rail Company (FFSS). It has a depth of 24 m and 1.300.000 m^3 capacity (D'Antonio 1976).

Because of this injury to the landscape the natural features of the Sagittario Valley, especially the botanical and zoological ones, have changed considerably, mostly downstream of the dam. The disappearance or rarity of a great part of the local aquatic or partially aquatic fauna is probably due to this big human impact.

The territory examined, because of its morphology, doesn't have a uniform climate; it is possible to consider two very different zones (Pogliani and Di Gregorio 1979). The Sirente (2012-2349 m.) and Marsica (1712-2242 m.) Mountains, on the NW and S sides, have a cold and often moist climate. The Sulmona Plain (at NE and E) has subcontinental climatic characteristics with strong thermal seasonal fluctuations, high temperatures, and rare summer rains.

As a result of this the W and S areas have a 10°C annual mean temperature and 1150 mm mean rains and the E and N areas have a 12°C annual mean temperature and 662 mm mean rains.

The vegetation belongs to the samnitic belt (hills, broadleaved mixed woods with dominant oaks) and to the subatlantic belt (mountains, broadleaved forest with dominant beech) of the mediterranean zone (after Pignatti 1979).

Until 40-50 years ago this territory was utilized for agriculture, forestry and pastures, as typical for the mountain Abruzzo economy (see also Almagia 1929, Bolzano 1927, Cecchettani 1909, Chierici et alii 1963, De Magistris 1902, Fondi 1970, Furrer 1924, 1931, Giuseppetti 1934, Milone 1955, Ortolani and Dagradi 1964).

Plate I – Typical landscape of the study area photo. S. Bruno.

Overgrazing and intense wood cutting caused much more environmental damage than urbanization and agriculture (Arpea 1958, Biondi 1989, Cederna 1975, Franciosa 1951, Parente 1956, Pratesi and Tassi 1972, Rivera 1960).

In recent years a strong human impact was caused by the Roma-Pescara highway which upset the slope continuity and a great extent of the valley landscape (see Aa.Vv. 1970), by the presence of quarries (now dis-used), of country roads which go up to the mountains (Cassola 1978, Cederna 1975) and of reafforestation projects.

The reafforestation projects are mostly on the NW and SW mountain slopes with trees (like *Pinus* and *Thuja*) completely foreign to local flora and able to destroy the original vegetation (Allavena 1972, Biondi 1989, Cappuccini 1951, Pavari 1952, Vecchio 1974, Zangheri 1968).

Plate 2 - A beautiful group of Four-lined Snake shown by a "serparo" at Cocullo during the 1st May Thursday holiday. Every year on average 40 specimens of Four-lined Snakes are used in the procession photo. F. Grimaldi.

Plate 3 – Some people still believe a child brought in procession with a Four-lined Snake is protected in the future from viper bites phot. V. Di Valerio.

Plate 4 – Grass Snake female about 160 cm long. The name "cervone" given from italian language to the Four-lined Snake in the regional speech is given to the Grass Snake, and particularly to the old females. In the dialect the Four-lined Snake is called "capitone", like the big-headed eels, that means, "big snake good to eat " photo. S. Bruno.

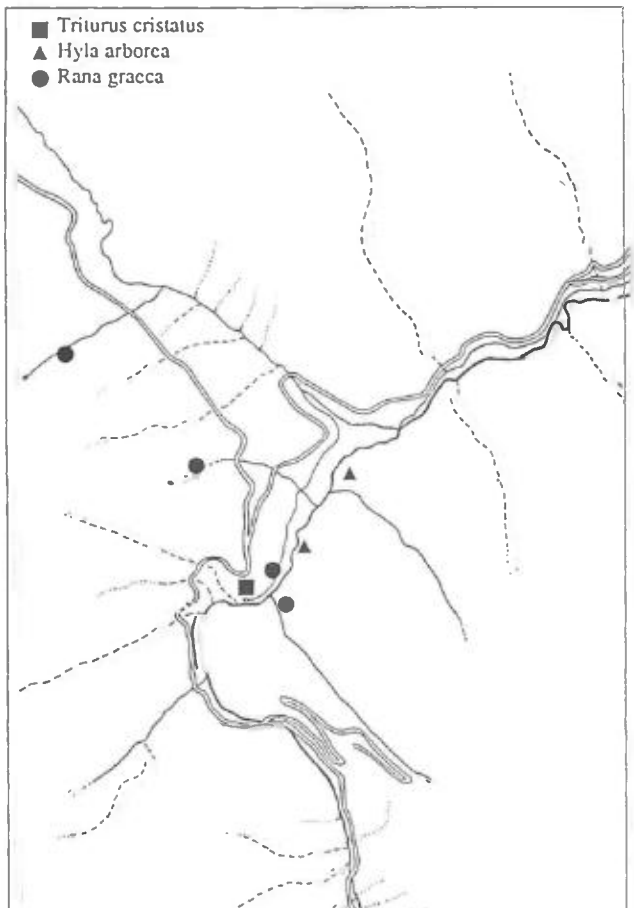

Fig. 3 – Localities where specimens of Warty Newt, Common Tree Frog and Stream Frog were collected.

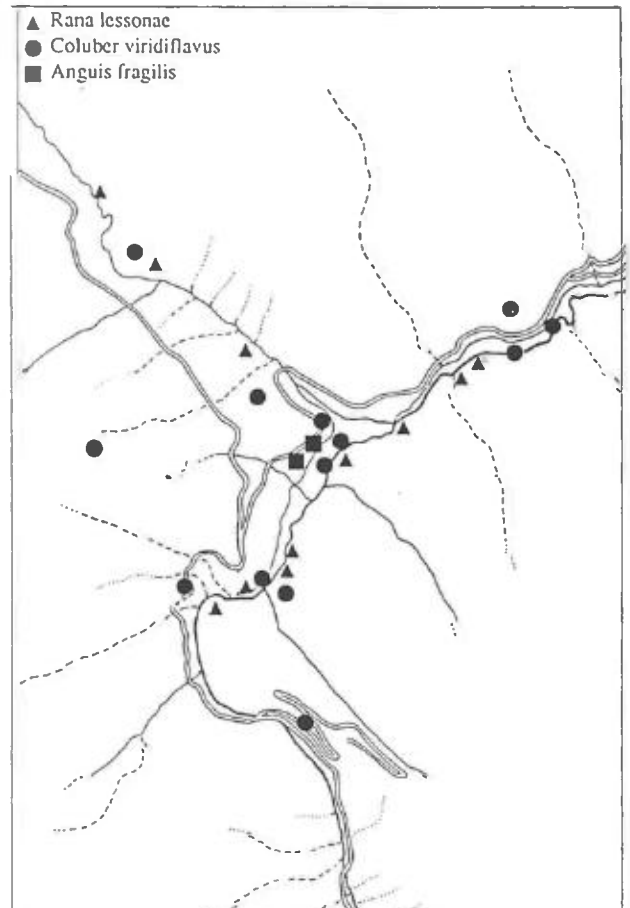

Fig. 4 – Localities where specimens of Pool Frog, Slow Worm and Western Whip Snake were collected.

