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THE BRITISH HERPETOLOGICAL SOCIETY

BULLETIN

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BRITISH HERPETOLOGICAL SOCIETY

c/o Zoological Society of London
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Correspondence, membership applications, subscription renewals and purchase orders for the British Journal of Herpetology 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 Townsen

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

FRONT COVER
(left) Adult Albanian Frog *Rana shqiperica* (Bojana or Buenë or Bunë River), Albania.
(right) Adult Epirus Frog *Rana epeirotica* (marshes of Asfáka, surroundings of Ioánnina), Albania.
See *Introduction to a study of the herpetofauna of Albania*, by Silvio Bruno, p.16.

REMAINING MEETING 1989

To be held in the Lecture Theatre of the Linnean Society of London, Burlington House, Piccadilly, London, W.1., at 7.00 pm.

NOVEMBER 29th — Dr Clive Cummins (Monks Wood Experimental Station, Abbots Ripton): Effects of acid rain on amphibians.

PROVISIONAL MINUTES OF THE 42nd ANNUAL GENERAL MEETING OF THE BRITISH HERPETOLOGICAL SOCIETY, HELD AT THE LINNEAN SOCIETY, ON 7th MARCH 1989

(The meeting was attended by 26 members and 6 guests)

1. Minutes of the previous AGM and an extraordinary meeting held on the 29.5.89
These were approved without alteration.

2. Matters Arising
No matters were raised.

3. Treasurer's Report
A full report will appear in the Bulletin. The number of members has increased but income from subscriptions has decreased due to a change in the value of the dollar. Deeds of covenant have in the past been made out on incorrect forms. All members are encouraged to take out a new covenant to help the Society. Mrs. Green was thanked by Dr. Griffiths, who chaired the meeting, in the absence of Lord Cranbrook and Dr. Lambert, and she received prolonged acclamation.

4. Election of Officers
Existing Council members were elected unopposed.

5. Council Report
The librarian post is vacant and anyone willing to take on the post should contact Dr. Lambert. Colin Fitzsimmons proposed Mr. D. Bird.

6. Report of Education Officer, (Junior Section)
A full report will appear in the Bulletin. Several achievements were reported by Mr. Taylor. Numbers of J. Herps still exceed 100 and are increasing. A camp arranged in 1988 in Dorset, on a rare reptile site, was filmed by the BBC and £100 was donated to the BHS Land Fund. Camp '89 is to be in Dorset and Camp '90, in Cumbria. A joint meeting with the Young Friends of the Zoo was very successful, as also has been the recently created BHS Display. Volunteers were requested to help with the work of the Education Committee. Dr. Griffiths stressed the importance of the J Herps in recruiting future members and Mr. Taylor received prolonged acclaim.

7. Report of the Conservation Committee
Mr. Whitaker reported that the Committee has discussed leaving the Society, to set up an independent group. There was an overwhelming majority to stay in the BHS and he was pleased at this clear decision. A new charity, The Herpetofauna Conservation Trust, has been set up to raise funds for Herp conservation. Four of the eight trustees are BHS members and the aims and objectives of the BHS CC, and HCT, are inextricably linked. Keith Corbett, who worked exceedingly hard as BHS Conservation Officer, is now being employed by the Trust. He has been particularly involved with problems in Dorset. Publicity raised, in the media, has meant the conservation lobby is at last being taken seriously with regard to heathland conservation in Dorset. In conclusion, the Committee is continuing to work very hard. this was exemplified by the continued efforts of the former Chairperson and Secretary, Prof. and Mrs. Haslewood. Dr. Griffiths reiterated how valuable the work of this Committee was and

this was met with prolonged acclaim. It was suggested that Lord Cranbrook should write to Keith Corbett, thanking him for his splendid efforts.

8. Report of the Captive Breeding Committee
The Chairman of the Committee was unavailable and no report was given. However Mrs Green stated that two new leaflets were prepared in the past year and one more is in preparation. The Committee was thanked and received acclamation.

9. Report of the Research Committee
The Chairman was unable to attend the meeting. Dr Griffiths reported that in the past year the Committee had been formulating its terms of reference. It was hoped to provide a reservoir of scientific advice for the other BHS committees and to organise meetings and symposia. Several members were involved in the hosting of the First World Congress of Herpetology. A dossier of researchers was also to be produced. This report received acclamation.

10. Any other Business
Prof. Haslewood announced that Conservation Committee leaflets were available to members. Mrs Green read out two letters from Society members which complained that there were not enough articles in the Bulletin about captive husbandry. It was concluded that it is up to captive breeders to spend more time actually writing these articles as the Bulletin editors can only publish what they receive. It was suggested that the captive Breeding Committee might produce a list of individuals breeding captive animals, although precautions would need to be taken to avoid theft of collections, therefore telephone numbers only might be published. Mrs. Green also publicised the Dwarf Crocodile Fund which is selling tee-shirts and sweat-shirts to raise funds to conserve this endangered species.

The business concluded at 7.55 and was followed by a talk by Dr S. Halpern on the effects of snake bite.

5th INTERNATIONAL CONGRESS ON THE ZOOGEOGRAPHY AND ECOLOGY OF GREECE AND ADJACENT REGIONS,

Iraklion, Crete, 16-20 April 1990

The Hellenic Zoological Society is organizing the 5th International Congress on the Zoogeography and Ecology of Greece and Adjacent Regions in Iraklion, Crete, from the 16th to the 20th of April 1990.

As in the previous congresses, three main sections are planned: 1. Marine environment of the Greek seas and the central and eastern Mediterranean, 2. Inland waters and 3. Terrestrial environment.

Priority will be given to subjects concerning geographical and temporal distribution, ecology, systematics, phylogeny and evolution, endemism, speciation and protection of fauna and biotopes.

Those wishing to contribute or attend should contact the Congress Secretariat at the address below.

Congress Secretariat
Dr. A Legakis, Dept. of Biology, Univ. of Crete, P.O. Box 1470, 711 10 Iraklion, Greece.
Tel. 081-234010. Telex 262728

NEWS FROM THE HELLENIC ZOOLOGICAL SOCIETY: GREEK FAUNAL SURVEYS, CONTRIBUTIONS AND INFORMATION INVITED

The Hellenic Zoological Society is preparing a Red Data book of the rare and threatened animals of Greece. Emphasis is given to vertebrates but some data on invertebrates may also be included. At the same time, European threatened invertebrates will be discussed at a meeting of the Council of Europe next autumn at which the Society will be represented. Finally, the Ministry of Agriculture is preparing new laws for the conservation of nature in Greece. As

our knowledge on the status of the invertebrates of Greece is incomplete, we would like to ask everyone who has studied some invertebrate group in Greece to send us a list of the species he or she thinks that are rare, threatened, vulnerable or endangered with extinction and must be protected. Your contribution will be most valuable in helping us propose measures for the conservation of these species and their biotopes. Please send your lists to Dr. A Legakis, Dept. of Biology, Univ. of Crete, P.O. Box 1470, 711 10 Iraklion, Greece.

The Center for the Documentation of the Greek Fauna, which was set up by the Hellenic Zoological Society in order to record and analyse the fauna of Greece, is trying to collect all the articles that contain references to Greek animals. If you have published anything recently, we would be grateful to receive a reprint or copy for our collection.

We are also in great need of provisional lists of the species of various animal groups from Greece. These lists do not have to be complete but they will help us both in the documentation of the fauna and in proposing and carrying out further research on groups that are not well studied. There is a possibility that they will be published as a regular series. These lists will not be used for other purposes and will not be published without the consent of the author. Please send your reprints and/or your lists to Dr. A. Legakis at the address below.

Finally, the Hellenic Zoological Society is currently publishing the series Fauna Graeciae. It includes catalogues of groups that are well known from Greece – more than 80% of the species must be known. The catalogues include synonyms, all known localities, distribution maps and identification keys if possible. So far, we have published the Orthoptera by Dr. F. Willemse, the Siphonaptera by Dr. J.C. Beaucournu and the marine fish by Dr. C. Papakonstantinou. Other groups such as Amphibia and Reptilia are in preparation. However, more groups are needed. If you think that you can contribute to this series, please contact Prof. C. Krimbas, Lab. of Genetics, Agricultural Univ. of Athens, Iera Odos 75, 118 55 Athens.

Hellenic Zoological Society, P.O. Box 3249 C.T. Athens 102 10, Greece.

THE BIOLOGY AND CONSERVATION OF *CORONELLA*

A Linnean Society symposium sponsored by the Nature Conservancy Council to be held at Southampton University on the 11 and 14 September 1990

Preliminary Announcement and Call for Papers

Although the habitat of the two snakes *Coronella austriaca* and *Coronella girondica* has diminished and is under threat throughout Europe, only recently has there been much research on the two species. It is therefore timely that a Symposium be held to bring together results from research programmes and to discuss the biology and conservation of these species. The Symposium will consist of invited papers, workshops, discussion groups and a field excursion.

Anyone interested in presenting a paper is invited to send a title and abstract (of no more than 300 words) to any one on the Organizing Committee named below. The title and abstract must be in English. Final date for submission is *31 January 1990.*

Registration forms will soon be available and anyone wishing to receive a registration form should contact a member of the Organizing Committee.

Dr Ian Spellerberg
Biology Department
The University
Southampton SO1 6AN
Tel: (0703) 592442
Fax: (0703) 558163

Dr Chris Reading
I.T.E.
Furzebrook Research Station
Wareham, Dorset BH20 5AS
Tel: (09295) 51518
Fax: (09295) 51087

Martin Gaywood
Biology Department
The University
Southampton SO1 6AN

'CRAZY' JUNIOR HERPETOLOGIST'S ON T.V.

A 10 minute BBC school programme to be shown in the New Year shows how several Junior Herptologists ('J-Herps') helped to rescue rare reptiles.

The programme 'Tutorial Topics' entitled 'craze' follows David Draper (then aged 11) on the annual J-Herp Dorset Camp week-end. Filmed in May 1988, the J-Herps helped to save Sand Lizards and Smooth Snakes from some of the many doomed development sites (under NCC Licence).

The BBC 2 T.V. transmission times are 11.55 am Tuesday 30th January and repeated at 11.40 am Thursday 1st February. The programme, which was first broadcast in 1989, shows how a hobby can develop and brings the Reptile Conservation message into the classroom.

Acknowledgements. The BHS Education Committee would like to thank the following for their help in making this programme and running the many camp week-ends: 1. The BHS Conservation Committee, particularly Doug Mills and Dave Bird. 2. Sophie Neville, producer BBC Schools TV for making it all possible and for a donation to the BHS Land Fund. 3. J. Herp David Draper, for his excellent commentary and for putting up with many repeated showings of Tutorial Topics not only at the many Fetes and displays by the Education Committee, during 1989, but also at the Natural World, Aquarium and Serpentarium, Poole, Dorset.

Colin Fitzsimmons, B.H.S. Education Committee
c/o Natural World, Aquarium and Serpentarium,
The Quay, Poole, Dorset.

LETTER TO THE EDITORS

Autumn mating in Grass Snakes

Dear Sir,

It has been suggested to me that I write to you about some observations on Grass Snakes which I made recently.

I have been studying a colony of Grass Snakes in County Durham, on the banks of the river Derwent, for some 5 or 6 years now, for the last 4 of which I have put in a manure heap for their use. The snakes have made extensive use of the heap in late summer for each of those years, presumably for egg laying, and also for hibernation.

The unusual event which has prompted this letter occurred on the 23rd of September this year. I visited the manure heap in the hope of seeing snakes basking or evidence of this year's breeding. When I arrived I saw a knot of snakes behind the heap in a sun patch. This was about 11.25 am; I watched them until 11.40 am when the knot broke up.

I'm sure that what I saw was mating. There was a large female in the centre of the group linked to one male. Two or three other males were trying hard to get in on the act. The whole affair was quite frenzied, with the unattached males leaving the group, and rushing through the surrounding vegetation, before returning to the pile. It was possible to see the fixed point where the male and female were linked, but the rest of the knot was fluid. When the group eventually broke up, and the female left, males kept returning to the spot for a few minutes, and "tonguing" it before rushing through the undergrowth.

The 23rd was a cloudless and sunny day, very warm. I did manage to take some photo's of the event which hopefully will come out successfully.

Local B.H.S. members have suggested that a record of autumn mating would be of interest to your members. I would also like some information on the subject. I can find very little information in the literature. I assume it occurred because this summer has been so long and warm, but presumably it could not be a viable mating or result in eggs.

Hopefully this is of interest to you and your members. If anyone has information for me I can be contacted at the address below.

Terry Coult
4 Officials Row, Malton, Nr. Lanchester, Co. Durham DH7 0TH

CONSERVATION MATTERS:

A REVIEW OF HERP CONSERVATION ISSUES IN THE NEWS DURING THE PERIOD APRIL TO AUGUST 1989

BRIAN BANKS

30 Frenches Farm Drive, Heathfield, East Sussex. TN21 8BW

Species protection in Dorset

The Conservation Committee is fortunate to have many members who are willing to devote a vast amount of time to the conservation of our native herptiles. Foremost among these is Doug Mills who did a splendid job last year rescuing amphibians and reptiles from building sites in Dorset. This work received a great deal of publicity which drew attention to the sad trail of destruction on Dorset's heathland (BHS Bulletin No 26 p32-34). Suffice it to say that since then Doug has continued his efforts to such effect that a number of developers are now donating money to pay for the rescue work.

Care is taken to enter into such deals only when the fate of a site has been sealed and development is imminent. This is done to prevent local authorities granting permission for developments and using the fact that the animals are being rescued as a conservation feature supporting the destruction of the habitat. The BHS view is widely publicised; we would rather not have to do this at all and would prefer to spend our time managing the heaths concerned to protect the animals. The fate of a number of sites has been sealed however and the Conservation Committee feels it has a moral duty to remove the animals, particularly when there are a number of other heaths where rare herps have been eliminated in the past by incorrect management or accidental fires. Of course animals are only released onto sites when it can be shown that they are now managed in a sensitive way.

Last year the exercise was conducted largely by volunteers, although in the case of Doug this turned out to be a full-time unpaid job! This effort continued over the winter to raise funds from the developers to undertake the operation in a more professional way in 1989. To date £12,600 has been raised from J.P. Sainsbury, Bryants, Taylor Woodrow, Walter Lawrence

The problem bracken poses on some sites is shown above. Doug Mills attempting to spray the fronds is almost invisible in the centre of the frame.

and Clarkes. The result of this is that Doug will be working on a contract basis as the BHS species protection officer and there will be funds to pay the travel expenses of people helping with the exercise.

One further positive outcome of these deals is that some of Doug's time will be spent managing habitat, incuding controlling bracken which is a serious pest on many reptile sites. This is a difficult task to arrange using volunteers so it will be very advantageous to have a keen employee locally based and able to do the work when weather conditions are appropriate.

As luck would have it the present high interest rates have resulted in a huge reduction in the number of people willing to buy new homes with the result that development has slowed down considerably. Although it will take place at some point in the future, this gives us precious additional time to survey sites and rescue the reptiles before the land goes under the bull-dozer.

The British Herpetofauna Conservation Appeal
Formerly known as the Land Fund, this appeal continues to raise money for the conservation of our amphibians and reptiles. Since the last up-date in BHS Bulletin No 26, Winter 88/89, the appeal has raised a further £9,204 and the total now stands at £12,295.40.

We would like to thank the following people for their generous donations during the past 6 months – Dr Baksh, Mrs M. Green, Mr C.S. Nice, Janet and David Potter, Geoff Fielding, Colin Fitzsimmons, Travis Hurlock, Geoff and Beth Haslewood, M. Preston, Dr T. Beebee, Marcus Langford, John Buckley, Dave Bird, Brian Banks, Lord Parmoor, the Sussex Wildlife Trust, The Kent Trust for Nature Conservation, The Avon Naturalists Trust, Richard Griffiths, The Thames and Chiltern Herpetological Society and Mr P. Middleton. The Conservation Committee are particularly grateful to 2 anonymous individuals who very generously made donations of £3,000 and £5,000 to the appeal.

We are now in the fortunate position of having enough money to pay all of our existing lease bills with money to spare and the aim is now to raise a reserve of £100,000 to generate interest for use when rare herp sites come on the market. We would be delighted to receive any assistance from Society members in achieving this goal. There are certainly many ways in which you can help:

1. You could make a donation to the appeal, making cheques payable to B. Banks and D. Bird (Re BHS).

2. If you do this remember that donations to charities can be counted against income tax, whereby the treasury will pay an additional 25% of the sum you donate to the Society.