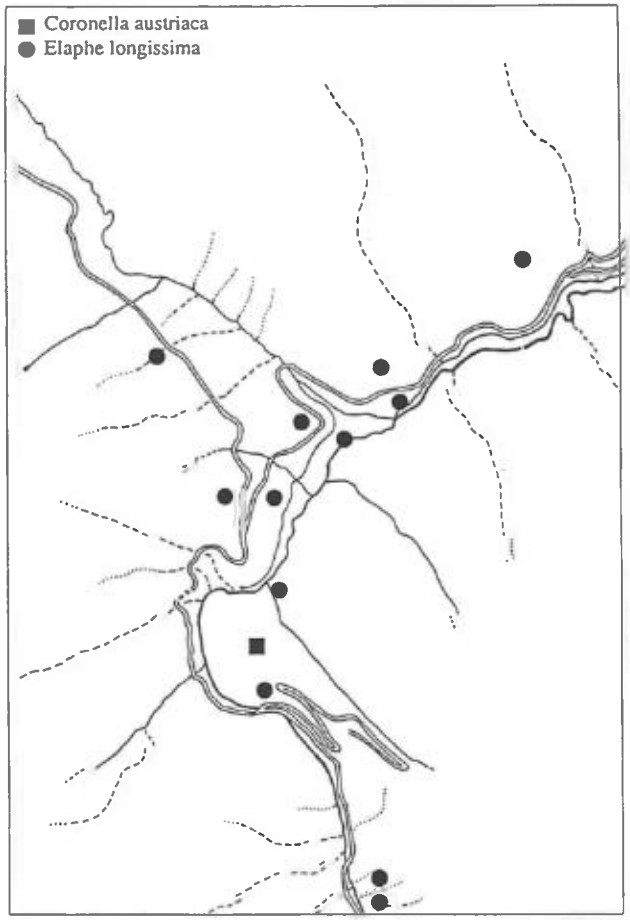

Fig. 5 – Localities where specimens of Smooth Snake and Aesculapian Snake were collected.

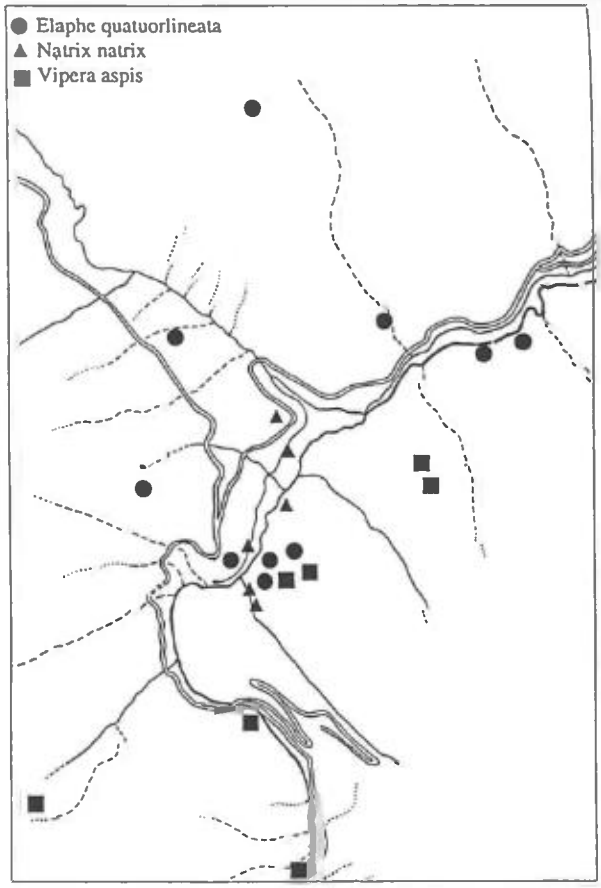

Fig 6 – Localities where specimens of Four-lined Snake, Grass Snake and Asp Viper were collected.

AMPHIBIA

CAUDATA
Salamandridae

Salamandra salamandra (Linné, 1758) Schrank, 1786.
Fire Salamander.

Mr. Vittorio Di Cesare (from Anversa degli Abruzzi) found one specimen of this species before 1974 near the hydro-electric power plant drainage canal.

According to the classic taxonomy the abruzzian populations belong to the ssp. *gigliolii* Eiselt and Lanza, 1956.

Triturus cristatus carnifex (= T.carnifex) (Laurenti, 1768) Dunn, 1918.
Warty Newt.

Mr. Claudio D'Angelo (from Anversa degli Abruzzi) found one specimen of this species in the locality Cavuto Spring in February 1981.

In the Giuseppe Altobello amphibian collection one adult female specimen coming from "Anversa" with the number 19 was present (Altobello 1930a).

According to the classic taxonomy the abruzzian populations belong to the ssp. *carnifex* (Laurenti, 1768).

Triturus italicus (Peracca, 1898) Mertens and L. Muller, 1928. Italian Newt.

In the Abruzzo and Molise amphibian and reptile Giuseppe Altobello collection, bottle n. 77, numerous specimens coming from the Sulmona area were present (Altobello 1930a).

This species is no longer found in our study area.

SALIENTIA

Bufonidae

Bufo bufo (Linné, 1758) Cuvier, 1817.
Common Toad (rusp).

Common and widespread in all vegetation types from 520 up to 1570 m.

According to the classic taxonomy the Apennine populations belong to the sep. *spinosus* Daudin, 1803. We believe this matter requires further study.

Hylidae

Hyla arborea (Linné, 1758) Laurenti, 1768.
Common Tree Frog (raganell).

It lives mostly in the riverine woods with *Populus* and *Salix*; it is possible to find it, with less frequency, in the mesophilous woods with *Quercus robur* and *Ulmus minor*. From 520 up to around 800 m.

According to the classic taxonomy the abruzzian populations belong to the ssp. *arborea* (Linné, 1758).

Ranidae

Rana graeca Boulenger, 1891.
Stream Frog (ranocch).

It lives in the *Populetalia* and in the mesophilous woods with *Quercus robur* and *Ulmus minor*.

It is not very common and it is localized in the bottoms of the valleys where vegetation is rich and water is permanently present. From 520 up to about 700 m.

The Italian populations are considered to belong to the ssp. *italica* Dubois, 1985.

Rana lessonae Camerano, 1882.
Pool Frog (ranocch).

It lives in the riverine woods with *Populus* and *Salix* of the valley bottoms. Common but localized; from 520 up to 600 m.

We found *maculata* Camerano, 1883 and *punctata* Camerano, 1883 varieties.

Until 10 years ago they were much more common than today.

REPTILIA

TESTUDINES

Testudinidae

Testudo hermanni Gmelin, 1789.
Hermann's Tortoise.

Until 1960 some specimens were bred in the power plant surroundings by the plant warden. Nobody found any specimens after that time.

SAURIA

Anguidae

Anguis fragilis Linné, 1758.
Slow Worm.

Only three specimens of this species were certainly recorded: 1 young specimen was collected at Madonna della Neve during May 1974 by John Needham and 2 specimens were collected during October 1985 at Sant 'Antonio.

From 465 up to 480 m. Rare, it lives in the riverine higrophilous wood with *Populus* and *Salix*. It could live in other environments too.

The specimens studied belong to the var. "*typica*".

Lacertidae

Lacerta viridis (Laurenti, 1768) Daudin, 1802.
Green Lizard (u rag'nj).

It lives in the same environments as the Italian Wall Lizard. In the moist and shady valleys with thermophilous woods *(Quercetalia pubescentis)* it can reach about 1300 m.

Abruzzian populations are considered to belong to the ssp. *viridis* (Laurenti, 1768) but the taxonomic positions of the central and southern Apennine populations have to be studied better.

We observed *maculata* Bonaparte, 1836, *mentocoerulea* Bonaparte, 1836 and *variegata* Massalongo, 1854 varieties.

Podarcis muralis (Laurenti, 1768) Bonaparte, 1836.
Common Wall Lizard (r'scertl).

It lives everywhere from 520 up to 1600 m. It is common.

One specimen of the "ssp. typica" was collected on July 8, 1812 at Anversa (Altobello 1930b).

The taxonomic position of the populations living in the Apennine subatlantic vegetation is discussed.

We observed, among the others; the *appenninica* (Taddei, 1949), *porphyrea* (Dehne, 1856) and *rubriventris* Bonaparte, 1836 varieties.

Podarcis sicula (Rafinesque Schmaltz, 1810) Bonaparte, 1835.
Italian Wall Lizard (r'scertl).

It lives mostly in the valley bottoms up to 600-700 m. It is more common southwards in the hills of "ai Contra and Caccavone" on clay soils.

According to the classic taxonomy the abruzzian populations belong to the ssp. *campestris* De Betta, 1857.

Scincidae

Chalcides chalcides (Linné, 1758) Laurenti, 1768.
Three-toed Skink.

We never found this species in our considered territory, but we recorded one specimen in the Monte della Selva area, at 1235 m., immediately westwards of the study area.

SERPENTES

Colubridae

Coluber viridiflavus Lacépède, 1789.
Western Whip Snake (nera = var. *carbonarius; penta = var. connectens*).

We found this species in the thermophilous woods *(Quercetalia pubescentis)*, in the mesophilous ones *(Quercus-Ulmetum-Carpinion)*, in the riverine higrophilous woods *(Populetalia)*, in the xerophilous grasslands of the hills *(Brometalia)*, in the abandoned fields and rural houses.

It is common and widespread, up to around 800 m.

In our studied territory adults belonging to the *connectens* Bruno and Maugeri, 1990 and *carbonarius* Bonaparte, 1833 varieties are present.

Coronella austriaca Laurenti, 1768.
Smooth Snake.

Only one specimen (var. *pallida* Fatio, 1872) of this species was found on the Colle San Michele, at about 850 m.

The potential vegetation of this area belongs to the *Quercetalia pubescentis.*

Elaphe longissima (Laurenti, 1768) Mertens, 1925.
Aesculapian Snake (lattarina).

It lives in the localities with a vegetation like *Populetalia, Querco-Ulmetum, Carpinion* and *Quercetalia pubescentis,* in the xerophilous grasslands of the hills *(Brometalia)* and in abandoned fields.

It is common and widespread; up to 700 m.

The specimens of this area belong to the var. *"typica"*. One specimen of the var. *nigrescens* (Massalongo, 1854) was found during August 1986.

Elaphe quatuorlineata (Lacépède, 1789) Nikolskij, 1916.
Four-lined Snake (capitone).

It lives normally in the thermophilous woods with *Quercus pubescens* and *Ostrya carpinifolia*, in uncultivated areas, in the xerophilous grassland on the hills and mountains, and in the mesophilous woods with *Quercus robur* and *Ulmus minor*, but also in country houses.

Occasionally it can reach the upper limit of thermophilous woods (1200 m. between the Intesa and Chiocchio Valleys).

It is common, but localized.

The specimens belong to the ssp. *quatuorlineata* (= *Elaphis cervone* Schreiber, 1875).

The longest specimen we observed was 165 cm in length and was captured in June 1986 in the locality Vignale along the Sagittario River.

Natrix natrix (Linné, 1758) Stejneger, 1907.
Grass Snake (cervone).

It lives both in the mesophilous woods with *Quercus robur* and *Ulmus minor* and in the hygrophilous woods along rivers with *Populus* and *Salix*.

It is possible that adults, but mostly old females, live also in the *Fagion sylvaticae* and *Quercetalia pubescentis*.

It is common, but localized; up to around 600 m.

The specimens belong to the var. *lanzai* Kramer, 1971 of the ssp. *helvetica* (Lacépède, 1789).

Natrix tesellata (Laurenti, 1768) Bonaparte, 1834.
Dice Snake.

We never found the species in this study area but it is present nearby in the S. Domenico artificial Lake (about 800 m., higher in the Sagittario Valley), and Lake Scanno.

Viperidae

Vipera aspis (Linné, 1758) Merrem, 1820.
Asp Viper (vipera).

It lives in all the vegetation types on the southward facing slopes.

It is localized and not very common; up to 1570 m.

The specimens belong to the ssp. *francisciredi* Laurenti, 1768. The commonest varieties are: *fusca* Bonaparte, 1834, *nigra* Massalongo, 1854 and *rufa* Bonaparte, 1834.

Mangili (1985) drew a specimen with a livery we never found in any animal either coming from the territory we considered or from Abruzzo or from any other italian Regions where sp. *francisciredi* lives (cf. for example Bruno 1976). We believe this drawing was not of a specimen collected in the territory under study but of a *Vipera aspis aspis* or *Vipera aspis atra* photograph (cf. for example Phisalix 1968).

ACKNOWLEDGEMENTS

We thank Massimo Agrillo, Luigi Di Cesare, Vittorio Di Cesare, Valerio Di Valerio, Susanna Greco, Febo Grimaldi, Livio Petriccione, John Pickett and Mark Vokins for their help and suggestions.

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CONTRIBUTION TO THE REPTILE FAUNA OF NORTHERN IRAN

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ABSTRACT

Reptiles were observed and collected in Northern Iran in February and May 1968 on the way to and on the return journey from Afghanistan (Clark 1990). A report on this trip is long overdue and is justified owing to the scarcity of first-hand accounts in recent times on the herpetofauna of this country which is now virtually inaccessible to the ordinary traveller. For this reason I present detailed ecological observations, full descriptions of the lizards and snakes found as well as selected data on measurements and pholidosis. These latter details are either presented in the text or in tabular form in the case of the lacertid lizards. In addition I am including a fully detailed account of the itinerary, weather conditions experienced and a zoo-geographical analysis so that as clear a picture as possible will be given to the reader. Some taxonomic discussion is also allowed in some cases but in the main I refrain from making judgments in areas of uncertainty. Here can be mentioned the *Eremias* genus and the position of *Lacerta strigata* which is currently under review. 23 species are here considered: 16 lizards and 7 snakes. In addition *Testudo horsfieldi* was found in the Mashad region. *Rana ridibunda* was seen along the Caspian Sea coast. Most species were collected within 60 kilometers from the nearest town or village. Heights were measured using an aneroid altimeter and are given in meters: viz. 1060 m. Dates are given as day and month viz: 19/2, 25/5. All descriptions of the animals were made on freshly killed material or on living specimens and are as in life. In the text T/B indicates ratio of tail to body length. In the Tables the body length of juveniles is omitted. The collection was donated to the Senckenberg Museum in Frankfurt for permanent accession.

ITINERARY

The route followed on the outward journey between February 13th and February 22nd was the same as used on the return journey from May 15th to May 25th. From Bazorgan on the Turkey/Iran border the road passed through Maku, Marand, Tabriz, Mianeh and Qazvin to Tehran and then across the Elburz mountains to the Caspian Coast to Gorgon, Bojnurd, Quchan, Mashad Torbat-e-Jam to Taiabad near the Iran/Afghan border. These localities can be found on the accompanying map together with collecting sites.

WEATHER CONDITIONS

Snow cover was extensive in February from the Turkish border to the outskirts of Tehran and over the Elburz range. A minimum of -9°C was recorded near Maku on February 13th with a midday reading of 1.5°. The Caspian zone at this season was mild but cloudy with minima around 4° and maxima of 16°. Eastwards to Mashad the weather was fine with early afternoon temperatures between 14° and 17.5°. Night minima lay between -1° and 6.5°. Snow was present on the mountains either side of the road between Bojnurd and Mashad and with varying altitude was also lying along the route followed. Between Mashad and the Iran/Afghan frontier post there was some sun and cloud with maxima between 13.5° and 17° with minima around 6°. In February it was only on this last stage that any quantity of lizards were found and most of these were dug out of hiding.

In May day-time maxima were still not high and indeed conditions were at their optimum for species activity. The highest recorded was 30.5° near Behshar at the eastern end of the Caspian on May 18th. Otherwise 25° was not exceeded and minima ranged from 12.5° near Mashad on May 16th to 19.5° on the Caspian coast. West of Tehran, as the height rose to the Azerbaijan highlands, rain fell in heavy showers. The stretch between Marand and Bazorgan was appreciably drier and warmer.