3. We intend to offer the services of the Society to any individual or organisation willing to pay for herp surveys to be done. This has already raised £200 from a County Council this year, when surveys were undertaken to determine if crested newts were in ponds threatened by roads. The aim is to raise money for conservation, and to repay the travel expenses of the volunteer, and hopefully at the same time help protect amphibian and reptile sites that are threatened by road schemes.

4. Collect old snake skins from your captive animals. If sent to Dave Bird at the Poole Aquarium these can be sold to raise money for the land fund.

5. Think of a good fund-raising idea and contact Brian Banks or D. Bird, addresses on the back page of this Bulletin.

The return of the Wealden natterjack.
Over the past 17 years one of the primary goals of the Committee has been to rescue the last tiny relict colony of Natterjack Toads on the heaths of southern England and to restore the population to its former size. One of the more pleasing events to report this year is that for the second year running a record breaking number of spawn strings has been recorded indicating that the population now numbers more than 100 animals.

In 1972 the Natterjack was thought to be extinct in southern England but a few toads were located on an army gun range breeding on an area of heavily disturbed heathland. The old

breeding pond is now known to have acidified so much as to be of little use to the toads and they appear to have abandoned it during the 1960's, resorting to a series of shallow puddles in a relatively lime rich area that was becoming thickly over-grown by scrub. Between 1972 and 1976 severe droughts resulted in no natural recruitment to the population, but thousands of tadpoles taken from the site were reared to toadlet stage for release to boost the population. 11,800 toadlets were released between 1975 and 1981 to ensure that there was some recruitment to the largely senile population. This was done in conjunction with the excavation of a series of deeper scrapes using M.o.D. equipment, and scrub clearance by BHS volunteers covering an area of about 1.8 hectares. By the mid 1980's there were 5 suitable breeding ponds but while these were unshaded by trees the surrounding terrestrial habitat was overgrown by 20-30 year old woodland. As Natterjacks are known to require large areas of open terrestrial habitat it became obvious that about 100 hectares of land needed to be kept scrub free and that this could not be achieved using volunteers alone.

It may look destructive but this is a most effective way of clearing over-grown heath. In 1989 this cleared area was used by breeding Wood Lark, as well as Natterjacks.

The BHS produced a management plan for the site, for which large credit must go to Dr Trevor Beebee who has been the main inspiration behind the conservation effort at the site. The plan has been adopted by the army conservation group and as a result a great deal has been achieved in recent years. In the past two years the BHS has raised £5,700 from a number of organisations (namely Hampshire County Council, East Hampshire District Council, the Nature Conservancy Council, The Hampshire and Isle of White Naturalists Trust, and the Worldwide Fund for Nature) and this has been used to employ contractors to clear the scrub. We were also fortunate that the Defence Land Agent Mr Terry Macgrath became as enthusiastic about the survival of the toads and used MoD bulldozers to increase the area cleared at an estimated cost of £4,300. Consequently the area of open heath has increased considerably with 12 hectares cleared in the past two years. It is aimed to spend a further £5,800 raised by the BHS this year plus whatever effort the MoD can give to support the work.

The result of all this effort is that the Natterjack population has grown steadily, with a record 49 spawn strings laid at the site this year. It was ten years ago that the population reached its lowest ebb with only 11 spawn strings recorded. Thanks to all of the conservation work the toads now have enough suitable ponds surrounded by a large area of open sandy ground. Once this work is completed it is to be hoped that a plan can be drawn up to ensure that

the open areas remain suitable for the Natterjacks with the minimum of effort and expense. It may surprise some people to know the true cost of this exercise but we hope you will agree that the presence once more of at least one large colony of Natterjack toads in southern England is more than worth it.

New initiatives to help conserve heathland

The summer of 1989 saw two very welcome proposals to fund heathland management in Dorset and Surrey. In Dorset the Royal Society for the Protection of Birds in collaboration with BP are to spend £500,000 on the restoration of unmanaged heathland and if possible recreate the habitat from areas that are currently under conifer plantations or farmland. This is a most important project and should go a long way to stemming the losses of this vital rare reptile habitat in the county.

Meanwhile in Surrey the Naure Conservancy Council and Surrey County Council are collaborating on a different project. They have recently completed a strategy for the conservation of heathland in the county and the aim is now to employ a heathland conservation officer. His role will be to encourge land-owners to manage their heaths and to assist with the preparation of management plans.

Both of these projects are vital for a habitat which is disappearing under scrub and bracken due to the absence of any management. Our Society has devoted much of its scarce resources to areas which support the rare reptiles and the Natterjack but cannot deal with the larger surrounding areas of heath which are just as important. Heathland is easier to manage in large blocks, and its special fauna and flora are more secure than on vulnerable small heathland fragments.

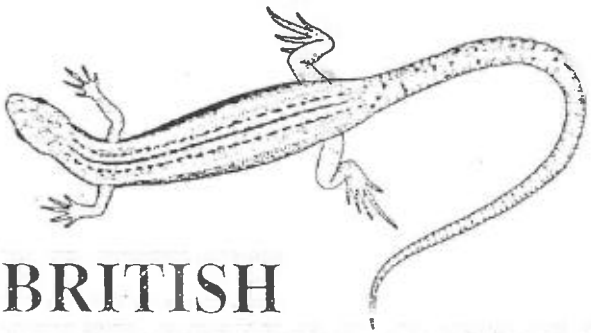
BHS T-SHIRTS AND SWEAT-SHIRTS

Orders are now being taken for BHS T-shirts and sweat-shirts featuring the BHS lizard logo designed by Tim Halliday (see below) printed in green and black on the chest.

Prices, including postage and packing are: T-shirts: adult – £5.20, child – £5.00; sweat-shirts: adult – £9.00, child – £8.50. Both garments are available in white, yellow, red or light blue in the following sizes: adult – S (34-36in), M (37-39in), L (40-42in), XL (42-44in), child – S (22-24in), M (26-28in), L (30), XL (32).

Please send your order with a cheque/P.O. made out to "British Herpetological Society", and clearly stating type of garment, size, and preferred colour to: Richard Griffiths, BHS Shirts, 1 Brunswick Court, 27 Brunswick Road, Sutton, Surrey SM1 4EH.

Orders must be received by 5th January 1990, and should be despatched in early February.



BRITISH
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THE VINE SNAKES

J. L. CLOUDSLEY-THOMPSON
Department of Biology (Medawar Building) University College, University of London, Gower Street, London WC1E 6BT, UK

Vine snakes, remarkable for their excessive slenderness and elongated heads, are found in tropical forest regions throughout the world. They are aboreal, and either green or the colour of bark so that they resemble the stems and tendrils of lianas vines. Back-fanged Colubridae, they are practically harmless to human beings, their venom causing pain, swelling and blisters, but no systemic effects. The mild poison is normally utilized for paralysing the lizards upon which vine snakes mostly feed.

Four distantly related genera are known. As a group these are morphologically and behaviourally alike. Ecological equivalents, their similarity results from convergence rather than from close relationship. *Oxybelis* (4 spp.) ranges from southern Arizona and western Mexico into South America - Bolivia, south-east Brazil, Paraquay and northern Argentina. The genus *Ahaetulla* (= *Dryophis*) (8 spp.) occurs in India, Sri Lanka, South East Asia, the Malayan peninsula and Indo-Australian archipeligo; *Thelotornis* (2 spp.) inhabits Central and South Africa, while *Uromacer* (4 spp.) is found in Haiti, the Dominican Republic and surrounding islands.

Vine snakes are probably the only arboreal snakes that feed on potentially speedy prey, to the movements of which they respond by sight. Day-active, they have the widest binocular fields of vision known for any snakes. Before stalking their prey, however, they sway their heads. This presumably, assists in distance judging and three-dimensional vision by invoking parallax. Black horizontal stripes from the posterior of the eye to the tip of the snout in *Oxybelis* and *Uromacer* spp. not only enhance camouflage, but may also aid vision by assisting the snakes to line up their heads onto the prey. The eye line may be extended by protruding the tongue, for up to nearly 20 mins in the case of some *Oxybelis spp.* In *Thelotornis* spp., the markings are really more of an eye mask. *Oxybelis* and *Uromacer* spp. have round pupils, typical of most diurnal colubrids, while *Ahaetulla* and *Thelotornis* spp. have horizontal, key-hole pupils (which are also found in *Dryophiops* spp. of S.E. Asia). *Ahaetulla, Thelotornis,* and possibly *Dryophiops,* are the only snakes with a fovea or yellow spot. At the outer rim of the retina, on the temporal or caudal side of the eye, a line of sight passes through the centre of the lens, through the slot in the key-hole pupil, along a groove in the cheek in front of the eye, and straight forward parallel to the axis of the body. Furthermore, the slender cones in *Ahaetulla* increase visual acuity.

Vine snakes are 'sit and wait' foragers, which stalk their prey with lateal swinging of their heads. Predatory behaviour is released by the movements of the prey. Even subtle motions, such as breathing, are sufficient to attract attention and induce a vine snake to begin stalking. If the lizard prey walks or runs, the pursuing snake will move just a little bit further, thus closing the distance between them. It strikes when the gap has narrowed to 10-15 cm. The prey is grasped at, or anterior to, the pectoral girdle: once seized the predator's grip is never relaxed until the lizard has been swallowed.

The red tongue of the African Twig Snake *Thelotornis kirtlandi* is, apparently, sometimes used as a lure which attracts the prey: its effect is enhanced by expanding the forepart of the snake's body. This has been shown to entice birds to approach the snake, whose display makes it look like one of their own fledglings. From this may have arisen the concept of snakes charming their prey!

Vine snakes are normally exceedingly cryptic and difficult to see (Plate 1). When the wind blows, they sway their bodies like branches. Some species even fall to the ground when touched, and lie motionless there, looking like dead twigs. The eye stripes serve to camouflage the eyes which would otherwise be very conspicuous. In *A. acuminatus,* a horizontal band terminates on a level with the bottom of the pupil; in *O. argentius* the band is as wide as the pupil.

Oxybelis acuminatus on Barro Colorado Island, Panama.

Tail vibrations may perhaps produce warning sounds, as they do when terrestrial snakes rattle their tails among dry leaves, and the blue-black lining of the open mouth of *Oxybelis* spp. serves as a threat display. The front part of the body may also be inflated in threat. *Oxybelis* spp. are mimicked by third and fourth instar larvae of the Neotropical sphingid hawk-moth *Hemeroplanes triptolemus,* whereas the last instar has been described as a mimic of the formidable pit viper *Bothrops schlegelii.* Whether these are cases of true mimicry, or examples of deimatic or startling behaviour is, of course arguable.

Oxybelis spp. inhabit all types of habitat from dry, open scrub to rainforest, but are usually to be found well above the level of the grass. They feed primarily on lizards, with the occasional insect or frog. *O. brevirostris* is a native of Costa Rica, Panama, Colombia and Equador. *O. fulgidus,* the largest species, feeds mainly on birds and small rodents. It occurs in Mexico, Guatemala and Peru. *O. acuminatus* and the bićuda, *O. aeneus* also have Neotropical distributions, as already mentioned.

For a detailed review of the ecology of vine snakes, the reader is referred to Henderson & Binder (1980).

REFERENCE

Henderson, R.W. & Binder, M.H. (1980). The ecology and behaviour of vine snakes *(Ahaetulla, Oxybelis, Thelotornis, Uromacer):* a review. *Contr. Biol. Geol. Milwaukee Publ. Mus.* No. 37: 1-38.

SEA TURTLES AND THE GREENHOUSE EFFECT

JOHN DAVENPORT

School of Ocean Sciences, University of Wales at Bangor, Marine Science Laboratories, Menai Bridge, Gwynedd LL59 5EY, N. Wales

INTRODUCTION

For more than three decades scientists have predicted that global warming ("the greenhouse effect") will follow from Man's accelerating industrial and agricultural activities. In the past couple of years increasing confidence of prediction (stemming from sophisticated computer modelling) has combined with media attention to stimulate high level political interest, even though clear *direct* evidence of warming is still lacking.

Briefly, the greenhouse effect is caused by rising levels of the so-called "greenhouse gases"; carbon dioxide, methane, chlorofluorocarbons (CFCs – which also damage the ozone layer) and nitrous oxide (in descending order of importance). These gases allow the passage of short wave length radiation more readily than long wave radiation. Since solar energy reradiated from the Earth is of longer wavelength than incoming energy, the gases act to retain heat, so shifting the average global temperature upwards. Carbon dioxide accumulation is associated with the burning of fossil fuels and the destruction of forests. The causes of methane increases are more obscure, but rising areas of rice paddies, intensive rearing of belching ruminant cattle, the fermenting waste tips of rich countries and even enhanced numbers of termites which release methane as a bye-product of wood digestion have all been invoked (Pearce, 1989). CFCs and nitrous oxide are produced as a result of industrial activities, particularly in refrigeration and road transport.

At present carbon dioxide is the most important greenhouse gas, and it is the capacity of the world ocean for buffering or absorbing carbon dioxide that explains the lack of observed greenhouse effect so far. Carbon dioxide is "fixed" biologically at the sea surface, either as calcium carbonate in skeletal systems, or as living carbon which is eventually lost to deep water by death or defaecation. Transfer of atmospheric carbon to sea sediments has created a lag between the increased output of greenhouse gases following from the industrial, public health and agricultural revolutions of the past two centuries, and its expression in the form of increased temperatures. However, it is now agreed that the next 50-100 years will see an increase in average global temperature of some 2-6 deg. C. This will inevitably be accompanied by rises in sea level as ice melts and rainfall patterns change. Less consensus is as yet available concerning the likely extent of sea level rises. Estimates for increases by the year 2100 generally range from 0.5 to about 3.5 metres, though a few more alarming predictions have suggested rises of as much as 6 metres, which would involve substantial melting of the Antarctic and Greenland icecaps.

Global warming, with its associated changes in patterns of weather and oceanic circulation will have profound effects on the world's vegetation and animal life, so why should attention be particularly focussed upon sea turtles? Although sea turtles are individually mobile, in that they travel hundreds or thousands of kilometres in a year, they have features of their reproductive strategy which would, *a priori*, make them particularly vulnerable. Firstly, they lay their eggs on sandy beaches to which they are apparently extremely faithful. The evidence for this fidelity has been derived almost exclusively from the tagging of adult female turtles which return to the same beach each time they breed. It is generally assumed that hatchling turtles return as adults to the beach of their hatching (Carr, 1967), but direct evidence to support this hypothesis is still lacking, mainly because no tagging system has yet allowed hatchlings to be identified as adults. Mistakes in maternal homing behaviour do occur, and presumably have allowed colonization of new habitats in the past (Bowen *et al*, 1989), but such colonization is apparently slow, since none of the Caribbean habitats which were fished out by European seafarers in the 16th, 17th and 18th centuries have been reinvaded despite protection and attempts at

reintroduction over the past 40 years. It would appear, therefore, that turtles will be essentially limited to their present breeding sites during the course of the development of global warming.

Secondly, in the decade since Yntema and Mrosovsky (1979) showed that the sex of Loggerhead Turtle *(Caretta caretta)* hatchlings was determined by incubation temperature rather than genetically, it has become apparent that sex is environmentally determined in all sea turtle species, with as little as 4 deg. C making the difference between a wholly male and a completely female clutch.

Thirdly, turtles are long lived animals which are particularly slow to mature. In this respect the Green Turtle *Chelonia mydas* has been best studied. Females may take 30-50 years to reach sexual maturity in the wild and survive for a similar period thereafter. Much of the development of the greenhouse effect may therefore take place during the lifetime of turtles hatching on beaches around the world at present.

The rest of this paper consists of an attempt to evaluate the likely impact of various features of the greenhouse effect upon populations of sea turtles, bearing in mind the antiquity of living species, all of which appear to have lived throughout the Quaternary era (*ca* 2 million years ago to the present), with at least the Green and Leatherback turtles *(Dermochelys coriacea)* having origins in the Tertiary period which started 60 million years ago and ended with the start of the Quaternary (Gaffney, 1984; Bowen *et al*,1989). The long duration of individual turtle species (which contrasts strongly with the much more rapid speciation of birds and mammals) can be combined with current palaeoclimatological knowledge to give some idea of turtle species' past resilience when faced with environmental change.