ZOO-GEOGRAPHY

Although only a narrow belt of Iran was covered the route passed through several distinct zones and representatives of each region were collected. Close to the Turkish frontier, contiguous with the plains below the foothills of Mt. Ararat, are semi-desert lowlands around 900 meters. Here were found *Eremias strauchi, E. pleskei, Ophisops elegans, Mabuya aurata* and *Malpolon monspessulanus.* In 1964 *Agama caucasica* and *Phrynocephalus helioscopus* were also collected. *E. pleskei* and *P. helioscopus* filter into this area along the valley of the Araks river.

East of Tabriz the road climbs to highlands over 1600 meters in altitude. Here were found *Lacerta brandti, E. arguta* and *E. strauchi.*

The unique climatic conditions along the southern Caspian coast have enabled the penetration of elements widely distributed in the more westerly parts of their range in Turkey and S.E. Europe. Only very few of these extend much further east: *Natrix tessellata, Ophisaurus apodus* and *Rana ridibunda* as far as the foothills of the Hindu Kush. Species found in the Caspian region included: *Natrix n. persa. N. tessellata, Coluber n. najadum* and *R. ridibunda. Vipera lebetina turanica* was also caught. In addition *Lacerta strigata* represents the *L. viridis/L. trilineata* group. *Lacerta saxicola defilippi* was found immediately on entering the lower slopes of the Elburz and higher up was sympatric with *Agama caucasica.* The Elburz range separates the Caspian zone abruptly from the arid regions of central Iran. Going eastwards from the Caspian the herpetofauna becomes typical of the semi-desert regions of Central Asia. Species found were *Trapelus agilis, A. erythrogastra, E. persica, Messalina watsonanna, Eryx miliaris* and *Testudo horsfieldi.*

SPECIES ACCOUNT

Tenuidactylus caspius (Eichwald)
Locality: Bojnurd, 1060 m., 17/5.
Description: Ground fawn with 5 dark bands across the dorsum which continued down non-regenerated part of tail. Venter dirty white.
Diagnostic data: body length 54.0; ventrals 25; dorsal tubercles 12 rows; femoral/anal pores 24 in a continuous series; tail plates in 2 rows for first 7 out of 10 segments then 1.
Remarks: this gecko was found in the same locality and at the same time as *Mabuya aurata.* It was basking on the edge of a crack in an earth bank. Another example was seen nearby but escaped down a hole.

AGAMIDAE

Trapelus agilis Olivier
Material examined: 5 males, 3 females, 1 juvenile.
Localities: Torbat-e-Jam 955 m., 22/2; Mashad 1380 m., 16/5.
Description: Ground fawn to grey-brown. A dorso-lateral and vertebral row of light pink or white oval spots, bordered thinly with black. These spots joined transversely with bars of diffuse dark brown forming a shallow 'V'. Markings continuing on tail as alternating light and dark bars. Dark patch at base of forelimb. Head brown with a few dark spots. Flanks partly marked with black, lower flank zone in 4 males either deep purple or dark blue. Belly off-white with scattered black dots aggregating into longitudinal lines on neck. Large purple patches on belly in 2 males. Throat heavily striated with light and dark grey, on 4 males with purple or blue.
Diagnostic data: body length 77-91, juv.48.5; T/B males 2.40-2.92, females 2.35-2.50, juv. 2.71; scales round body 60-76; total preanal glandular pores Males 16-22 in 2 rows, females absent or 6 indistinct pores in 1 row.
Remarks: the specimens caught in February were found near gullies in a baked-earth habitat. 2 were in hiding and those in the open were sluggish. The weather was partly overcast but when the sun broke through there was a burst of reptile activity (time 11.30-13.45, air temperature 17.3°C, ground 18.5°C). *Eremias persica* and *Mesalina watsonana* were also found in hiding with several small scorpions, centipedes, ants, hornets and beetles. No acridids were noted.

Agama caucasica (Eichwald)
Material examined: 4 males 4 females.
Localities: Bojnurd 820 m. 17/5; Minoodasht 700 m. 17/5; Ab Ask (near Amol) 1620 m. 19/5; Ab Ali 2600 m. 19/5.
Description: In a female from Ab Ali the ground forms cream, irregular cross bars with bold black reticulations with the venter light and dark grey.
In the others the ground was fawn-grey with a black network over back and flanks either heavy or fine with the mid-dorsal zone grey. Some orange patches near forelimb and on flanks either pale or in the form of broken cross bars. Tail banded light and dark grey. Venter in males black save for an ochre-grey glandular patch in the midline and near anus; females cream-white. Tail below grey in males, orange-pink in females. Some examples seen in the field at Ab Ask and Ab Ali had striking cream-yellow heads.
Diagnostic data: body length 109-149; T/B oo2.46 oo 2.34 and 2.65; scales round mid-body 146-160; number enlarged spinal rows 11-15; preanal glandular pores oo 40-65 in 4-6 rows oo absent.
Remarks: with the exception of one from Minoodasht which was found on a rock in a forest clearing, all these agamas were seen in open, arid rocky terrain often several being found together. At Bojnurd three were sheltering under the same boulder.

A. caucasica was active from early morning throughout the day in May but daytime maxima were not all high the highest being noted that was relevant to this species being 25° at 13.30 at Bojnurd. Those from the two sites in the Elburz mountains were found with the air temperature around 19°.

Agama erythrogastra (Nikolsky)
Material examined: 3 males 4 females 3 juveniles
Localities: Torbat-e-Jam 1120 m. 15/5; Mashad 1380 m. 16/5.
Description: Ground colour ochre-grey, olive or dusty pink. Black markings over dorsum either as fine dustings or a network. On neck orange or yellow patches in broken bars. Tail banded indistinctly with dark grey. Venter in adult males black with a greyish callosic glandular patch in midline. Throat in males white with large black patches. Females were pink or orange on the underside with some grey markings. Throat as in males but with dark grey markings. Juveniles as adults with the black dorsal markings in the form of broken cross bars. No orange ventrally.
Diagnostic data: body length 121-151, juvs. 62.5-64; T/B 2.07-2.18 (3 specimens only tail complete), juvs. 2.12 and 2.29 (2 specimens); scales round body 95-118; number of enlarged dorsal rows 7-16; preanal glandular pores oo 30-36 in 2 to 4 rows, oo absent in 2 but 20-30 in others in 2 indistinct rows, in juvs. absent.
Remarks: this large agama was common at both localities but difficult to approach as it turned and ran for cover at the slightest hint of danger. The habitat comprised deep holes and crevices in earth banks and cliffs and piles of stones. Some were dug out of hiding but many seen escaped as the tunnels they occupied were long and often branched into several passages. The area in question was poorly cultivated with numerous stream beds and steep-sided gullies. Some locals assisted in the caspture of some specimens. *A. erythrogastra* from near Torbat-e-Jam were active at 14.00. Those from 60 km. S.E. of Mashad were taken between 07.00 and 08.15 with an air temperature of 18.5° and 40% relative humidity. In Clark, Clark & Anderson (1966) it was remarked that this agamid is rare in collections and only known from the Mashad area in Iran and S.E. Turkemistan. However since then it has been found by the Street Expedition to Afghanistan from N.W. Afghanistan and more significantly from Paghman in eastern Afghanistan at 2440 metres elevation (Anderson & Leviton 1969). This indicates a much broader distribution than previously suspected and a considerable altitudinal range.

ANGUIDAE

Ophisaurus apodus apodus (Pallas)
Material examined: 2

Locality: Minoodasht 1120 m. 17/5.
Description: dull red-brown above with a few light olive patches on flanks and head. Underside white-fawn with red and grey patches.
Diagnostic data: Total length 855, 945; body length: 360; 415; scales round mid-body 22 (12 dorsals 10 ventrals); supralabials 12+11, 11+11.
Remarks: *O. apodus* was very common in May in the Gulistan Forest. Six were seen on a short stretch of road east of the collecting site. Of those caught one was dead on the road and the other taken at the base of a bush in a grassy field (air temperature 21.5°, R.H.67%, weahter partly cloudy). On the lowlying plains at the eastern end of the Caspian Sea one was found dead on the road. In assigning these specimens to the nominate form I follow the taxonomic designation of Obst (1975).