TEMPERATURE INCREASE

Superficially, temperature-dependent sex determination would appear to make turtles appallingly vulnerable to the greenhouse effect. Surely if the average global temperature rose by as much as 6 deg. C, then a single sex would be produced on all breeding beaches (with beach fidelity preventing an escape to cooler latitudes) and all turtles would disappear a few decades later after a fruitless search for mates? Several factors deny such finality. Firstly, the various greenhouse models all agree in this respect; though average temperatures may rise, the increases are *not* evenly distributed across the globe. The more extreme of current models which predict an average rise of 5-6 deg. C involve increases of 10-12 deg. C at the poles, but only 1-2 deg. C at the equator. Less extreme models involve proportionally smaller equatorial increases. A high proportion of turtle breeding beaches are in or near the tropics, so although sex ratios might be somewhat skewed, it is most unlikely that temperatures would rise sufficiently to abolish a sex. The situation for warm temperate breeding areas (e.g. the Mediterranean, south eastern U.S.A.) is less encouraging.

Secondly, as may be seen from the discussion of Mrosovsky (1980), incubation temperature is strongly affected by nest site selection and the timing of egg laying during the breeding season. We do not know how much (if any) control the female has over incubation temperature. Under warmer conditions, might females be more prone to lay eggs earlier in the season, seek shadier nesting sites, or dig deeper (= cooler) nests? Also, not enough is known about the flexibility of the pivotal temperature range over which the hatchlings' sex is controlled). Most turtle species breed over a fair latitudinal range, particularly the Loggerhead, *Caretta caretta*. Presumably the populations breeding in cooler latitudes have rather lower pivotal temperatures (again, evidence is lacking), but are latitudinal differences in pivotal temperature genetically or phenotypically determined? If there is a phenotypic component it is feasible that the thermal history of an adult female may affect the pivotal temperature of her clutches, so that a female exposed to a warmer environment might lay eggs with a higher pivotal temperature.

Palaeoclimatology (which relies on a battery of techniques, including measurement of $^{16}0$; $^{18}0$ ratios in the shells of fossil foraminiferans, study of palaeomagnetism and fauna/flora analysis) gives similarly conflicting messages. Broadly speaking, information about climate during the Quaternary is good and rapidly improving, but most data have been obtained for middle latitudes (currently cool temperate in nature). More attention is now being paid to the Tertiary, but inevitably detail is more difficult to obtain the further back in time investigation is pursued.

During the Tertiary, global temperatures were apparently stable and high, peaking in the Eocene (40-50 million years before present) at about 22°C, but steadily falling thereafter to a value of around 12.5°C at the beginning of the Quaternary (Nilsson, 1983). The Quaternary has been characterized by pronounced fluctuations in global temperatures. These changes are now known to be driven by the Croll/Milankovitch astronomical cycles which reflect:

a) changes in the shape of the earth's orbit (96,000 year periodicity)
b) changes in the earth's axis tilt from 21.5° to 24.5° and back (42,000 year periodicity).
c) equinoctial precession ("wobble") (21,000 year periodicity)

These cycles control the amount of solar energy reaching the earth's surface and, during the Quaternary, have interacted to produce cold glacials ("ice ages") and warm interglacials. During glacials the amount of ice at the poles rises, sea levels fall and so do atmospheric carbon dioxide levels (for reasons which are not yet clear). A reverse sequence of events takes place during interglacials, so the greenhouse effect is likely to produce a "super interglacial" and delay the onset of the next ice age. The longest periodicity of the Milankovitch cycles appears to be most important and intervals between ice ages have been about 100,000 years. During glacials, global average temperatures have dropped below 0°C; currently we are close to the end of an interglacial with a global average surface air temperature of about 9°C (it must be remembered that such averages integrate the atmospheric temperatures of all latitudes and all seasons). Global averages must be interpreted with care; equatorial temperatures have varied much less than the global average. However, Emiliani (1972) reported that Caribbean surface sea temperatures have been as much as 1 deg. C warmer in the past 500,000 years than the present 27°C (as well as 5 deg. C colder!) and this implies air (and presumably turtle nest) temperatures several degrees higher than at present. Even within the present interglacial, temperatures have apparently been at least 2 deg. C higher in the Mediterranean area (ca. 7,000 years ago). On balance it seems probable that sea turtles have previously encountered temperatures at least as high as are likely to be caused by the greenhouse effect. It is even more certain that they have encountered lower temperatures during ice ages without suffering extinction through production of one-sex egg clutches! It might be argued that the temperature increases induced by the greenhouse effect will occur more rapidly than any previous alterations encountered by turtles. However, the realization in recent years that volcanic eruptions and meteorite impacts can affect climate suddenly, profoundly and for substantial periods make such arguments relatively weak.

Global warming will not only affect the breeding phase of sea turtle life history. With the exception of the Leatherback turtle, living sea turtles are limited to waters of about 18-19°C or higher; when temperatures fall below these levels they either retreat to warmer waters, become torpid (Felger *et al,* 1976; Carr *et al,* 1980), and cease feeding (Davenport, *et al,* 1989). The greenhouse effect is likely to expand the potential foraging areas open to sea turtles (though whether Man allows enough turtles to survive to take advantage of this opportunity is less certain!). The Leatherback, almost certainly an endothermic ("warm blooded") animal when living in cool waters (Pritchard, 1969; Friar *et al,* 1972; Greer *et al,* 1980), currently forages for jellyfish as far north as Labrador, the U.K. and Western Norway in warm summers. Global warming should permit more frequent appearances in northern waters, but again this must be set against the decline in Leatherback numbers due to Man's more direct influences.

RISING SEA LEVEL

Much information is now available about past sea levels, interpretation being based upon geological studies of fossil coral reefs in areas thought to have avoided geologically recent glaciation and tectonic activity (e.g. New Guinea), combined with analysis of $^{16}0$; $^{18}0$ ratios in the shells of fossil foraminiferans (which allow estimates of the relative volumes of water in the sea and in ice sheets). Sea levels have varied greatly during the past 160,000 years, from as much as 120 metres below present levels, during a glacial period (Shackleton, 1987), to 6 metres above current sea level. Clearly turtles have tolerated sea level changes greater than those predicted for the next 50-100 years. Sandy beaches are mobile, dynamic structures, especially surf-built beaches exposed to oceanic swells. Material can be added or subtracted rapidly, so a beach can easily move inland as sea level rises – but only if the land is not itself covered by the rise! Some turtle breeding beaches on low islands may disappear, but overall it seems improbable that predicted sea level changes will be as damaging as hurricanes or developers.

CHANGES IN OCEANIC CURRENTS

Ocean currents are important to turtles. Hatchlings of some species probably spend much of their early life drifting in oceanic gyres as part of weedline communities (Carr, 1987), while Archie Carr long ago suggested that adult turtles (particularly *Chelonia mydas)* might navigate their way to their natal beaches by following chemical cues ("smells") brought to them by currents. Surface oceanic currents owe much of their direction and strength to wind patterns. Winds, in turn, are strongly affected by temperature gradients. Global warming is likely to reduce wind velocities and thereby gradually slow oceanic currents, conceivably disrupting the life history of the more oceanic species (Green, Leatherback), but probably having less influence on the coastal species (e.g. Loggerhead and Hawksbill, *Eretmochelys imbricata).* Effects on turtle species are difficult to predict, not least because so little is known of their methods of navigation. As well as the possibility of olfactory navigation mentioned above, solar, celestial and geomagnetic mechanisms have all been suggested. None of the clues which such navigation methods rely upon are entirely stable; the Earth's magnetic field changes strength and direction over quite short time scales (<100 years), and even reverses frequently by geological or evolutionary standards (reversals happen every 10,000-100,000 years and take ca. 2000 years to complete). The star map shifts over the centuries, and even the sun's position in the sky varies with the Milankovitch cycles. However, of all likely navigation aids, the oceans' currents are probably the most labile, changing noticeably through natural causes during the life of a single turtle generation. Unless currents are totally altered by the greenhouse effect it seems unlikely that consequence to turtles will be critical.

CONCLUSIONS

In a hypothetical world unaffected by Man, a warming of the globe by 1-2 deg. C at the equator and perhaps 6 deg. C. in middle latitudes would almost certainly be beneficial to sea turtles. In a sense turtles are relict species, survivors of a warm Tertiary era, confined to the tropics by the unstable climates of the Quaternary. Prolongation of the present interglacial could only help them.

However, in the past few centuries Man has had a considerable impact on turtle populations. Many have been destroyed by fishing, by the introduction of predators (e.g. dogs, rats, pigs), by egg collection, by beach development, by incidental capture in fishing nets or by pollution (particularly plastic garbage – Carr, 1987). While conservation legislation and initiatives have burgeoned, so have the pressures of exploitation; nowhere is it possible to point to a growing sea turtle population. The Kemps Ridley *(Lepidochelys kempi)* is probably the only species in imminent danger of extinction, but the recent crash of the Trengganu Leatherback rookery (due to unremitting egg collection), and the continued massive kills of Hawksbills and Green Turtles in the Far East (e.g. Davenport, 1988) give little encouragement to conservationists.

Much of the resilience of sea turtle populations in the past has probably relied upon the existence of large numbers of relatively separate populations around the warmer regions of the globe, each containing substantial numbers of breeding animals. Such populations relied on high egg and hatching numbers to sustain recruitment (effectively the high numbers saturated the appetite of natural predators during the vulnerable nesting, hatching and swimming frenzy stages of the life history). Man's activities have removed whole populations and continue to reduce the size of those that remain. The genetic material on which selection could act to alter responses to environmental conditions has been much depleted. In these circumstances it is probable that the greenhouse effect will have detrimental consequences (particularly to populations furthest from the equator), but it seems doubtful whether it will be possible to discern such consequences against a background of continued human improverishment of sea turtle environments.

REFERENCES

Bowen, B.W., Meylan, A.B. & Avise, J.C. 1989. An odyssey of the green sea turtle: Ascension Island revisited. *Proceedings of the National Academy of Science. U.S.A.*, **86**, 573-576.

Carr, A.F., 1967. *So Excellent a Fishe.* Natural History Press: New York.

Carr, A.F., 1987. Impact of nondegradable marine debris on the ecology and survival outlook of sea turtles. *Marine Pollution Bulletin*, **18**, 352-356.

Carr, A.F., Ogren, L. & McVea, C., 1980. Apparent hibernation by the Atlantic loggerhead turtle *Caretta caretta* off Cape Canaveral, Florida. *Biological Conservation,* **19,** 7-14.

Davenport, 1988. The turtle industry of Bali. *British Herpetological Society Bulletin,* **25,** 16-24.

Davenport, J. Antipas, S. & Blake, E., 1989. Observations of gut function in young green turtles. *Chelonia mydas* L. *Herpetological Journal,* **1,** 336-342.

Emiliani, C., 1971. Quarternary palaeotemperatures and the duration of high temperature intervals. *Science,* **178,** 398-401.

Felger, R.S., Cliffton, K. & Regal, P.J., 1976. Winter dormancy in sea turtles; independent discovery and exploitation in the Gulf of California by two local cultures. *Science,* **191,** 283-285.

Friar, W., Ackman, R.G. & Mrosovsky, N., 1972. Body temperature of *Dermochelys coriacea:* warm turtle from cold water. *Science,* **177,** 791-793.

Gaffney, E.S., 1984. Historical analysis of theories of chelonian relationship. *Systematic Zoology,* **33,** 283-301.

Greer, A.E., Lazell, J.D. & Wright, R.M., 1973. Anatomical evidence for a countercurrent heat exchanger in the leatherback turtle *(Dermochelys coriacea). Nature,* **244,** 181.

Mrosovsky, N., 1980. Thermal biology of sea turtles. *American Zoologist,* **20,** 531-547.

Nilsson, T., 1983. *The Pleistocene: Geology and Life in the Quarternary Ice Age.* D. Reidel Publishing Co.: Dordrecht.

Pearce, F. (1989). Methane: the hidden greenhouse gas. *New Scientist,* **122,** 37-41.

Pritchard, P.C.H. 1969. Sea turtles of the Guianas. *Bulletin of the Florida State Museum,* **13**(2), 85-140.

Shackleton, N.J., 1987. Oxgen isotopes, ice volume and sea level. *Quarternary Science Reviews,* **6,** 183-190.

Yntema, C.L. & Mrosovsky, N., 1979. Incubation temperature and sex ratio in hatchling loggerhead turtles: a preliminary report. *Marine Turtle Newsletter,* **11,** 9-10.

INTRODUCTION TO A STUDY OF THE HERPETOFAUNA OF ALBANIA

SILVIO BRUNO

Via di Pizzo Morronto, 43 00061 Anguillara S., Italy

Ion E. Fuhn sapientiae doctor, hominum societatis atque rerum gestarum studiosus, animi humani investigator, animantium descriptor fuit, sed praecipue dilectissimus amicus. Haec verba dicata sunt recordationi et memoriae viri qui mecum egit pleraque tempora in disputando de "herpetofauna" Illyrica.

The first specimens of Reptiles and Amphibians originating with certainty from Albania were collected between 1854 and 1882. There are occasional records collected by researchers coming back home from Greece or Turkey etc. Studies of the herpetological fauna of Albania were begun by the Vienna Natural History Museum: first A. Klaptocz (1910) carried out partial researches, later (1914-1918) E. Ebner, H. Karny, F. Kopstein, A. Penther, G. Veith etc. undertook a program with specific field campaigns. More or less in the same period (1916-1918) E. Csiki made researches in Albania for the Budapest Natural History Museum and in 1918 G. Veith and A. Winneguth undertook the same for the Bosnia and Hercegovina Land Museum of Sarajevo.

The researches of the Italians P. Parenzan (1929-1930) and L. Cardini (1936) follow this very active period. K. Müller made researches during 1938-1939 for the Berlin Natural History Museum. During 1959 E. Frommhold printed some results of his touristic-naturalistic trip in Albania. More information is given by E. Kattinger in 1972. The Museum and Institute of Zoology of the Tiranë University organized two field campaigns for herpetological researches during 1967-1969 and 1976-1985 with P. Dani, I. Haxhiu, etc.

The territory around the borders of Albania has been the subject of many researches made by people from different countries and it would be too long to list them all. During the summer of 1980, 1982 and 1984 I had the chance to visit the following localities: Bojana (or Buenë, or Bunë) Valley, West, East and North slopes of the Albanian Alps, East side of Korab-Deshat, Jablanica Mountains, Drimkal Region, Ohrit and Prespa Lakes and Ilkseria-Kolonjë-Zagori Regions.

In the herpetological literature the data referring to Albania is frequently not cited or the information is incomplete or even not true. For example, even in the interesting work of Atatür and Yilmaz (1986) about the Balkan Amphibians, Albania is not considered.

What follows is a synthesis of a wider work about taxonomy and biogeography of the Albanian herpetofauna I have prepared as a contribution to a study of the herpetofauna of the Balkans that I. Fuhn from Bucharest (Romania) began to coordinate before his death.

For general information about Albania see, for example, the works of Mantegazza (1912), Almagià (1929), Baldacci (1917, 1931, 1933, 1937) and Kemal Vlora (1978-1979).

For the biogeographic (bioclimatic, phytosociological and vegetational) nomenclature see: Margraf (1927, 1932), Bagnouls and Gaussen (1957), Matvejev (1961), Emerger et al (1970), Polunin (1980), Tomaselli (1980), Müller (1981), Saint Girons (1982a,b) and Walter (1985).

When not cited, the common names of species are not known.

AMPHIBIA

CAUDATA

Salamandridae

Salamandra atra atra[1] Laurenti, 1768
Alpine Salamander (Pizrrak, Salamandra e zezë)
[1]after Trevisan, P. et al (Boll. Zool., 48: 77-82, 1981): but see also Joger, U. (*Salamandra*, 22(2/3): 218-220, 1986).

Seems to be exclusive to the Albanian Alps (Vermosh, Kelmend, Theth, Shalë, Dukagjin, Nikas and Krasniq Regions).

Cafa Drosks or Qaf'e Droshks (Dragobija) in the Valbonë Valley (Krasniq Region) is the best known locality in Albania where the Alpine Salamander occurs.

Salamandra salamandra salamandra (Linnaeus, 1758)
Fire Salamander (Salamandra, salamandra me njolla të verdha)

1940 *Salamandra salamandra albanica* Gayda, Atti Soc. ital. Sci. nat., Milano, 79: 265. – Terra typica: village of Spas along the Drin River (NE-Albania).