SCINCIDAE

Mabuya aurata septemteniata (Reuss)
Material examined: 1 female.
Locality: Bojnurd 1060 m. 17/5.
Description: ground olive-grey. On neck 3 broad longitudinal stripes comprised of ground colour in the dorso-lateral and vertebral positions separated by two rows of black flecks. On the body these bands less clearly marked so that the ground has four longitudinal rows of black flecks. Upper flank zone marked with black and brown. Lower flanks greyish/white. Head fawn, venter white.
Diagnostic data: body length 77; T/B 2.53; scales round midbody 36; supraoculars 4; preoculars 2; postoculars 4; supranasals 2 not touching nostril.
Remarks: this skink was found lying in loose, fine soil at the base of an earth bank in hilly, stony country at 08.30, air temperature 20°C.

LACERTIDAE

Lacerta brandti de Filippi
Material examined: 8 males 5 females 9 semiadults.
Locality: Tabriz 2000 m. 24/5.
Descriptions: Males: ground green anteriorly, olive-fawn posteriorly or entirely this colour. Dorso-laterally a double row of white spots and a row of black bars. Black dots on nape, head with black markings. Side of head, neck and anterior flank zone bright green, even on specimens not green dorsally. Hindlimbs with small light ocelli and black network. Usually 3 prominent blue black-ringed ocelli above forelimb. Belly green-yellow. Throat blue or green, also chin and chest. Main outer ventral row marked with blue and black. Underside salmon-pink or orange, paler on tail.
Females: marked as males but ground darker and more brown. Mid-lateral white stripe. Belly more yellow, throat pale blue-green. Less blue on outer ventrals but black edging more pronounced.
Semiadults: as in females but ground paler and black markings finer. Flanks browner.
Diagnostic data: this is presented in Table 1, together with 8 specimens caught in 1964 at the same time.
Remarks: this lizard was only found at this locality 45 km. S.E. of Tabriz and was abundant on earth banks, stone piles and low stone walls. They sought refuge in holes, under rocks and at the base of plants and shrubs. The terrain was hilly and consisted of partly cultivated land above a small lake. *L. brandti* was found to be not a very active lizard and those encountered in the open were easy to catch – time 12.30 to 14.00 air temperature 19.5°C. All the females contained eggs 3-8 mm. in diameter. *L. brandti* has a restricted range in N.W. Iran and the S.E. Transcaucasus. The type locality of Basminsk is between Tabriz and Tehran.
Lacerta saxicola de Filippi Camerano
Material examined: 5 males 2 females.
Localities: Amol 350 m 19/5; Ab Ali 2545 m. 19/5.
Description: Olive-grey above with scattered black dots confined to the vertebral line in two

specimens. An indistinct row of white spots down the dorso-lateral aspect. Flanks darker brown with white dots and black markings. Head brown with black dustings. The Amol specimen has two blue forelimb ocelli and faint blue flank dots. Belly either entirely orange-red (two examples) or with paler orange on outer one or two ventral rows with the main outer row always blue tipped. Throat, chin and underside of tail white, anal region orange.
Diagnostic data: see Table 1.
Remarks: the single example from Amol was found on a rock face by the road in open woodland. Another was seen. The remainder were taken from near the pass crossing the Elburz mountains in rough rock-strewn country with stone walls and small streams. More were seen but they were not common and their retiring disposition made them elusive. Time 13.30, air temperature 19°C. This subspecies is the most easterly of the *L. saxicola* complex which reaches its greatest diversity in the Caucasus region (Darevsky 1966).

Lacerta strigata Eichwald
Material examined: 1 male 3 females 1 juvenile
Locality: Mahmudabad Caspian seal level 18/5-19/5.
Description: Adults – dorsal ground soft moss-green or brownish, one animal plain the others with heavy dark spottings or speckling. Trace of lighter green dorsal stripes (3 examples) and a mid-lateral one (2). Forelimbs mostly green, hindlimbs and tail fawn-grey. Venter from chest forward and outer ventrals metallic green or yellow/green. Rest of venter white with green tinge. Sexes not distinguishable on colouration.
Juvenile – ground brown with darker brown patches. Three dorsal white stripes down length of body and a similar stripe down the mid-flank. Venter uniform white.
Diagnostic data: see Table 1.
Remarks: this lizard was common on the narrow strip of bush and shrub-covered waste ground between the Caspian and the main road, beyond which lay extensive rice fields. The habitat was sandy and the tracks of *L. strigata* were seen on the low hills here and at another site nearby. In addition this species was observed further east between Gorgon and Babol Sar. *L. strigata* was plentiful but very timid and alert running for cover at the slightest disturbance. Since much of the bush cover was dense and thorny they were difficult to catch. Activity was in the early morning (07.00-08.00) and again in the evening (16.00). Air temperatures 22.5° and 25° respectively; R.H. 90% and 73%. Two females had eggs. In one they measured 14 mm. x 9 mm.
Comments on the taxonomic status of *L. strigata*: the reader is here referred to Schmidtler (1986) in which the author questions the validity of *L. strigata* as a self-standing species. There is no doubt that *L. strigata* and *L. viridis* are closely allied. Boulenger (1920) described a series of Green Lizards from the south Caspian coast under the name *L. viridis* var. *woosnami*. Mertens & Wermuth (1960) reinstated the taxon *L. strigata* Eichwald under which this characteristic form was first named in 1831. From the present author's experience with Green Lizards in Asia Minor it can be remarked that *L. strigata*, if allowed as a species in its own right, differs from *L. trilineata* in its consistently smaller size, no larger than *L. viridis*, and in the femoral pores reaching the knee. From *L. viridis* it differs in the body patterning *L. strigata* has the stripes always in odd numbers persisting into old age. The blue throat, typical of adult male *L. viridis*, is not found in *L. strigata*. Further comparison with *L. viridis* and *L. trilineata* demonstrates that *L. strigata* has a lower dorsal count. In the present author's material from Turkey 45 *L. viridis* from along the stretch of the Black Sea had a range of 45-59 and 55 *L. trilineata* from the whole of Turkey had a range of 39-57 though the majority lay between 42 and 53. Seven examples of *L. princeps* had a range of 33-38. Boulenger (1920) remarked on this similarity of *L. princeps* with *L. strigata*. It should be mentioned that *L. strigata* is the most eastern form of the Green Lizard complex with its most westerly point in extreme eastern Turkey – see Schmidtler 1986.

Ophisops elegans elegans Ménétries
Material examined: 8 males 9 females 2 juveniles.
Localities: Zandjan 1728 m. 23/5; Mianeh 1545 m. 24/5; Tabriz 1758 m. 24/5.

Description: Males – ground grey-fawn. Dorso-lateral white stripe on anterior half of body tending to fragment posteriorly and bordered internally with small black spots or bars on an undulating band. Short black nape stripe. Flanks reddish-brown. Mid-lateral white line and some black markings. Side of head white with grey. Underside white, grey on outer ventrals. Females and juveniles – similar to males but the dorso-lateral white stripe continuing down length and black internal markings in the form of a more or less continuous stripe. Flanks less reddish and reduced black markings.
Diagnostic data: see Table 1.
Remarks: near Zandjan the habitat was stony ground covered with low woody plants. *O. elegans* was active from 09.30 (19.5°) and hid down holes when chased. The specimen from Mianeh was caught. at 08.00 (14° R.H. 85%) under a pile of dead vines in a grassy gully. Several more were seen. At the site 80 Km. S.E. Tabriz it was found on broken partly grassy ground near rock outcrops. Nearer to Tabriz the lizard was common on flat, clay steppe with some bush cover. Five females contained eggs which varied in size from 3.5 mm diameter to 10 x 4.5 mm.

Eremias arguta (Pallas)
Material examined: 1
Locality: Tabriz 2060 m. 24/5
Description: ground grey-brown with two longitudinal rows of large white black-ringed ocelli on either side of the mid-dorsal line. Flanks with an indistinct row of similar markings on upper zone. Lower flank grey-white. Venter dull cream.
Diagnostic data: see Table 2.
Remarks: taken from the same site as *L. brandti*. This single specimen, the only one seen, was caught on a stone wall bordering a field. This member of the *Eremias* group has a range from Rumania to Central Asia but only just penetrates Iran in the north.

Eremias pleskei Bedriaga
Material examined: 2 males 1 female 1 juvenile.
Locality: Marand 1090 m. 25/5.
Description: ground black or dark chocolate with five light stripes on neck reducing to four on the body with the vertebral one disappearing. These stripes white or cream and brighter in the two smallest examples. A dorso-lateral stripe 3-4 scales wide. Upper flank as ground with a broad mid-lateral cream stripe. Lower flank grey. Limbs as ground with large white ocelli. Venter cream or white, immaculate.
Diagnostic data: see Table 2.
Remarks: these were found on rough stony terrain in low hilly country. They hid under small plants or down shallow holes but not under stones. The single female contained eggs. The dorsal count for these few specimens seems higher than those caught by the author in Turkey (R 48-60 x 54.6 s 2.70 number in sample 21). The granule count is higher than that quoted by Terentev & Chernov which is given as 24-30. The range of this species embraces southern Armenia and the region of Azerbaijan in N.E. Turkey and N.W. Iran. In contrast to both *E. arguta* and *E. strauchi* it is restricted to the relatively low-lying semidesert plains and does not range into the mountains.

Eremias persica Blandford
Material examined: 3 males 2 females 8 juveniles
Localities: Torbat-e-Jam 955 m 22/2; Mashad 1380 m. 16/5.
Description: adults – dorsum grey-brown. Four rows of elongated black spots about 2 scales wide. Between each row a pale fawn-grey stripe (5 in all). These stripes coverge at the tail base the outer rows continuing. Flanks with a 3-4 scale wide cream stripe. Above this is a black band with spots of the ground showing. Venter white immaculate. Hindlimbs black with cream-yellow ocelli. Juveniles – dorsum black with five cream/white stripes. Dorso-laterals continue down tail. Flank black with a mid-lateral cream stripe and a variable row of small light dots. Another light stripe from orbit to forelimb. Venter as adults. Some grey on outer side of neck and throat.

Diagnostic data: see Table 2.
Remarks: those from Torbat-e-Jam were found in February under cool conditions in the early afternoon (17.5°). They were mostly dug out of holes in earthy banks. Three juveniles were discovered together. Only one was active. *Mesalina watsonnana* was fully active (see below). Those taken from near Mashad in May in the early morning (18.5°) were active quickly running to hide under low plants or down holes. A juvenile was seen entering a hole and scraping loose sand across the entrance with its tail. One of the females contained eggs 3-6 mm. in diameter. *E. persica* is very close to *E. velox* but range southwards to southern Afghanistan.

Eremias velox velox (Pallas)
Material examined: 1 male.
Locality: Bojnurd 800 m 19/2.
Description: dorsal ground colour fawn-grey with small black dots. A row of white ocelli down dorso-lateral aspect, partially black-edged. Another row of green dots mid-laterally. Some black spotting on flanks. Venter white.
Diagnostic data: see Table 2.
Remarks: this single example was found at midday moving clumsily along a sunny earth bank in open country. With an air temperature of 17.5° and a ground of 30.5° this lizard showed little activity. This specimen of *E.v.velox* came from the region where the three closely related species (*E. v.velox, E. persica* and *E. strauchi*) apparently converge. *E. v.velox* ranges from the Caucasus far into Central Asia.

Eremias strauchi Kessler
Material examined: 1 male 2 females.
Localities: Tabriz 2060 m. 24/5; Marand 1090 m. 25/5.
Description: Grey-brown ground with a double row of white dashes down and parallel to the vertebral line, the other being down the dorso-lateral aspect. These markings are variable in their consistency. Black spots on the dorsum as well as smaller dark flecks. On upper flanks a row of white or green ocelli. Lower flanks creamish with some black. Hindlimbs with black flecks and white ocelli. Underside white, chin cream.
Diagnostic data: see Table 2.
Remarks: the specimen from 45 Km. S.E. Tabriz was taken near to where *E. arguta* was found while the two from Marand were sympatric with *E. pleskei* on rock outcrops amongst low stony hills. Time 10.00, 23°. Neither female contained eggs. This member of the *E. velox* complex occupies a strip of territory from the Caucasus to about the Kopet Dag in N.E. Iran.

Mesalina watsonnana (Stoliczka)
Material examined: 18 males 2 females.
Localities: Mashad 1300 m. 20/2; Fariman 410 m. 21/2; Torbat-e-Jam 955 m. 22/2.
Description: ground brown or greyish. Two rows of white ocelli dorsally and one row dorso-laterally prominently black-edged. Dorso-lateral row tending to form a stripe. Head plain and as dorsum. Flanks with a white stripe mid-laterally and above this a few white dots ringed with black. Lower flanks marked with black. Entire underside whitish, outer ventrals dark grey. Hindlimbs marked with black and white.
Diagnostic data: see Table 1.
Remarks: the four specimens from Mashad and Fariman were found in flat, open country with little vegetative cover. Conditions were cool and cloudy with air temperature around 14°. One was dug out of a shallow hole. At the site near Torbat-e-Jam the weather was warmer and sunny and this lizard was markedly active darting around low plants and hiding in deep holes. The habitat was a series of gullies in a dry, flat, baked-earth area. Here it is sympatric with *E. persica* and *T. aigilis* which showed lower activity levels. It is clear that *M. watsonnana* is active at much lower temperatures than most other reptiles in this region. The two females contained eggs 3 mm. in diameter. This species is ubiquitous in semi-desert habitats in S.W. Asia. Here it is found towards the northerly limit of its distribution.

BOIDAE

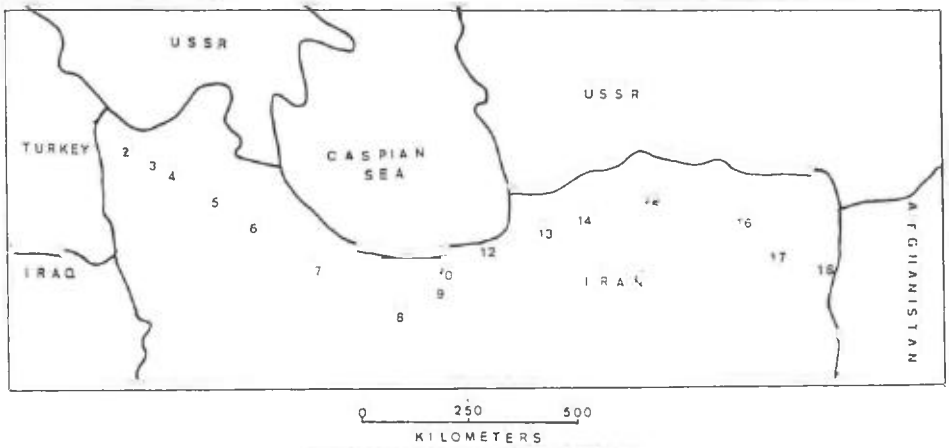
Eryx miliaris (Pallas)
Material examined: 1 female.
Locality: Torbat-e-Jam 955 m. 15/5.
Description: ground pink-fawn with slightly slanting khaki cross bars 3 scales deep often broken or alternating along the midline. Between these pale orange spots prominent near tail base. Head uniform grey. Dark stripe from orbit to angle of jaw. Vertebral grey line half-a-scale wide down length. Flanks marked with short darker bars and spots. Venter and lower flanks white, patches of grey-orange along mid-ventral line.
Diagnostic data: total length 442 mm., tail 32 mm; dorsals 48 ventrals 199 anal entire. Subcaudals 14 in single plates and then 6 rows of double plates. Circumoculars 12 each side including a single enlarged subocular. Interoculars 6 on each side.
Remarks: this was found freshly killed on the road during the late morning. The surrounding countryside was open and flat with low woody plants on an earthy soil.
This specimen was similar to 3 *Eryx* caught in northern Afghanistan though of larger size, the biggest Afghan specimen totalling 375 mm. The Afghan sample was assigned to *E. tataricus* and the identification of the present example is rather open. The four scales posterior to the internasals agree with *E. miliaris* although the ventral count is more in accordance with *E. tartaricus*. Since head scalation is less variable I prefer placing this with *E. miliaris*. Both species could be expected in this region. It is worth mentioning that the Afghan examples were found in sandy desert.