It is more or less widespread in all of Albania. Lower level (plains and hill vegetation: e.g. in the surroundings of Bukura, Myzeqe, and near Pogradec, Ohrit Lake) and Mountain level (area of sciaphilous broad-leaved trees: e.g. Albanian Alps, Beshtriku, Gjalika Lumës, Mounts Korab, Mirditë, Mount Deja, Mount Runjë, Mount Kreshtës, Mount Nëmerçkë, etc.).

Triturus alpestris alpestris (Laurenti, 1768)
Alpine Newt (Tritoni i Alpeve)
North (Albanian Alps: Vermosh, Theth, Krasniq, Dukagjin, Trunit and Lumë Regions; Mounts Korab-Deshat and Central (Lurë, Mounts Kreshtës and Luçon; perhaps also on Mounts Polisit and Thatë) Albania. It lives in lakes and ponds in valleys and mountain grasslands from 1200m up to 2600m, but is more common between 1700m and 2200m.

Buresh & Zonkow (1941: 204-25; map 44, locality 26) incorrectly recorded the locality of "Cafa Malit, 1200 m" (Kopstein & Wettstein 1923: 411): instead it is not immediately east of Skodër, but between Vasiaj and Flet (between Mounts Trunit and Rrasës) in the upper Madh Valley.

Triturus alpestris montenegrinus[1] Radovanovic, 1951.
[1]See Gorham, S.W. (Checklist of World Amphibians. New Brunswick Museum, p.25, 1974).

It is a pedogenetic form (sensu A. Dubois, Alytes, Paris, 4: 122-130, 1987) endemic to Bukumirsko Lake, 1430 m, on Mount Maglic close to the border of Albania and Crna Gora (Yugoslavia). It is sympatric with ssp. *alpestris* (see for example, Pozzi 1966).

I agree with Breuil & Thuot (1983) who believe it is not a valid subspecies.

Triturus alpestris veluchiensis[1] Wolterstorff, 1935.
[1]Steward (1969, p. 99, map 7 partim), but see also Rocek, Z. (Acta Univ. Carol., Biol., 1972 (5/6) : 295-372).

South-East Albania: Mounts Nëmerçke and Grámmos but perhaps also on Mounts Otrovicë and Tomorrit (= Tomorricë).

Triturus cristatus carnifex[1] (Laurenti, 1768)
Warty Newt *(Tritoni me Kreshtë)*
[1]See Bucci-Innocenti, S. et al (Copeia, 1983: 862-872) and Mancino (1988: 216).

Werner (1912), Schreiber (1912), Fejervary (1923), Mertens and L. Müller (1928, 1940), Buresch and Zonkov (1941), Mertens and Wermuth (1960), Thorn (1969) ascribed the Warty Newts from Albania and all other parts of the Balkans to the ssp. *karelinii* (Strauch, 1870).

On the other hand Wolterstorff (1925) asserts that in Montenegro the ssp. *carnifex* is present.

Spurway (1953) believes the ssp. *karelinii* is present only in the biogeographical taurido-caucaso-pontic area. Strangely he considers the Warty Newt is absent from the central-South Balkans.

According to Frommhold (1959) the Warty Newts from Albania belong to the ssp. *cristatus* and according to Steward (1969) to the ssp. *carnifex*.

On the basis of my experience I agree with Steward but this matter might be better examined.

This Newt is recorded from the plains and the Albanian Alps but is certainly present elsewhere too. I know it is present in the Ikeseria District (Epirus).

Triturus vulgaris graecus (Wolterstorff, 1905)
Smooth Newt (Tritoni i vogël, tritoni i zakonshëm, tritoni me pika)

According to the literature this is the commonest and most widespread newt of Albania.

It lives throughout Albania in the lower, mountain and alpine zones.

On the basis of my researches the range of this subspecies reaches, in the West, South Dalmatia (Trebisnjica Valley, between Croatia and Hercegovina). Also Schmidtler & Schmidtler (1983) found the ssp. *graecus* at Ravno (Popovo Polje). These authors consider the population living in the lower Neretva as *Triturus v. vulgaris x Triturus v. graecus.*

SALIENTIA

Bufonidae

Bufo bufo (Linnaeus, 1758)
Common Toad (Thithlopa ose zhaba e madhe, Thithëlopa e zakonshme).

It is common all over Albania. It is more frequent than the previous species in the lower level (hills and submontane vegetation) and in the mountain level (lower mountain vegetation).

Populations of the Albanian Alps, of Mounts Korab-Deshat and of the Central Albanian mountains seem to be closest to the ssp. *bufo.*

Populations of West and South Albania (South to the Seman-Devoll Valley), instead, seem to be closest to ssp. *spinosus* Daudin, 1803.

Bufo viridis viridis Laurenti, 1768
Green Toad (Zhaba e gjelbër, thithëlopa)
It occurs all over Albania. It is even more thermophilous than the previous species and prefers plains at lower altitudes though it can reach 2400 m. (Mount Korab).

Discoglossidae

Bombina variegata scabra (Küster, 1843)
Yellow-bellied Toad (Bretkoca barkverdhë or Bretkoca)

1923 *Bombina salsa* var. *csikii* Fejérváry, Mag. tudom. Akad. Balkan-Kutat. tudom. Eredm., Budapest, 1 (1922): 24; pl. 2, figs. 2-4. – Terra typica: Ipek (nunc Pek, Kosovo, Yugoslavia), Mount Korab at 1800 m, and Kula Lums (North-East Albania).

All over Albania. From sea level (Dukati, Kanina, Kneta e Kakarriqit, Myzeqejä, etc.) to 1800 m (Mounts Korab-Deshat).

It lives in brooks, rivers, ponds, marshes, springs and pools, mostly where they are covered by vegetation.

Hylidae

Hyla arborea arborea (Linnaeus, 1758)
Common Tree Frog (Bretkosëza e gjethes, e drurëve, gielbëra jeshile, or Bretkosëza)

It is more or less widespread all over Albania. Lower level (littoral, plains and hills vegetation) and Mountain level (orophile vegetation).

Pelobatidae

Pelobates syriacus Boettger, 1889
Eastern Spadefoot.

Frommhold (1959) recorded it from Albania but he didn't find it (confirmed *in litteris* to S. Bruno, 1962).

Karaman (1928) mentioned it as occurring in the Ohrit and Presbës Lakes (South-West Macedonia, Yugoslavia).

During summer 1980 I observed and collected the Eastern Spadefoot in some localities near Struga and Ohrid, but above all at Sv. Naum (South shore of Lake Ohrit and at Stenje and Konsko (Central-West shore of Lake Presbës at the border between Yugoslavia and Albania). It is highly possible it lives also in the sandy shores of the two cited lakes inside the boundary of Albania (e.g. between Sv. Naum and Pogradec, between Konsko and Zaroshkë, and in the surroundings of Zagradec).

Ranidae

Rana dalmatina Bonaparte, 1840
Agile Frog (Bretkosa këmbëgjatë).

All over Albania. Lower level (littoral, plains and hills vegetation) and Mountain level (orophile vegetation). It appears to be more common than the Stream Frog in the plains woods. Where they are sympatric, the Agile Frog prefers to lay eggs in lakes and ponds whereas the Stream Frog seems to prefer brooks.

Rana graeca graeca[1] Boulenger, 1891
Stream Frog (Bretkosa e përrenjve)
[1]See Dubois, A. (Alytes, 4(4) : 135-138, 1985).

It is the most common and widespread Brown Frog of Albania. It lives from sea level to 1850 m. (Djalica Lums or Galica or Gjalica Liumës Mountains, Lumë Region, North-East Albania). In many localities lower than 300 m. in the lower level, with littoral and plains vegetation, it is replaced by the Agile Frog.

Rana epeirotica Schneider et al, 1984
Epirus Frog.

Schneider et al (1984) on the basis of the studies made by Hotz and Uzzel (1982) and by Tanner and Heppich (1982) described the Green Frogs from Epirus as a new species.

Certainly this Anura, which sometimes is sympatric with *Rana ridibunda,* is distributed in the island of Corfu or Kérkira and in Epirus (NW Greece), in the drainage area of the Akhéron and Thiamis Rivers, Ioánnina Lake and Asfáka Marsh.

In Albania it could be present in the Pavla and Butrintit Valleys (Chaonia or Vurg District), and perhaps also in some areas of the Albanian-Greek Epirus: Lunxhëri, Zagori, Ikseria, Kolonjë, Moravë and Tomorricaë Districts.

Rana ridibunda Pallas, 1771
Marsh Frog (Bretkosa e pellgjeve, e zakonshme, or zhaba)
It is the most common and widespread Anura of Albania; from sea level to 1500 m.

According to morphological, ecological and ethological researches, Haxhiu (1986 a,b) believes the phenotype "ridibunda" lives in almost all Albania and that along the coast (*Quercion ilicis* associations) is sympatric with phenotypes "esculenta" and "lessonae".

Frommhold (1959: 180, fig.) cited *Rana lessonae* as present at Durrës.

In reality the problems of the Albanian Green Frogs have to be studied on the basis of biochemical and molecular data (Hotz and Uzzell 1982, Hotz 1983, Hotz et al 1985, etc.)
Rana ridibunda could be sympatric with *Rana epeirotica* and *Rana shqiperica* in the alluvial plains of the coast between the Butrintit Plain (South) and the Kakariqit Plain (North).

The Green Frogs from Albania are exported in quantity as food to West European countries, mostly France.

In 1941 Mr. P. Lavezzoni released at Borgomaro (Province of Imperia, NW Italy) some *Rana ridibunda* (sensu Auct.; perhaps also *Rana epeirotica?)* collected in the Tomorricaës River (SE Albania). These specimens, although they were collected for gastronomic purposes, spread along nearly all the Impero River, reached the Prino Stream and in 1970 were introduced in the Caramagna Stream (see, for example, H. Hotz and S. Bruno, *Rend. Accad. N. Sci. of XL, Mem. Sci. fis. nat.,* Roma, 4 (6): 76, 1980). This species was also found between April

Truck for export trade of frogs and snails from Albania.

1984 and April 1985 in the Bevera Stream, in the Cervo Stream (West Province of Imperi and at the confluence of the Neva and Arroscia Streams (Province of Savona) (V. Ferri an A. Dell'Acqua, *Natura*, Milano, 76 (1-4): 49-52, 1985).

Rana shqiperica Hotz et al, 1987
Albanian Frog.

This species was described from specimens from the Lake Shkodrës drainage area and th adjacent coastal plains of Southwestern Yugoslavia (Hotz et al, 1987).

I agree with these authors that the species could be widely distributed in the coastal plains of Albania. It is possible the Albanian Frong could reach Vlorë Bay in the south.

It is sympatric with *Rana ridibunda.*

Rana temporaria temporaria Linnaeus, 1768
Common Frog (Bretkosa e kuqërremtë e malit)

North (Albanian Alps) and North-East (Lune Region and Mount Korab) Albania. Generally it lives in localities higher than 1000 m. On Mount Korab adults were observed up to 2200 m. and young to 2400 m. in the dolines of Fusa Pecinec or Fusha Petshinets. It is possible it lives also in the lower level (submontane vegetation), south to the Drin Valley and west to the Drin i Zi Valley.

REPTILIA
TESTUDINES
Emydidae

Emys orbicularis (Linnaeus, 1758)
European Pond Tortoise (Breshkë uji or Breshkujcë).

North, West, Central-East and South Albania. Lower level (littoral, plains and hills vegetation: area of evergreen sclerophylles and heliophilous broad-leaved trees).

Very common but localized in alluvial plains, in river valleys, in marshes and in lakes.

Variety *hellenica* (Valenciennes, 1833) or *hofmanni* Fitzinger, 1833 is present with an intermediate form between var. "typica" and var. *hellenica.*

Mauremys caspica rivulata (Valenciennes, 1833)
Stripe-necked Terrapin (Breshkë uji or Brenshkujzë)

West Albania. Lower level (littoral, plains and hills vegetation: area of evergreen sclerophylles).

Common but localized. In some localities it is sympatric with previous species.

Testudinidae

Testudo graeca ibera Pallas, 1814
Spur-thighed Tortoise.

Berthold (Mitt. Zool. Mus. Göttingen, 1: 7, 1846) mentioned one specimen of this subspecies collected in Albania.

Graf Attems collected some specimens of this tortoise, sympatric with *Testudo hermanni,* near Usküb in the Treska Valley, Yugoslavian West Macedonia (Siebenrock 1906). This is the closest locality to the Albanian border where *Testudo graeca ibera* is surely present.

Haxhiu (1985) considered two females collected in Albania as belonging to this subspecies, but the locality is not recorded.

Testudo hermanni hermanni Gmelin, 1789
Hermann's Tortoise (Breshka e zakonshme).

1932 *Testudo enriquesi* Parenzan, Atti R. Ist. ven. Sci. Lett. Art., Venezia, 91 (1931-1932): 1160; pls. 30-33 partim; pl. 34, figs. 3, 7. – Terra typica: Dell of Elbassan in the Skumbin Valley (Central Albania).

All over Albania, Island of Sverneci in Nartës Bay and Island of Sazan in Vlorë Bay. It is necessary to confirm the presence of this Tortoise on the two islands.

Lower level (littoral, plains and hills vegetation: maquis, garigues, Quercion ilicis associations, lentisk associations, mediterranean Pine forests, evergreens and deciduous oaks, Ostryo-Carpinion orientalis associations, european chestnut, schibljak associations) and Mountain level (lower mountain vegetation).

From sea level to about 1200 m (environs of Kishajt or Kishaj or Kisait: higher Drin i Bardhë Valley between Kukës and Mount Pastrik or Pushtrikut).

Testudo marginata Schoepff, 1792
Marginated Tortoise (Breshka malore)
South Albania (Chaonia or Vurg District: lower Pavla Valley and Butrintit Valley, to north until the ancient ruins of Lekures). Sometimes it is sympatric with *Testudo hermanni.*

Cheloniidae

Caretta caretta caretta[1] (Linnaeus, 1758)
Loggerhead Turtle (Breshka me pllaka)
[1]sensu Capocaccia, L. (Ann. Mus. civ. St. nat. Genova, 76:1-22, 1966).

Adriatic Sea and their coasts (Drinjt Gulf: coast between Pulaj and Shëngjin; Lalzës Bay: coast of Pyll i Rrushkullit, betwen the Tarin and Erzen mouths; Vlore Bay; Sarandë Bay).

Rare.

Eretmochelys imbricata (Linnaeus, 1766)
Hawksbill Turtle.

Frommhold (1959: 146) writes as follows: "Doch kommen zumindest Unechte Karette, *Caretta caretta caretta* (Linné), und Echte Karettschildkröte, *Eretmochelys imbricata imbricata* (Linné), vor. Ein großes Stopfpräparat einer metergroßen Seeschildkröte befindet sich in der Sammlung des Zoologischen Institutes der Universität Tirana, Über das später noch zu berichten inst".

I have no more information about it.

Adult male Albanian Wall Lizard *Podarcis muralis albanica* (Ada Island)

Albanian Frog, *Rana shqiperica*, adult male from Lake Shkrodës.

Dermochelyidae

Dermochelys coriacea (Vandelli, 1761)[1]
Leathery Turtle (Breshka lëkurore or me 7 kreshta or e zezë e detit).

[1]See Fretey, J. & Bour, R. (Boll. Zool., 47: 183-205, 1980).

Adriatic Sea (Drinjt Gulf: coast between Pulaj and Shëngjin). Very rare.

SAURIA
Gekkonidae

Cyrtodactylus kotschyi bibroni Beutler & Gruber, 1977
Kotschy's Gecko (Zhapiu me lara i shtëpisë).

South-West Albania and islands. Littoral and insular vegetation *(Quercion ilicis* assocations).

It is considered rare and localized, but almost certainly because of the scarcity of observers and research.

Hemidactylus turcicus turcicus (Linnaeus, 1758)
Turkish Gecko (Zhapiu i zakonshëm i shtëpisë).

West Albania and islands. Littoral, plains and hills vegetation *(Quercion ilicis* and *Ostryo-Carpinion orientalis* associations).

Seems to be the most common and widespread Gecko of Albania.

Tarentola mauritanica[1] (Linnaeus, 1758).
Moorish Gecko.

[1]I consider this is a monotypic species because I believe *deserti* Boulenger, 1891 is a species and not a subspecies.

It is possible it exists along the coasts and on the islands of Albania. Erhard Frommhold sent to me in 1962 a specimen from Sazan Island.

In July 1980 one specimen was found in the campground of Ada Island (Bruno 1988). This species was not found again in following years and its presence has to be confirmed.

Lacertidae

Algyroides nigropunctatus (Duméril & Bibron, 1839)
Dalmatian Algyroides (Hardhucka e shkëmbinjve)

1919 *Algiroides nigropunctatus* var. *concolor* Bolkay, Glasn. zemaljsk. Muz. Bosn. Hercegov., Sarajevo, 31: 18, 34. – Terra typica: Brustar and Mulani (Central Albania).

Nearly all over Albania, including Sazan Island, certainly up to 100 m. It is possible it lives to the North of the Drin Valley but I do not know of any records.

Lacerta agilis Linnaeus, 1758
Sand Lizard (Zhapiu i ngathët)

The Sand Lizard seems to be occasional and localized on the North Albania Alps and on the North-East Korab-Deshat Mountains, from about 1200 up to 1800 m.

In theory the Albanian specimens belong to the ssp. *bosnica* Shreiber, 1912 (see Buresch & Zonkow 1933, Karaman 1939, Radovanovic 1951, Dimovski 1959, 1964, Brelih & Dzukic 1975, Jablokow 1976) but an adult female from Mount Korab, captured July 26th 1918, at 1800m. (Mus. Hung,. Rept. No. 2721/20) belongs to the ssp. *agilis* (Fejérváry 1923: 44-46; pl. 3, fig. 4).

Lacerta oxycephala Duméril & Bibron, 1839
Sharp-snouted Rock Lizard.

The locality closest to the Albanian border was Godinje, south to Virpazar, near Lake Shkodër

(Radovanovic 1951). Mr Giuseppe Sorisi, from Cernusco sul Naviglio (Milano), has taken a picture of an adult male on the Rumija Mountains during summer 1982.

Frommhold (1959) mentioned it generally from Albania. I asked him for more information about the exact locality and he told me that it occurred on the Tarabosh Hills or in the Anamali Region.

Lacerta trilineata[1] Bedriaga, 1886
Balkan Green Lizard (Zhapiu me tri vija).

[1]sensu Frör, E. (Biol. gallo-hellenica, 8: 331-334, 1979).

It is necessary to specify better the distribution of this species. According to the information I have obtained, I believe it is absent north-east of an imaginary line connecting Lake Shkodër, Orosi or Oroshi (upper Mat Valley) and Lake Ohrit.

The taxonomic position of Albanian populations is uncertain. It is not known if they are the ssp. *trilineata* or the ssp. *major* Boulenger, 1887 or if both are present. According with the biogeography it seems to be possible that the populations of the lower level (littoral, plains, hills and submediterranean vegetation) are the ssp. *major* and those of the Lower level (submontane vegetation) and Mountain level in SE Albania are the ssp. *trilineata*.

Lacerta viridis (Laurenti, 1768)
Green Lizard (Zhapiu i gjelbër).

It is more or less common all over Albania from sea level to more than 1000 m (Tropojës Valley in the Albanian Alps and Lumë Valley in the Lumë Region between the Koritnik and Korab Mountains).

It is necessary to study in a better way the taxonomic position of *Lacerta viridis* from Albania. In theory it could belong to the ssp. *viridis* but it is possible that in the region with Mediterranean vegetation (South-East to the Seman-Devoll Valley) the ssp. *meridionalis* Cyrén, 1933 or their hybrids are present.

Lacerta vivipara Jacquin, 1787
Viviparous Lizard (Zhapiu që lind këlyshë)

North (Albania Alps) and North-East (Korab Mountains) Albania.

This species seems to be typical of the alpine level (area of prostrate shrubs, alpine meadows and everlasting snows).

Even though it is not recorded at altitudes lower than 1800 m., it is possible it can live there (e.g. area of the sciaphilous broad-leaved trees: Fagion moesiacae assocations).

Var. "typica" and var. *montana* Mikan, 1805 are present.

Pordarcis erhardii veithi (Werner, 1918)
Erhard's Wall Lizard (Hardhucka e gurëve).

1918 *Lacerta muralis* subsp. *veithi* Werner, Archiv. naturg., 84: 142; fig. partim. – Terra typica: between Debar or Dibra (Mavrovo Nacional Park, Macedonia, South Yugoslavia), Peshkopijë or Piskopeja or Peshkopi (Drin i Zi Valley, Korab Mountains, North-East Albania) and Babia or Babjë (Shkumbin Valley near Librazhd, Central Albania).

1919 *Lacerta erhardi* var. *veithi* Bolkay, Glasn. zemaljsk. Muz. Bosn. Hercegov., Sarajevo, 31: 2, 12, 32; pls. 3-4. – Terra typica: Visoka (Central Albania).

1920 *Lacerta veithi* Bolkay, Glasn. zemaljsk. Muz. Bosn. Hercegov., Sarajevo, 32: 215. – Terra typica: Visoka (Central Albania).

It is necessary to know better the distribution of this species. It is certain it lives in the east (e.g. Drin i Zi Valley) and Central (e.g. Mallakastër, Shkumbin-Devoll Valleys and Osum Valley) Albania.

Since it is present in the Kosovo Polje (f. e. Radovanovic 1964), in Yugoslavian West Macedonia

(e.g. Dimovski 1959, 1964) and Greek North-West Macedonia (coasts and hills of Lake Kastorias, Aliákmon Valley, Aóos Valley annd Zagori Region: S. Bruno pers. obs., summer 1980 and 1982) it is possible it lives also in North-East (Drin i Bardhë Valley) and South-East (Vijosë Valley) Albania.

Podarcis melisellensis fiumana (Werner, 1891)
Dalmatian Wall Lizard (Hardhucka e vogël e gjelbër).

It is necessary to study better the distribution of this lizard. It certainly lives along the shores of Lake Shkodër (= Ligen i Shkodrës) Zogaj, Shirokë. Shkodër, Flakë. It also occurs in the Drin Valley as far as Spas (= Spasit, Spashit or Han Spashit).

According to Kopstein and Wettstein (1921) its potential distribution is Northern Albania north of the Mat Valley. I believe it is true only for the coastal region because for biogeographical reasons it cannot reach the Mirditë Table-land to the south.

In the work of F. Tiedemann and K. Heule (Böhme et al 1986: 116; fig. 16) a confusion between two localities exists: "18 Han Spasit/Drim" (but its name is Han Spasit/Drin) is in Albania and not in Yugoslavia, instead "20 Tuzi", named for Albania, is in Yugoslavia.

Podarcis muralis (Laurenti, 1768)
Common Wall Lizard (Hardhucka e mureve).

1919 *Lacerta muralis* var. *albanica* Bolkay, Glasn. zemaljsk. Muz. Bosn. Hercegov., Sarajevo, 31: 12, 32. – Terra typica: Fjeri (Central-West Albania).

Of the genus *Podarcis* it is the most common and widespread species both in the plains and in the mountains.

The taxonomic position of the Albanian Common Wall Lizards is discussed. A modern study of this subject would be very interesting and useful. On the basis of pattern, colour and size it is possible to distinguish the following forms, some of which are considered as subspecies by some authors:

– ssp. *muralis* "typica": North and East-Central Albania.

(Albanian Alps, Koritnik, Korab-Deshat and Jablanica Mountains). It lives mostly in the Mountain level (orophile vegetation) and in the Alpine level (hypsophile and pioneer vegetation). Up to 2400 m. in the Korab and Gjalicës (or Galica) Mountains and up to 2300 m. in the Skelsen (Skülsen or Shkelsen) Mountains.

– var. *fusca* (Bedriaga, 1878). It is sympatric with *muralis* in almost all of North and East-Central Albania. Nevertheless it lives also in Central (Shkumbin Valley: Elbasan Mountains and South-West (Dukat Valley: Lungara, Keraunë and Himarë Mountains) Albania. In North and North-East Albania it lives up to 600-700 m. and in Central and South Albania it lives also at higher altitudes.

– ssp. *maculiventris* (Werner, 1891). West Albanian Alps (for example Postribë Region of Kir Valley) up to about 1100 m. Forms intermediate with *muralis* can be found in the Drin and Dukat Valleys (South-West Albania).

– ssp. *albanica* (Bolkay, 1919). It is the typical form present on the plains and on the hills all over South Albania to the Drin Valley, west of the Drin i Zi Valley and north-west to the Tomor, Ostrovi, Nemerçke and Gribë Mountains.

Phenotypes similar to both *muralis* and *maculiventris* live in the mountains of South and South-East Albania. The phenotype like *maculiventris* lives at the lower altitudes, instead specimens like *muralis* are present at the higher altitudes.

Podarcis taurica (Pallas, 1814)
Balkan Wall Lizard (Hardhucka e barit)

Potentially it could live almost all over Albania but, according to my information, its presence in the West Albanian Alps and in the regions of Mirditë, Kthellë, Mat and Cermenikë is not documented. In the East Albanian Alps it is known from the Drin i Bardhë Valley. This

species lives also in South and Central Albania (including Karakonisi Island in Nartë, or Arta, Bay). The presence of the species at Cetinje (Crna Gora or Montenegro, SE Yugoslavia) (Radovanovic 1951: 118) is in doubt. The record was not confirmed by Radovanovic (1964) or by Pozzi (1966) and was considered with reserve by Brelih & Dzukic (1974). It is also in contrast with the Yugoslavian distribution of this lizard made by Radovanovic (1951: 117) who says the species is absent west of an imaginary line Beograd-Usce-Prizren (Serbia, Vojvodina, Kosovo).

Two subspecies are present in Albania. The ssp. *taurica* lives in the South-East Albanian Alps (Kopstein & Wettstein 1921) and east of the Drin i Zi Valley. Those authors cite this species at Kjuks (today Qukës) but in the species distribution map they mark in this locality the ssp. *ionica*. They assign the ssp. *taurica* to an unnamed locality in the central-west coast of Lake Ohrit which could be where (see page 455) they collected reptiles and amphibians. The ssp. *ionica* is typical of Central-West and South Albania. I do not know any record north of the Erzen Valley, but it could occur between the Erzen and the Mat Valleys.

In Albania the presence of the var. *olivicolor* has been recorded (Schreiber, 1912).

Many specimens of this species were collected in July 1980 near the landing-stage of Ada Island. No more specimens were found on the island in the following years. Those specimens were studied by Ion. E. Fuhn who considered them as ssp. *ionica*. As reported in Bruno (1988), this locality is quite strange for this subspecies, both from the bioclimatic and the geographic point of view, and it could be supposed those specimens were imported there. Its presence on the island has to be confirmed.

Scincidae

Ablepharus kitaibelii Bibron & Bory, 1833
Snake-eyed Skink (Zhapiu me këmbë të vogla).

It is possible it occurs in the Drin i Bardhë Valley considering that it exists in the Beli Drim Valley (West Kosovo). Nevertheless we know with certainty that it lives south to the Seman-Devoll Valley.

It lives at the lower level (littoral, plains and hills vegetation).

The Snake-eyed Skinks from Albania are considered to be the ssp. *stepaneki* Fuhn, 1970 but the author writes as follows (pag. 12): "Die jugoslawischen und albanischen Populationen, Uber die es nur spärliche Literaturangaben gibt und von denen uns auch kein Material vorlag, dürfen wahrscheinlich in der Nähe von *stepaneki* stehen. In den Zonen wo sie in Berührung mit *kitaibelii* kommen, sind intergradierende Populationen zu erwarten".

Anguidae

Anguis fragilis[1] Linnaeus, 1758
Slow Worm (Kakzogëza)
[1] see Wermuth, H. (Deutsch. zool. Zschr., 1 81-121, 1950), Voipio, P. (Ann. zool. Soc. Vanamo, 23(2): 1-20, 1962) and Petzold, H. –G. (Blindschleiche und Scheltopusik, Ziemsen, Wittenberg Lutherstadt, 1-57, 98-102 pp., 1971).

All over Albania from sea level up to 1700 m. (Mount Pashtrik or Pëschtrich in the South-East Albanian Alps).

The contact between the ssp. *fragilis* and the ssp. *colchicus* (Nordmann, 1840) is in Albania.

The specimens which seem to belong to the ssp. *colchicus* are considered to live generally in the Mediterranean region (upper Shkumbin, Devoll, Osum, Vijosë and Dhrin Valleys), but specimens were collected also at Pasa liman, Vlorë, Fjeri, Durrës, Kula Lums or Kula Ljumës and Mount Pastrik (or Pastriku, Pashtrik, Pështrih).

The varieties *eryx* Bielz, 1888, *graeca* Bedriaga, 1881 and *incerta* Krynicki, 1837 are present.

Ophisaurus apodus (Pallas, 1775)
European Glass Lizard (Bullari).

West Albania in the Lower level (littoral, plains and hills vegetation) up to about 600 m.

(surroundings of Krujë) but it is possible that in the Skanderbent Mountains it lives also at higher altitudes.

SERPENTES

Typhlopidae

Typhlops vermicularis Merrem, 1820
Worm Snake (Gjarpri i verbër krimbor).

West Albania. Lower level (plains and hills vegetation). Common but localized.

Boidae

Eryx jaculus turcicus (Olivier, 1801)
Sand Boa.

South-West Albania. Lower level (littoral and plains vegetation). Very localized. It is the rarest of Albania's snakes.

Colubridae

Coluber caspius[1] Gmelin, 1789
Large Whip Snake (Shigjeta e gjatë).
[1] see Baran, I. (1976: 26-30; figs. 8-9; tab. 2).

All over Albania. Lower level (littoral, plains and hills vegetation) and Mountain level (areas of the sciaphilous broad- leaved trees and area of coniferous trees). It is the commonest terrestrial snake of Albania after *Malpolon monspessulanus.*

Coluber gemonensis gemonensis[1] [2](Laurenti, 1768)
Balkan Whip Snake (Shigjeta e shkurtër).
[1]sensu Mertens, R. (Senckenb. biol., Frankfurt am Main, 49: 181-188, 1968).
[2]nomen dubium sed conservandum (but see Schatti, B. & Vanni, S.: Rev. suisse Zool., Genève, 93 (1): 219-232, 1986).

All over Albania. Lower level (littoral, plains and hills vegetation) and Mountain level (orophile vegetation). It is the commonest terrestrial snake of Albania after *Malpolon monspessulanus* and *Coluber caspius.*

Coluber najadum[1] (Eichwald, 1831)
Dahl's Whip Snake (Shigjeta e hollë)
[1] sensu Baran, I. (1976: 34-43; figs. 10-12; tabl. 4-5)

All over Albania. Lower level (plains and hills vegetation) and Mountain level (orophile vegetation). Localized.

Coronella austriaca austriaca[1] Laurenti, 1768
Smooth Snakes (Gjarpri i zi)
[1] sensu Mertens & Wermuth (1960: 175-176)

North, East and South Albania. Lower level (hills vegetation) and Mountain level (orophile vegetation). Localized.

Snake with variable ornamentation; the following varieties are present: *fasciata* Dürigen, 1897, *quadritaeniata* Werner, 1897 and "typica" Auct.

In July 1980 one specimen of this species (Bruno 1988) was found in the rubbish dump of a tourist settlement on Ada Island. It was not found again in following years. According with bioclimatic and geographic considerations it could be possible this species was imported to Ada Island. Its presence on this island has to be confirmed.

Elaphe longissima[1] (Laurenti, 1768)
Aesculapian Snake (Bolla e shtëpisë)
[1] sensu Capocaccia, L. (Ann. Mus. civ. St. nat. Genova, 74: 353-387, 1964)

All over Albania. Lower level (littoral, plains and hills vegetation: mostly in the area of the

evergreen sclerophilles or mediterranean vegetation) and Mountain level (orophile vegetation). It is the commonest species of the *Elaphe* genus.

The North and North-East (Albania Alps and Korab-Desat Mountains) populations seem to be ssp. *longissima*. The Central-West and South populations seem to be ssp. *romana* (Suckow, 1798) (mean V 230 and Sc 83/83+1). Variety *deubeli* (Méhely, 1897) is present.

Elaphe quatuorlineata quatuorlineata (Lacépède, 1789)
Four-lined Snake (Bolla me katër vija).

West, South and Central Albania (littoral, plains and hills vegetation: mostly in the eliophilous broad-leaved trees area or submediterranean and submontane vegetation). Common but localized.

Elaphe situla (Linnaeus, 1758)
Leopard Snake (Bolla laramane)

West and South Albania. Lower level (littoral, plains, and hills vegetation) and Mountain level (area of coniferous trees: Silver Fir woods. Mostly south to the Seman-Devoll Valley). Localized.

Varieties *leopardina* (Bonaparte, 1834) and *quadrilineata* (Pallas, 1814) (= "typica" Auct.) are present.