COLUBRIDAE

Natrix n. persa (Pallas)
Material examined: 4 males
Localities: Gorgan 200 m. 17/2; Babol Sar Caspian sea-level 18/5.
Description: ground olive-grey or brownish. Dorso-lateral yellow stripes present but faint in one. Small dark patches present internally to each stripe, absent in one from Gorgan. Flanks with two rows of larger, dark patches. Moon patches small, clear, yellow. Throat and chin white. Venter marbled with white and black.
Diagnostic data: total length 471-732 mm.; body length 363-573 mm; dorsals 19, 17 in one. Ventrals 177-188, anal divided. Subcaudals 71-82 in 2 rows. Supralabials 7+7, with the 3rd. and 4th. bordering the lower orbit.
Remarks: the two from Gorgan were found in bramble thickets in a field at 14.00 (16°, R.H. 58%). Weather partly cloudy with some sunshine. Another was seen. The terrain was dry with no water in the vicinity. The two from Babol Sar were seen crossing the road at 16.00 (25°). Many more were seen. On either side of the road there was wasteground and some cultivation. In February this snake was hardly in evidence though by May it was extremely abundant.

Natrix. t. tessellata (Laurenti)
Material examined: 1
Locality: Tasabriz 2000 m.; 24/5
Description: ground light olive-yellow with darker greenish patches on the dorsum and flanks. Throat and neck rich cream then with an increasing amount of black on the venter. Tail below nearly uniform black.
Diagnostic data: total length 497 mm. Body length 403 mm. Dorsals 19. Ventrals 178, anal divided. Subcaudals 63 in 2 rows. Supralabials 8+8, the 4th bordering the orbit.
Remarks: this was found in a dry gully some distance from the lake. Sympatric with *L. brandti*.

Coluber n. najadum (Eichwald)
Material examined: 1 male
Locality: Mahmud Abad, Caspian sea-level; 19/5.
Description: dark olive-grey. 16 white encircled neck patches, gradually reducing in size, Labials cream, dustings of fawn on supralabials. Entire venter cream-white, immaculate.



MAP OF NORTHERN IRAN

Localities mentioned in text

1	Bazorgan	10	Amol
2	Maku	11	Mahmudabad
3	Marand	12	Babol Sar
4	Tabriz	13	Gorgan
5	Mianeh	14	Minoodasht
6	Zandjan	15	Bojnurd
7	Qazvin	16	Mashad
8	Tehran	17	Torbat-e-Jam/Fariman
9	Ab Ali	18	Taibad

Diagnostic data: total length 1212 mm.; body length 895 mm. Dorsals 19. Ventrals 223 anal divided. Subcaudals 109 in 2 rows. Supralabials 8+8 with the 4th and 5th bordering the lower orbit.

Remarks: this very large specimen, the largest that I have personally examined, was taken at the same site as for *L. strigata*. It was seen lying in a low bush at 08.00 (22.5° R.H. 90%) and hid in the undergrowth. Half-an-hour later it reappeared and was caught as it attempted to hide in a pile of refuse. The subcaudal count is lower than I have noted on my extensive Greek and Turkish material although within the range for the species. In Iran this is a species whose distribution is limited to the north of the country from Azerbaijan to the Kopet Dag.

Coluber r. ravergieri Ménétries

Material examined: 1 female

Locality: Tabriz (100 km. S.E.) 1640 m.; 24/5.

Description: ground fawnish with a double row of alternating small brown patches on dorsum uniting into cross bars on posterior third of body and into a mid-dorsal line on tail.

Diagnostic data: total length 866 mm.; body length 659 mm. Dorsal 21. Ventrals 213 anal divided. Subcaudals 93 in two rows. Preoculars 3, postoculars 3. Loreal 1 and an additional small scale below posterior part of loreal and partly replacing the 4th supralabial. Supralabials 9, the 5th and 6th touching the orbit with the 6th joined to the lowest postocular.

Remarks: this snake was seen disappearing under a boulder on a rocky outcrop at 10.00, 21.5°. This snake agrees with the description given by Smith (1943) except in having an additional

TABLE 1
Diagnostic characters of the Lacertid lizards of Northern Iran

	L.brandti	L.saxicola	L.strigata	O.elegans	M.watsonnana
Body length	r 50-67	r 39-51	r 72.5-101	r 34.5-53.5	r 42.5-54
	$\bar{x}$ 62.37	$\bar{x}$ _____	$\bar{x}$ _____	$\bar{x}$ 44.82	$\bar{x}$ 48.9
Dorsals	r 49-58	r 43-51	r 35-43	r 22-31	r 38.47
	$\bar{x}$ 52.40	$\bar{x}$ _____	$\bar{x}$ _____	$\bar{x}$ 27.0	$\bar{x}$ 42,6
Femoral pores	r 14-22	r 14-18	r 18.21	r 8-12	r 10-13
	$\bar{x}$ 18.23	$\bar{x}$ _____	$\bar{x}$ _____	$\bar{x}$ 10.2	$\bar{x}$ 11.53
Granules	r 6-15	r 10-15	r 3-9	r 9-13	r 13-25
	$\bar{x}$ 9.52	$\bar{x}$ _____	$\bar{x}$ _____	$\bar{x}$ 10.8	$\bar{x}$ 17.85
Supratemporals	r 2-3	r 1 *	not taken	r 1-3	absent
	$\bar{x}$ 2.75	$\bar{x}$ _____		$\bar{x}$ 1.97	absent
Masseteric	r 0-4	r 1-3	r 3-4	absent	absent
	x 1,38	x _____	x _____	absent	absent
Occipital	r 0-2	r 1-4	r 0-2	r 2-4	r 1-4
	$\bar{x}$ 1.18	$\bar{x}$ _____	$\bar{x}$ _____	$\bar{x}$ 3.58	$\bar{x}$ 0.84

* the supratemporal extends 1/3 – 2/3 length of parietal. r range. $\bar{x}$ mean.
_____ sample too small to calculate mean.
Occipital size: 0 (absent) – 4 (equals interparietal). Masseteric size: 0 (absent) – 4 (very large)

TABLE 2
Diagnostic characters of lizards of the genus *Eremias* (Lacertidae) of Northern Iran

	E.v.velox	E.strauchi	E.persica	E.pleskei	E.arguta
Body length	59.5	r 58.5-67	r 70.5-83	r 38.5-52.5	45
	-	$\bar{x}$ _____	$\bar{x}$ _____	x _____	
Dorsals	53	r 53-60	r 55-66	r 56-61	51
	-	$\bar{x}$ _____	$\bar{x}$ 59.8	x _____	
Femoral pores	19+20	r 16-19	r 17-21	r 15-16	8+8
		$\bar{x}$ _____	$\bar{x}$ 19.6	$\bar{x}$ _____	
Granules	52*	r 23-44**	r 18-44*	r 38-60**	41+45*
		$\bar{x}$ _____	$\bar{x}$ 29.4	$\bar{x}$ _____	
Supratemporals	absent	absent	absent	absent	4+4
Masseteric	absent	absent	absent	absent	absent
Occipital	absent	absent	absent	absent	absent
Supralabials	6	5-6	5-7	6	+

* granules encircle supraoculars. ** granules do not encircle supraoculars. r range. $\bar{x}$ mean.
samples too small to calculate mean. + subocular not part of supralabial series.

small loreal and from that of Terentev & Chernov (1949) in having 3 postoculars instead of 2. The species is distributed widely but spasmodically from western Asia Minor to N.W. India. Nowhere common.