Malpolon monspessulanus insignitus (Geoffroy, 1827)
Montpellier Snake (Birója).

West and South Albania. Lower level (littoral, plains and hills vegetation: maquis, garigues, Quercion ilicis associations, lentisk assocations, mediterranean pine forests, schibljak assocations, deciduous oak, Ostryo-Carpinion orientalis associations, European chestnut) and Mountain level (orophile vegetation: Beechwoods and Silver Fir woods).

It is the commonest terrestrial snake of Albania.

Varieties *fusca* (Fleischmann, 1831) and *neumayeri* (Fitzinger, 1826) nomen nudum [= *insignita* (Geoffroy, 1827)] are present.

Natrix natrix natrix[1] (Linnaeus, 1758)
Grass Snake (Gjarpri i madh i vjit).
[1] after Thorpe, R.S. (e.g. Experientia, Basel, 31: 180-181, 1975)

All over Albania. Lower level (littoral, plains and hills vegetation), Mountain level (orophile vegetation) and Alpine level (area of prostrate shrubs). Common everywhere except in the Alpine level where it is localized and lives rather near lakes and springs.

The varieties present in Albania are: *concolor* (F. Müller, 1886), *moreoticus* (Bedriaga, 1881), *persa* (Pallas, 1814) [= *bilineata* (Jan, 1864)] and "typica" Auct.

Natrix tessellata tessellata[1] (Laurenti, 1768)
Dice Snake (Gjarpri i vogël i vjit)
[1] sensu Hecht, G. (Mitt. zool. Mus. Berlin, 16(2): 313-320, 1930) and Mertens. R. (Senckenb. biol., Frankfurth am Main, 50(3/4): 125-131, 1969).

All over Albania. It is sympatric with *Natrix natrix*. It appears more common than the Grass Snake both in the area of prostrate shrubs and in the alpine meadows of the Alpine level lakes.

In the highest zones of South Albania it is more common than *Natrix natrix*.

The following varieties are present: *albolineolata* Bonaparte, 1834, *concolor* (Jan, 1864), *flavescens* (Werner, 1891) and "typica" Auct.

Telescopus fallax fallax (Fleischmann, 1831)
Cat Snake (Gjarpri me lara).

West Albania. Lower level (littoral, plains and hills vegetation). Not very common, and localized.

Telescopus fallax
In July 1980 one specimen (Bruno 1988) was found in the campground of Ada Island. This species was not found again in following years and its presence has to be confirmed.

Viperidae

Vipera ammodytes (Linnaeus, 1758)
Nose-horned Viper (Nepërka e zakonshme).

1919 *Vipera ammodytes* var. *connectens* Bolkay, Glasn. zemaljsk. Muz. Bosn. Hercegov., Sarajevo, 31 (1): 21, 36. – Terra typica: Pojani, Levan, Brustar and Gradica (Albania).

1920 *Vipera meridionalis* var. *connectens* Bolkay, Glasn. zemaljsk. Muz. Bsn. Hercegov., Sarajevo, 32 (1): 7-8, 12; fig. 1-2 – Terra typica: Pojani, Levan, Brustar, Gradica and Mali Glodit (Albania).

All over Albania. Lower (littoral, plains and hill vegetation) and Mountain levels (area of the sciaphilous broad-leved trees and coniferous trees). Potentially it could live also in the

Alpine level (area of prostrate shrubs and Alpine meadows).

It is the commonest Viperidae of Albania.

Populations of North and Central Albania, north of the Shkumbin Valley, belong to the ssp. *ammodytes* (Linnaeus, 1758), whereas populations south of the Shkumbin Valley belong to ssp. *meridionalis* Boulenger, 1903. In the Plain of Mallakastër intermediate forms (var. *connectens* Bolkay, 1919) are present.

The record of ssp. *meridionalis* at Vorë (= Vorra), between Durrës and Tiranë (Schwarz 1936) has to be confirmed.

Vipera berus (Linnaeus, 1758)
Adder (Nepërka e malit me lara të nderprera).

North and North-East Albania: Albanian Alps and Korab Mountains. Mountain level (Beechwoods, Silver Fir woods, mountain meadows) and Alpine level (subalpine and alpine vegetation).

It seems to be rare and localized.

The taxonomic status of *Vipera berus* in the Balkan Peninsula has to be better studied. I believe that some specimens considered in the literature as ssp. *bosniensis* Boettger, 1889 are instead ssp. *berus* (Linnaeus, 1758).

Vipera ursinii ursinii[1] (Bonaparte, 1835)
Orsini's Viper (Nepërka e malit me lara të pandërprera).
[1] after Kramer (1961: 842-848, 689-697, 714).

North and North-East Albania: Albanian Alps and Korab-Desat Mountains. Mountain level (Orophile vegetation) and Alpine level (Hypsophile vegetation: area of prostrate shrubs and pastures, *Cu-vuleta, Firmeta,* alpine tundra).

Common but localized.

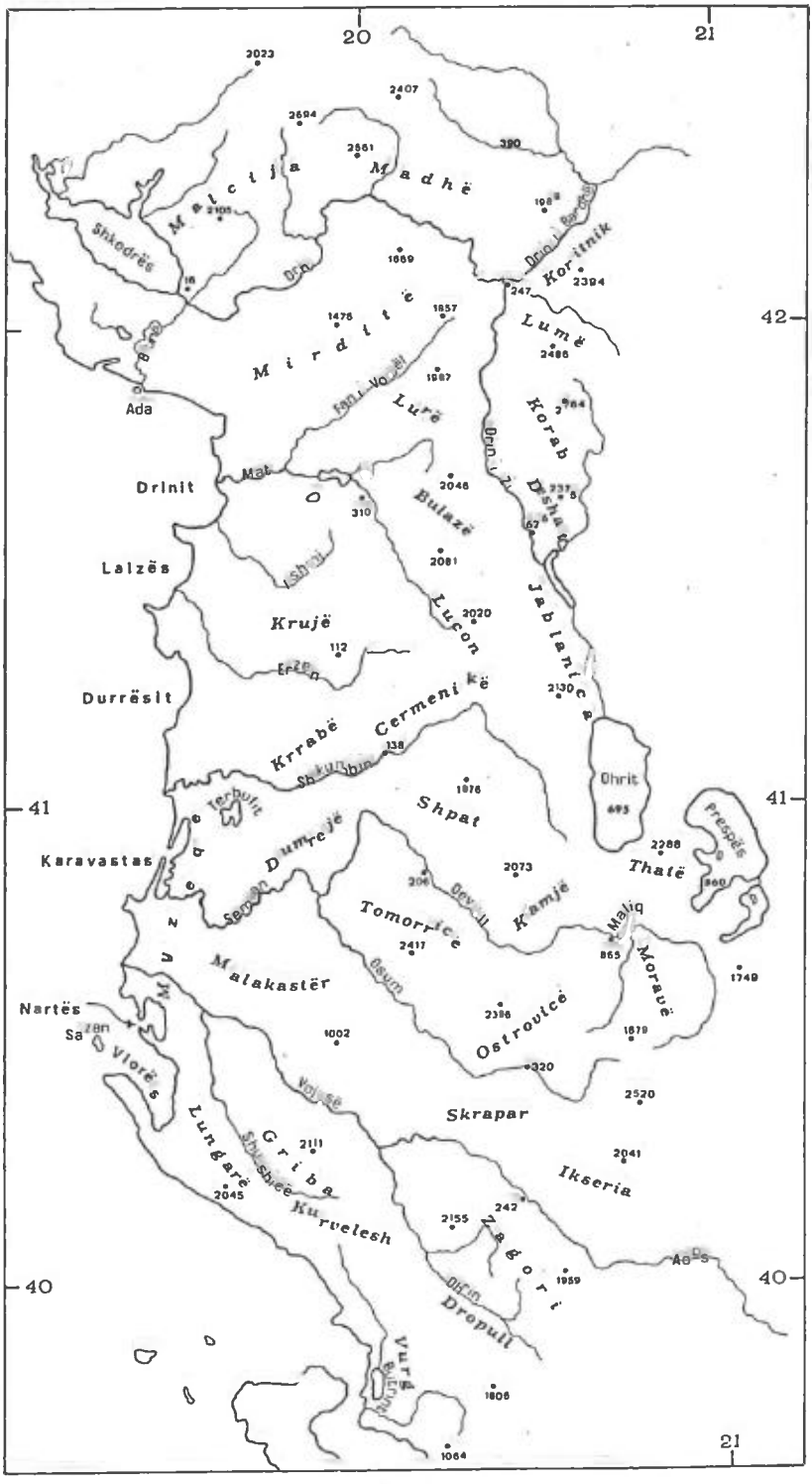

Fig. 1
Map of Albania

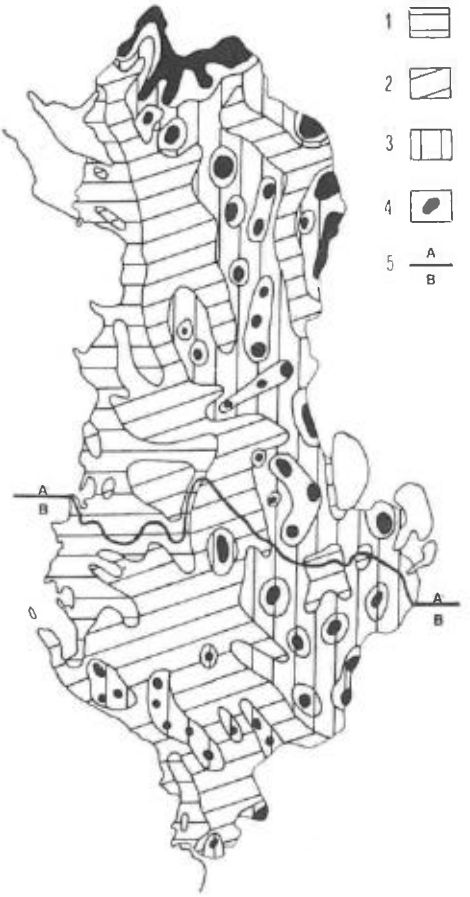

Fig. 2.
Bioclimatic map of Albania

1. Bioclimatic area: Mesomediterranean subregion. Phytosociologys taxa: *Quercion ilicis.* Tree guide species: *Quercus ilex, Fraxinus ornus, Arbutus andrachne.* Herpetofauna guide species: *Bufo bufo spinosus, Rana dalmatina, Mauremys caspica, Testudo marginata, Cyrtodactylus kotschyi, Ablepharus kitaibelii, Ophisaurus apodus, Typhlops vermicularis, Eryx jaculus.*

2. Bioclimatic area: Transitional subregion of the Meso- and the Uponmediterranean subregions. Phytosociologys taxa: *Ostryo-Carpinion orientalis.* Tree guide species: *Ostrya carpinifolia, Carpinus orientalis, Quercus pubescens, Acer campestris, Acer obtusatum, Acer pseudoplatanus, Sorbus aria, Abies cephalonica (= Acer borisiiregis).* Herpetofauna guide species: *Rana graeca, Podarcis erhardii, Elaphe quatuorlineata, Telescopus fallax.*

3. Bioclimatic area: Uponmediterranean subregion. Phytosociologys taxa: *Quercion fraintetto.* Tree guide species: *Quercus frainetto, Quercus cerris, Quercus petraea, Quercus pubescens, Quercus macedonica (= Quercus trojana), Abies cephalonica (= Abies borisiiregis), Castanea sativa, Carpinus orientalis, Ostrya carpinifolia, Crataegus monogyna, Acer monspessulanus, Acer obtusatum.* Herpetofauna guide species: *Salamandra salamandra* (South Albania partim), *Coronella austriaca, Elaphe situla.*

4. Bioclimatic area: Oromediterranean subregion. Phytosociologys taxa: *Fagion moesiacae.* Tree guide species: *Fagion moesiaca, Carpinus betulus, Quercus petraea, Acer obtusatum, Corylus avellana, Fraxinus ornus, Ostrya carpinifolia, Abies cephalonica (= Abies borisiiregis), Pinus peuce, Pinus leucodermis (= Pinus heldreichii).* Herpetofauna guide species: *Salamandra atra, Salamandra salamandra, Triturus alpestris, Bufo bufo bufo, Rana temporaria, Lacerta agilis, Vipera berus.*

5. Division line between the middle-european vegetation zone (A) and the mediterranean vegetation zone (B). It lies more or less along the Seman-Devoll Valley but, crossing the Mallakastër Plain, the limit between the two zones is variable with the northern limit at the Skumbin Valley and the southern one at Vlorë Bay.

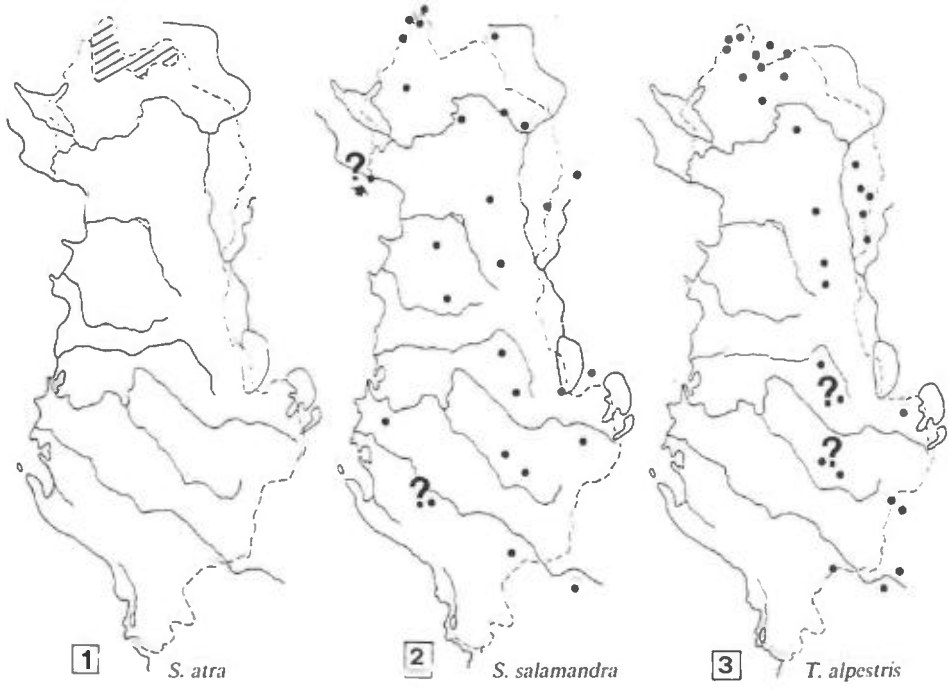

Fig. 3

Approximate distribution of *Salamandra atra* (1), *Salamandra salamandra* (2) and *Triturus alpestris* (3). Question mark (?) = potential presence. The presence of *Salamandra salamandra* on Ada Island (arrow) is surely due to passive introduction (possible with wood carried by the Bojana River). On the same island, for example, some species of Cerambycidae (Beetles) were found which surely cannot be autochthonous.

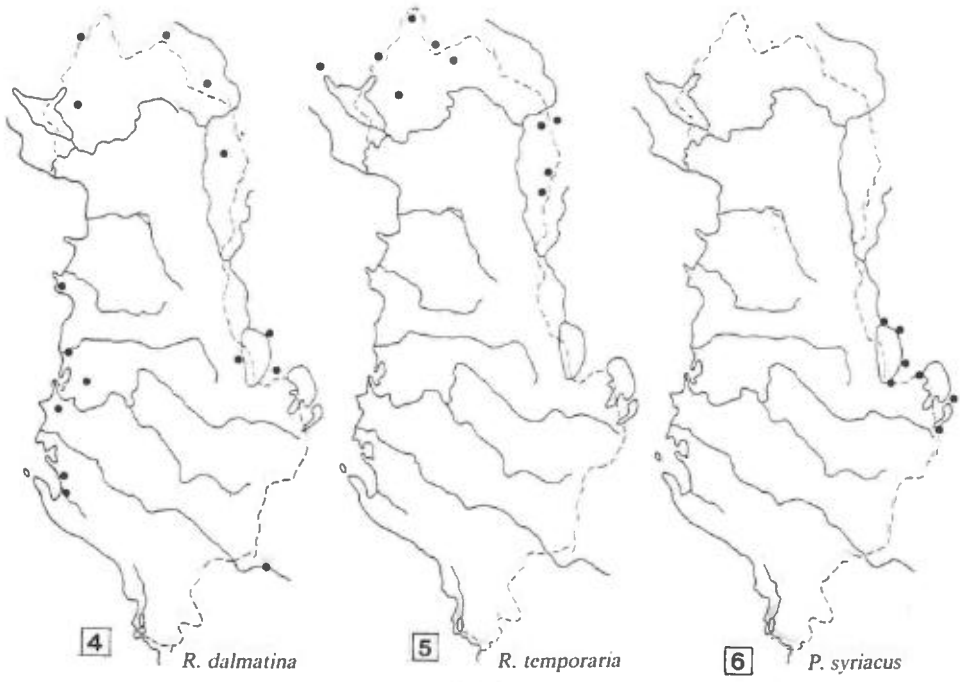

Fig. 4

Approximate distribution of *Rana dalmatina*, more significant localities (4), *Rana temporaria* (5) and *Pelobates syriacus* (6).

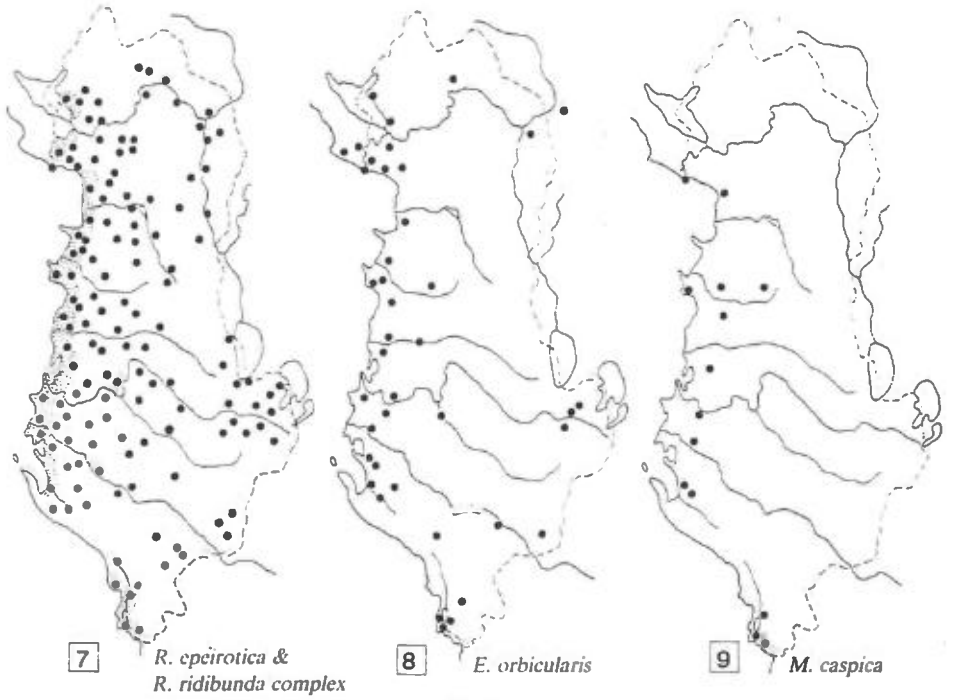

Fig. 5

Approximate distribution of Green Frogs, dotted area = sympatry zone of phenotypes "esculenta", "lessonae" and "ridibunda" sensu Haxhiu (1986b: 81) (7), *Emys orbicularis* (8) and *Mauremys caspica* (9).

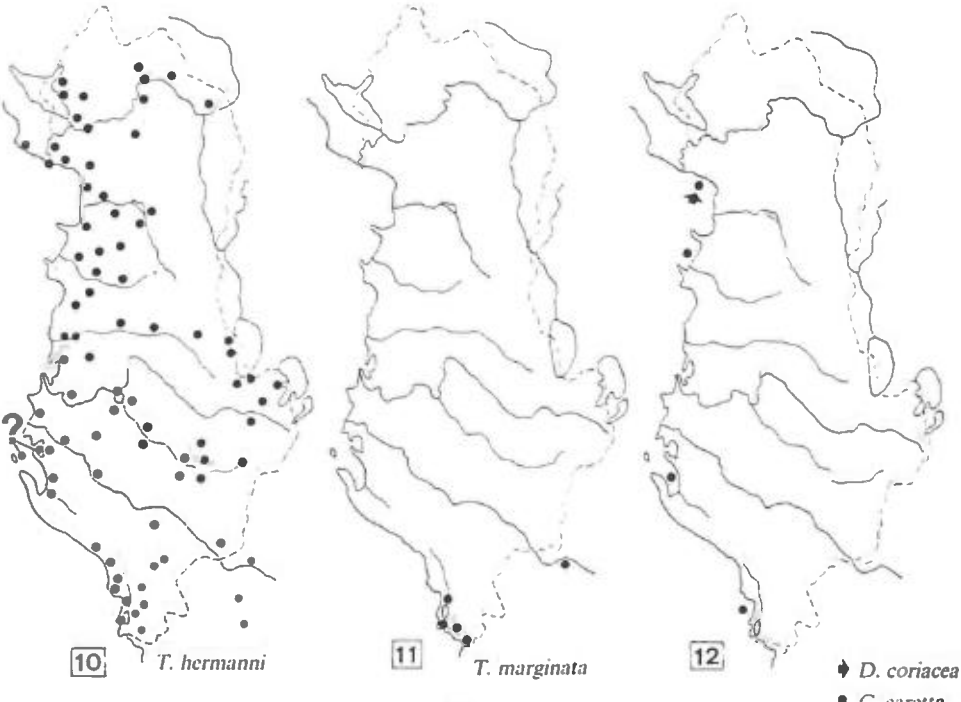

Fig. 6

Approximate distribution of *Testudo hermanni*, question mark (?) = perhaps introduced (10), *Testudo marginata* (11), *Caretta caretta*, spots and *Dermochelys coriacea*, arrow (12).

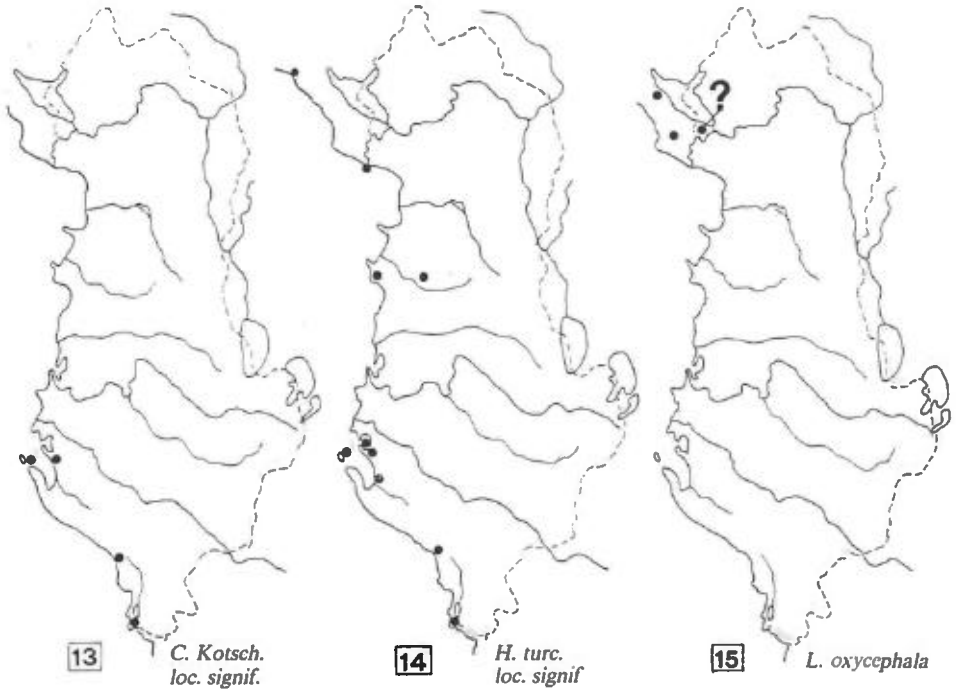

Fig. 7

Approximate distribution of *Cyrtodactylus kotschyi* (13), *Hemidactylus turcicus* (14) and *Lacerta oxycephala*, question mark (?) = presence to be confirmed (15).

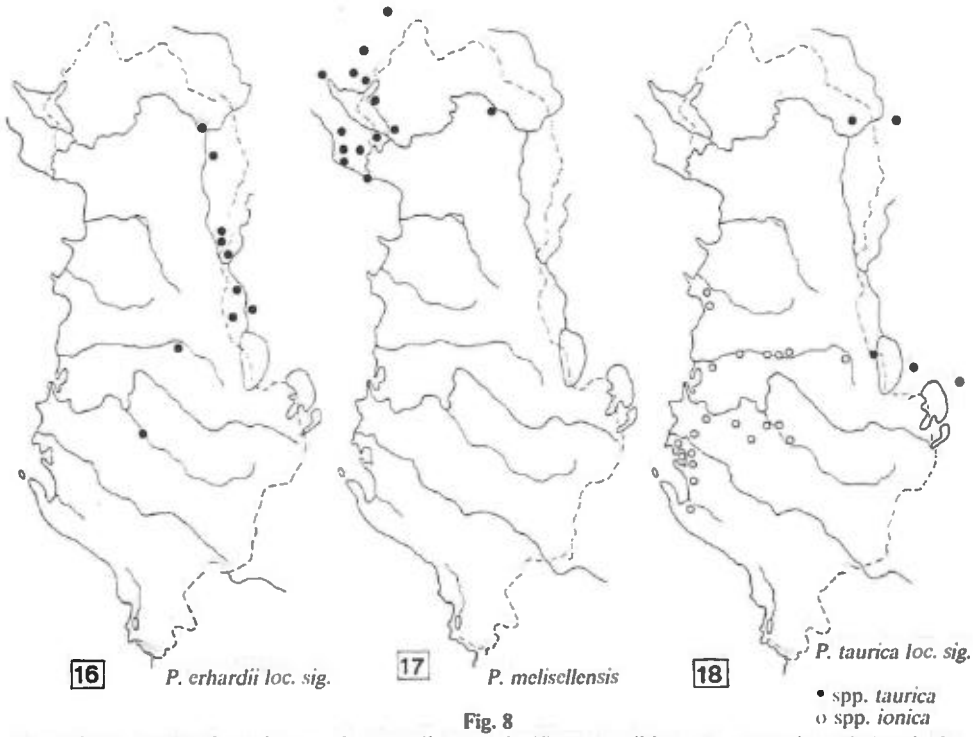

Fig. 8

Approximate distribution of *Podarcis erhardii*, more significant localities (16), *Podarcis melisellensis* (17) and *Podarcis taurica*, more significant localities (18).

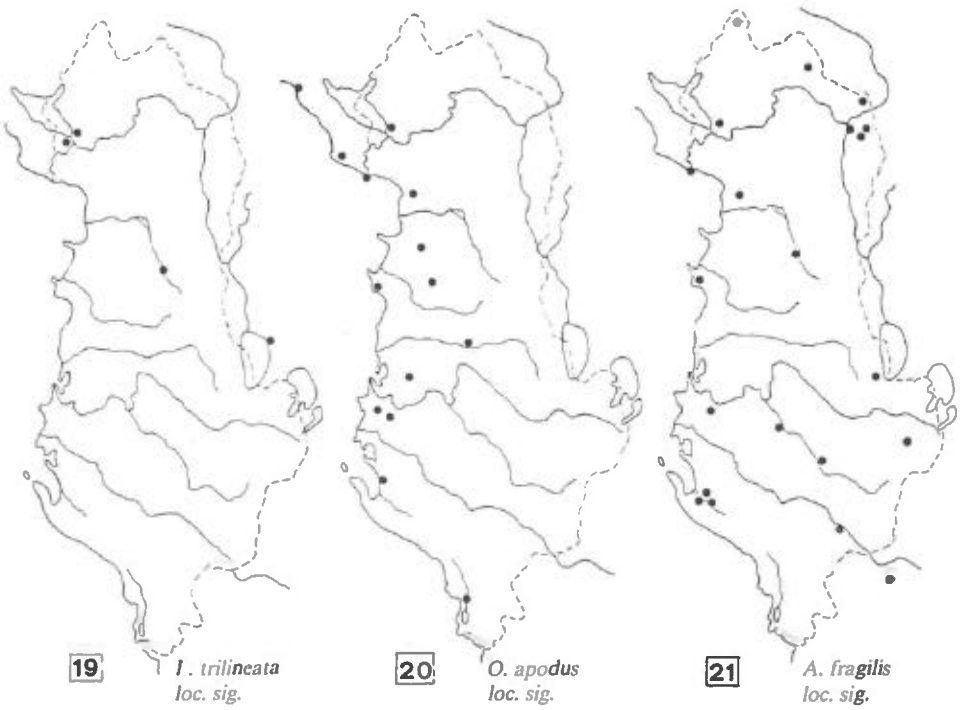

Fig. 9
Approximate distribution, more significant localities, of *Lacerta trilineata* (19), *Ophisaurus apodus* (20) and *Anguis fragilis* (21).

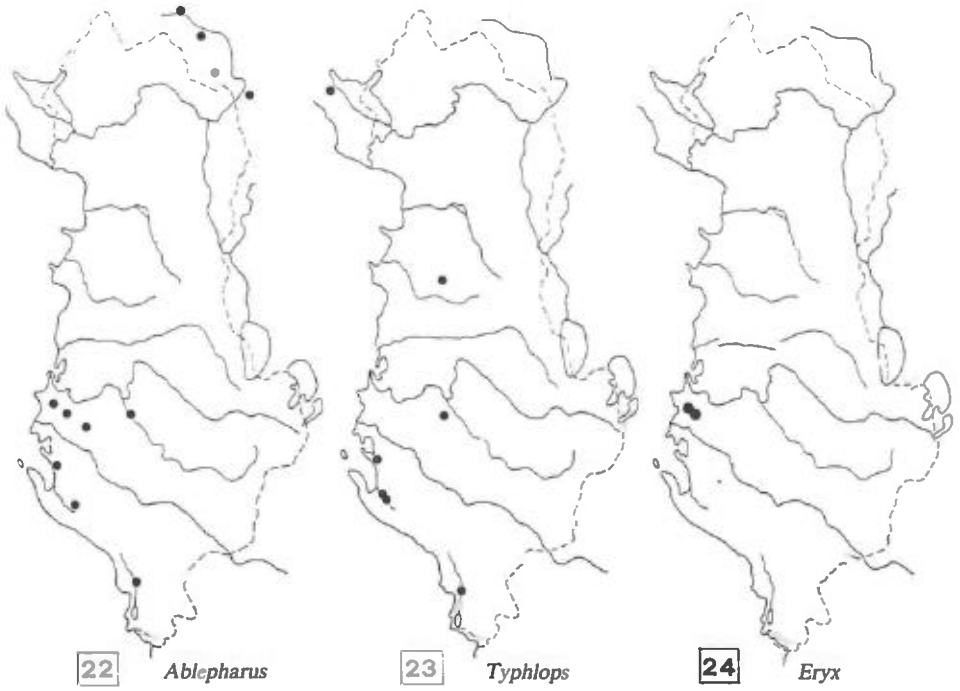

Fig. 10
Approximate distribution of *Ablepharus kitaibelii* (22), *Typhlops vermicularis* (23) and *Eryx jaculus* (24).

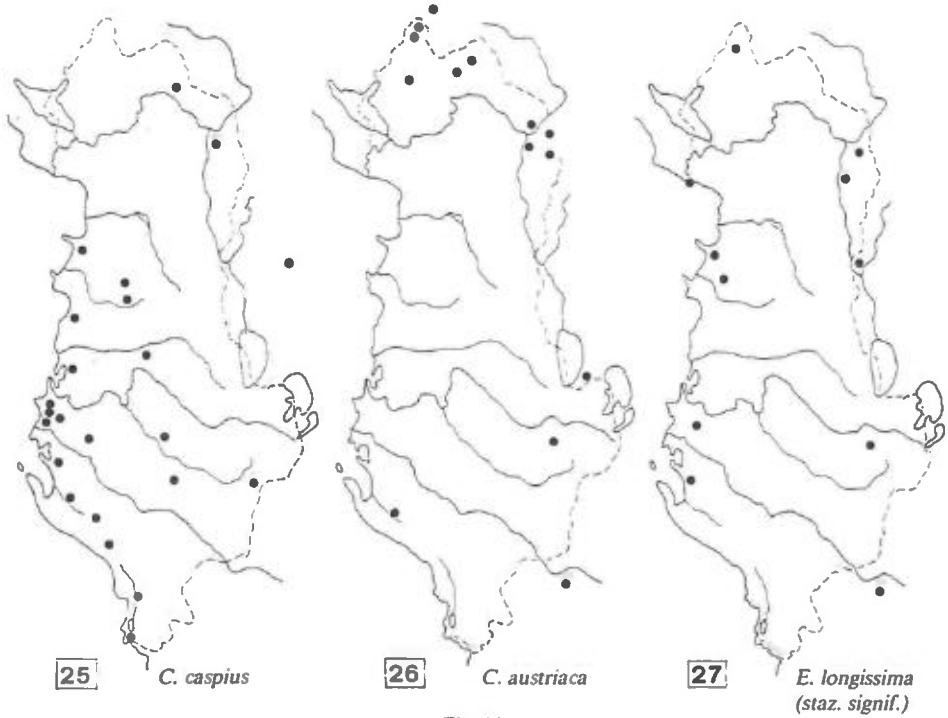

Fig. 11

Approximate distribution of *Coluber caspius* (25), *Coronella austriaca* (26) and *Elaphe longissima*, more significant localities (27).