Malpolon monspessulanus insignitus (Geoffroy)
Material examined: 2
Localities: Qazvin 1275 m. 22/5; Marand 1090 m. 25/5.
Description: the snake from Qazvin was uniform olive-grey above and cream-white below. The Marand snake had two rows of longitudinal fawn flecks on outer ventral zone and faint dark flecks dorsally.
Diagnostic data: total length 1197, 877 mm; body length 910, 670 mm. Dorsals ?, 17. Ventrals 181, 174 anal divided. Subcaudals 81, 83 in two rows. Supralabials 8, the 4th and 5th bordering the orbit.
Remarks: both of these were found freshly killed on the road, the one from Qazvin being severely damaged.

Vipera lebetina turanica Cernov
Material examined: 1 male.
Locality: Gorgan 240 m. 18/5.
Description: ground grey-fawn. On neck a vertebral row of dark markings with a streak on dorso-lateral aspect. Down the body these markings form a zig-zag breaking in places to give alternating patches. Flanks with a main row of large dark spots and on lower flanks further dark markings. Head above uniform with dark streak from eye to angle of jaw. Venter dirty white heavily powdered with grey and large grey spots. Throat and neck largely immaculate.
Diagnostic data: total length 920 mm; body length 800 mm; mid-body girth 102 mm. Dorsals 25. Ventrals 170 anal entire. Subcaudals 43 in two rows. Supraocular 3+. Pre/sub/postoculars 13+12. Interoculars 8. Supralabials 10+11.
Remarks: this snake wss found lying in a hedge bordering a field at 10.00, 27° R.H. 56%. The situation was cool and shady. To prevent escape the snake was seized and thrown into the open whereupon it showed a determined attempt to get back into cover. In moving it raised the anterior part of the body clear of the ground and struck out viciously while in motion, flattening the head and neck. Capturing this viper proved quite difficult. Another was spotted nearby but escaped.
This specimen differed from two caught in Turkey (*V. lebetina obtusa*) only in patterning. The Turkish snakes had no dorsal zig-zags. Klemmer (1963) gives the range of *turanica* as including N.E. Iran. The Caspian locality is about at the most western point of the range which extends eastward to N.W. Pakistan and western Kashmir (Gruber 1989).

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The following article originally appeared in ***New Scientist*** *8 September 1990 and has been reprinted with kind permission of the Editors.*

MORE THAN ONE WAY TO SAVE A CROCODILE

MARY-LU COLE

Thirty years ago you would be lucky to spot a Nile crocodile sleeping on a sunny rock. You were more likely to see them in the fashionable parts of Europe as shoes and handbags – a state of affairs that prompted a worldwide ban on trade in crocodile skins. Since the ban, crocodiles in Zimbabwe have flourished, to the extent that the government is now actively encouraging the sale of their skins and meat.

In 1976 the Nile crocodile was added to the list of the world's most endangered species. Appendix 1 of the Convention on International Trade in Endangered Species (CITES). But before CITES was ever introduced, ecologists in Zimbabwe (then Rhodesia) were aware of the immediate problem of uncontrolled poaching and they banned hunting of crocodiles. They also realised that protected populations would increase and eventually might become a nuisance.

While other African nations adopted preservationist attitudes, Zimbabwe's Department of National Parks and Wild Life Mangement took a less orthodox approach. The department decided to make good use of the growing populations by introducing crocodile ranching to the country. Today there are 30,000 crocodiles living in Lake Kariba alone.

Hides for the luxury leather trade are in big demand in Europe and the Far East. In 1989, sales of skins earned Zimbabwe's farmers £1.5 million in foreign currency.

Farmers registered with the Crocodile Farmers Association of Zimbabwe take eggs from the wild and incubate them on their farms. Once hatched, the crocodiles are raised under controlled conditions until they are two years old and are then slaughtered for their skin and meat. Each year, farmers have to return 3 per cent of their crocodile hatchlings to the wild, to maintain the populations.

Between 1965 and 1987 ranchers were allowed a quota of crocodile eggs each year. But, in the early 1980s, Jon Hutton, an ecologist and now executive manager of the CFA and vice-chairman of the World Conservation Union's crocodile specialist group for Africa, showed that the quotas, which were never more than 12,000 eggs, were conservative and bore no relation to the size of the wild population.

Three years ago the national parks department decided to allow farmers to collect as many eggs as they wanted: last year, they took 40,000 eggs. "Farmers collecting wild eggs had to record the number of nests and eggs they had harvested and where they were found," says Hutton. "Now we have a complete inventory of crocodile nests in Zimbabwe."

Recording of the nest sites continues but already it has shown where nests need protection and where other activities that conflict with crocodiles, such as inshore fisheries, should be restricted.

Hutton believes that the current regulations work. "We have modelled populations and simulated harvesting. The easiest and most productive option open to us is to take all the eggs we can find and put crocodiles back, equivalent to 3 per cent of the harvest," he says. The system also provides a way of monitoring the country's crocodile populations, using the data from routine collection.

Crocodile farmers have begun to increase their own production of eggs by breeding. Farm-reared crocodiles kept under ideal conditions reach sexual manturity in 5 to 6 years, compared with wild crocodiles which take up to 30 years.

Crocodiles are slaughtered when they are around 2 years old. At this stage they are 1.5 metres long and measure 30 centimetres across the belly. After skinning, the hides are salted, graded, measured and tagged for export. All trade is done through the association. Under CITES regulations each skin must be marked with a self-locking tag, showing a reference number, before it can be exported.

In 1989, Zimbabwe exported 15,000 skins to Europe, Hutton estimates that the number of skins will triple by 1995. Now farmers are looking to export crocodile meat to Europe and the Far East.

The economic incentive to maintain Zimbabwe's populations of wild crocodiles is high among commercial ranchers and the government, but peasant communities benefit very little from commercial crocodile farms and they often destroy eggs.

Anxious to extend the benefits of crocodile ranching to rural communities, the wildlife department and the CFA are working together on small-scale community schemes in two areas of the Zambezi Valley and in south-eastern Zimbabwe.

Hutton believes that it is impractical to try to safeguard a species through legislation and law enforcement unless people are at least ready to tolerate the animals. "This is especially true of the Nile crocodile which seriously competes with legitimate human interests," he says. Although it might be better to preserve a species in other ways, without exploiting it, there is not always a choice, he says. "Benefits can often only be realised through marketing animals or their products."

By the 1980s, the number of crocodiles in Zimbabwe had increased, so much that they were depleting stocks of fish needed to feed local people and were even killing cattle. Crocodiles killed at least 20 people between 1982 and 1986.

"The approach of preservationists in Western countries is to ban wild animal products," says Hutton. "But those people do not live with dangerous animals at their back door. They would help wild crocodiles more by buying crocodile skin bags and shoes originating from well managed wild harvests rather than banning them.

"Ten years ago control was important but now we have reached a stage where crocodiles are respected because they are high earners. The more crocodiles are valuable the more likely it is that African wetland habitats will also be protected."

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