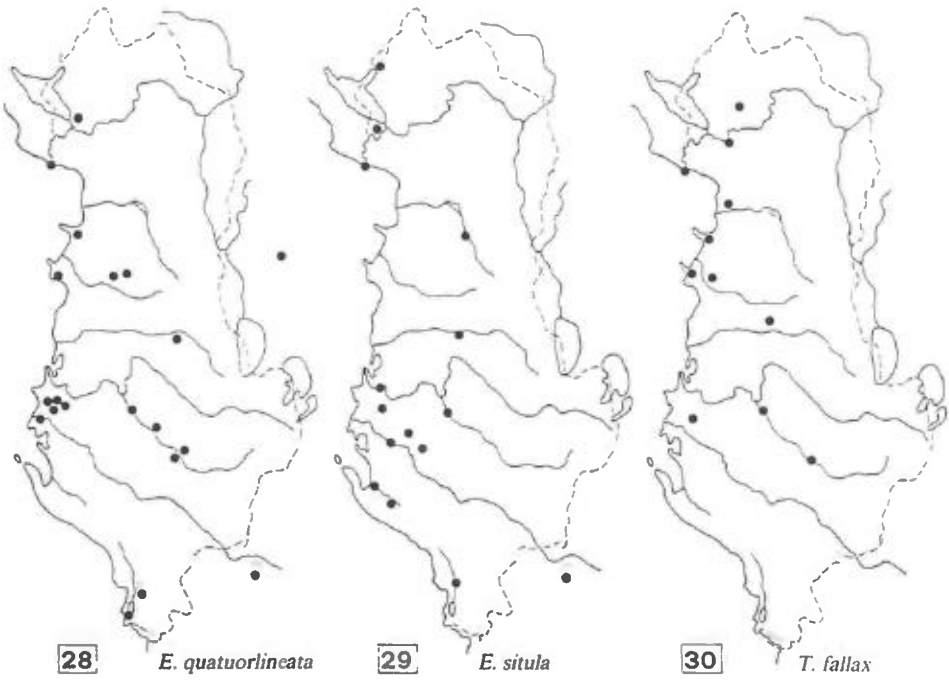

Fig. 12

Approximate distribution of *Elaphe quatuorlineata* (28), *Elaphe situla* (29) and *Telescopus fallax* (30).

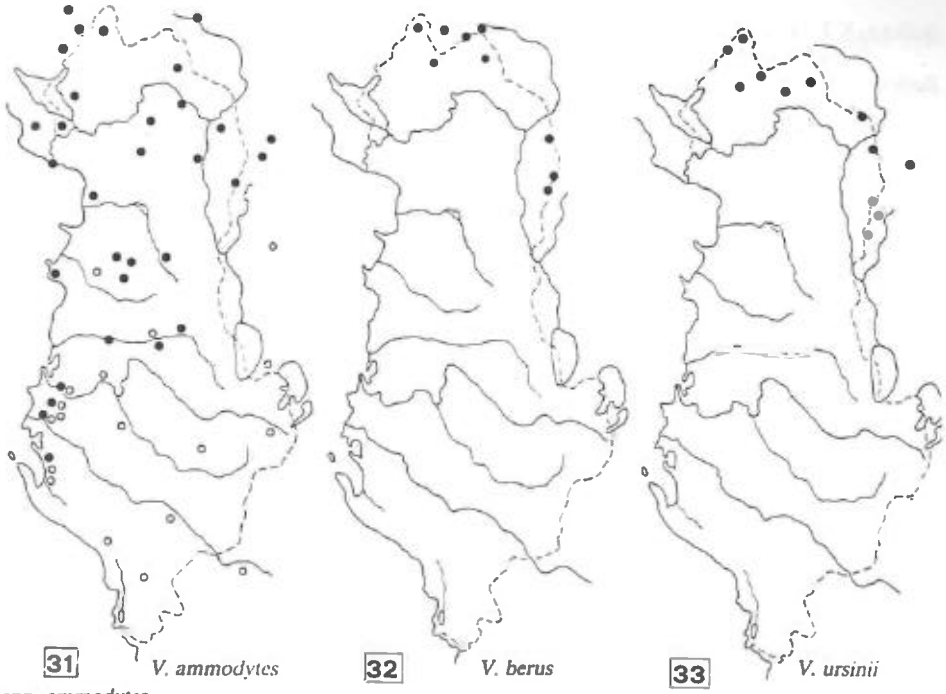

Fig. 13
Approximate distribution of *Vipera ammodytes* (31), *Vipera berus* (32) and *Vipera ursinii* (33).

REFERENCES

Almagiá, R. (1929). Albania *(pp. 97-113). ex: Enciclopedia Italiana di Scienze, Letters e Arti.* Istituto G. Treccani, Roma, 2: XVI-999.

Atatür, M. & Yilmax, I. (1986). A Comparison of the Amphibian Fauna of Turkish Thrace with that of Anatolia and Balkan States. *Amphibia-Reptilia,* Leiden, 7: 134-140.

Bagnouls, F. & Gaussen, H. (1957). Les climats biologiques et leur classification. *Ann. de Géogr.,* **66** (355): 193-220.

Baldacci, A. (1917). *Itinerari Albanesi.* R. Soc. Geogr. Ital., Roma, XXIV-542 pp.

Baldacci, A. (1931). *L'Albania.* Istituto per L'Europa Orientale, Roma, XXIV-464 pp.

Baldacci, A. (1933). *Studi speciali Albanesi. II.* Anomima romana Editoriale, Roma, VIII-618 pp.

Baldacci, A. (1937). *Studi speciali Albanesi. III.* Stab. Tipogr. F. Damasso, Roma, VIII-548 pp.

Baran, I. (1976). Türkije jilanlarinin taksonomik revizjonu ve cografi dagilislari. *T.B.A.G.,* Ankara, **IX:** 177 pp.

Boettger, O. (1888). Verzeichnis der von Herrn E. von Oertzen aus Griechenland und Kleinasien mitgebrachten Batrachien und Reptilien. *Sitzber. Akad. Wiss.* Berlin, 5: 139-186.

Böhme, W. et al. (1986). *Handbuch der Reptilien und Amphibien Europas. Echsen :* Podarcis. Aula, Wiesbaden, 3: 1-434.

Bolkay, S.J. (1899). Beiträge zur Kenntniss der Reptilien-und Batrachierfauna der Balkanhalbinsel. *Wissensch. Mitt. Bosn. Herceg.,* Wien, 6: 817-841.

Bolkay, S.J. (1919). Additions to the Herpetology of the Western Balkan Peninsula. *Glasn. zemaljsk. Muz. Bosn. Hercegov.,* Sarajevo, 31 (1): 1-38, 5 pls.

Bolkay, S.J. (1920). On the Phylogenetical Series *Vipera gedulyi* By., *Vipera ammodytes* L., *Vipera meridionalis* Blgr. *Glasn. zemaljsk. Muz. Bosn. Hercegov.,* Sarajevo, 32 (1): 1-22.

Bolkay, S.J. (1920). Some notes on *Lacerta veithi* By. *Glasn. zemaljsk. Muz. Bosn. Hercegov.,* Sarajevo, 32 (3/4): 215-226.

Bolkay, S.J. (1921). *Lacerta veithi* By., eine neue Eidechsenart aus Mittelalbanien. Bl. *Aquar. Terrar. Kunde,* Stuttgart, **32** (6/7): 104-107.
Bolkay, S.J. (1924). A list of the Amphibians and Reptiles, preserved in the Bosnian-Hercegovinian Land-Museum, with morphological, biological and zoogeographical Notes. *Spomenik Srp. Kralj. Akad.,* Beogradu, **61** (1923) (11): 1-39, 7 pls.
Bolkay, S.J. (1928). Contributions to the Knowledge of *Lacerta muralis albanica* Bolkay. *Glasn. zemaljsk. Muz. Bosn. Hercegov.,* Sarajevo, **40** (1): 17-22.
Bolkay, S.J. (1930). On the Phylogenetic Series *Vipera gedulyi, Vipera ammodytes* and *Vipera meridionalis. Glasn. zemaljsk. Muz. Bosn. Hercegov.,* Sarajevo, **42**: 57-114, 6 pls.
Boulenger, G.A. (1882). *Catalogue of the Batrachia Salientia s. Ecaudata in the collection of the British Museum (N.H.).* Wheldon & Wesley, London, XVI-503 pp.
Boulenger, G.A. (1920). *Monograph of the Lacertidae.* British Museum (N.H.), London 1: X-352.
Brelih, S. & Dzukic, G. (1974). *Catalogus Faunae Jugoslaviae. Reptilia.* Acad. Sci. Art. slov., Ljubljana, **4** (2): 1-33.
Breuil, M. & Thuot, M. (1983). Etho-ecology of neotenic alpine newt *Triturus alpestris montenegrinus* Radovanovic 1951 in Lake Bukumir (Montenegro, Yugoslavia): examination of lake communities features and proposal of an ecological determination for neoteny. *Prirod. Muz.,* Titograd, **16**: 85-96.
Brose, W. (1925). *Naturkundliche Streifzüge en den Ufarn des Ochridasees.* Bl. Aquar.-Terr. Kunde, Stuttgart, **36** (16): 417-430, (17): 462.
Bruno, S. (1969). Morfologia, distribuzione e biologia di *Elaphe situla* (Linnaeus, 1758) (Reptilia, Serpentes, Colubridae). *Atti Accad. Gioenia Sci. nat.,* Catania, **(7)** 1: 3-44, 2 pls.
Bruno, S. (1983). L'erpetofauna delle isole di Cres, Krk e Ada (Jugoslavia-Albania). *Bull. Ecol.,* Paris **19** (2-3): 265-281 (this paper was presented at the "Proceedings of the International Conference on Terrestrial and Freshwater Vertebrates from the Mediterranean Islands" held at Evisa, Corsica, between 10 and 16 October 1983).
Bruno, S. (1985). *Le vipere d' Italia e d'Europa.* Edagricole, Bologna, 270 pp.
Bruno, S. (1986). *Guida a Tartarughe e Sauri d'Italia.* Giunti Martello, Firenze, 256 pp.
Buresh, I. & Zonkow, J. (1932). Die Verbreitung der Giftschlangen (Viperidae) in Bulgarien und auf der Balkanhalbinsel. *Trav. Soc. bulg. Sci. nat.* Sofia, **15/16**: 189-206, 4 pls.
Buresch, I. & Zonkow, J. (1933). Untersuchungen Über die Verbreitung der Reptilien und Amphibien in Bulgarien und auf der Balkanhalbinsel. I Teil: Schildkrötten (Testudinata) und Eidechesen (Sauria). *Mitt. K. Naturwis. Inst.* Sofia, **6**: 150-207.
Buresch, I. & Zonkow, J. (1934). Untersuchungen Über die Verbreitung der Reptilien und Amphibien in Bulgarien und auf der Balkanhalbin sel. II Teil: Serpentes. *Mitt. K. Naturwis. Inst.* Sofia, **7**: 106-188.
Buresch, I. & Zonkow, J. (1941). Untersuchungen Über die Verbreitung der Reptilien und Amphibien in Bulgarien und auf der Balkanhalbin sel. III Teil: Schwanzlurche (Amphibia, Caudata). *Mitt. K. Naturwis. Inst.* Sofia, **14**: 171-237.
Buresch, I. & Zonkov, J. (1942). Untersuchungen Über die Verbreitung der Reptilien und Amphibien in Bulgarien und auf der Balkanhalbin sel. IV Teil: Froschlurche (Amphibia, Salientia). *Mitt. K. Naturwis. Inst.* Sofia, **15**: 88-154.
Calabresi, E. (1932). Anfibi e Rettili d'Albania. *Atti Accad. Sci. ven.-trent.-istr.,* Padova, **23**: 83-86.
Cei, G. (1943). Sopra una piccola raccolta erpetologica fatta dal Sig. L. Cardini nei dintorni di Butrinto (Albania). *Soc. tosc. Sci. nat., Proc. verb.,* Pisa, **52** (3): 35-39.
Cyren, O. (1909). Herpetologisches von einer Balkanreise. *Zool. Garten (Zool. Beob.), Frankfurt am Main,* **50** (1908): 265-271, 295-300.
Cyren, O. (1941). Beitrag zur Herpetologie der Balkanhalbinsel. *Bull. Inst. R. Hist. nat.* Sofia, **14**: 36-152, 6 pls.
Dani, P. (1970). Fauna e amfibëve në Myzeqe. *Bul. Shkenc. nat., Tiranë,* **(1)**: 39-43.
Dimovski, A. (1959). Beitrag zur Herpetofauna Mazedoniens. I. Teill. *Fragm. balc.,* Skopje, **3** (1): 1-4.
Dimovski, A. (1964). Beitrag zur Herpetofauna Mazedoniens. II Teil. *Fragm. balc.,* Skopje, **5** (4): 19-22.
Duméril, A.M.C., Bibron, C. & Duméril, A. (1854). *Erpétologie Générále ou Histoire Naturelle complete des Reptiles.* De Roret, Paris, **7** (1): 1-780, (2): 781-1536.

Dzukic, G. (1972). Herpetoloska zbirka prirodnjackog Muzeja u Beogradu. *Bul. Mus. Hist. nat.* Belgrade, (B) **27**: 165-180.

Ebner, R. (1913). Beiträge zur Herpetologie von Griechenland. *Verh. zool.-botan. Ges.* Wien, **63**: 307-314.

Emberger, L., Gaussen, H., Kassas, M., de Philippis, A. et al (1970). *Ecological study of the Mediterranean zone. Vegetation map of the Mediterranean zone. Explanatory notes.* UNESCO-FAO, Paris, 90 pp., 2 maps.

Fejérváry, G.J. de (1912). Uber *Ablepharus pannonicus* Fitz. *Zool. Jb. Syst.*, **33**: 542-574.

Fejérváry, G.J. de (1923). Exploratione zoologicae ab E. Csiki in Albania peractae. Pars 1. Batrachians and Reptiles. *Mag. Tudom. Akad. Balkan-Kutat. tudom. Eredm.*, Budapest, **1** (1): 7-65.

Frommhold, E. (1959). Als Tiergärtner und Herpetologe in Albanie. *Aquar. Terrar.*, **6**: 115-118, 144-147, 179-182, (214-217).

Fuhn, I.E. (1970). Uber die unterarten von *Ablepharus kitaibelii* (Bibron & Bory de St. Vincent, 1833). *Vestnik Cs. spol, zool.*, **34** (1): 9-17, 4 pls.

Gayda, H.S. (1940). Su alcuni anfibi e rettili dell'Albania esistenti nel Museo Zoologico di Berlino. *Atti Soc. ital. Sci. nat., Milano,* **79**: 263-272, 1 pl.

Haxhiu, I. (1980). Të dhëna paraprake mbi familjen Colubridae në Shqipëri. *Bul. Shkenc. nat.*, Tiranë, **(2)**: 85-91.

Haxhiu, I. (1981). Emërtime popullore të zvarranikëve. *Stud. filol.*, Tiranë, **(4)**: 209-217.

Haxhiu, I. (1985). Rezultate të studimit të breshkave të vendit tonë (Rendi Tustudines). *Bul. Shkenc. nat.*, Tiranë, **(2)**: 99-104.

Haxhiu, I. (1986a). Studim për bretkosat e gjelbra të vendit tonë. I. Të dhëna morfologjike të krahasuara ndërmjet *Rana lessonae* Cam., *R. ridibunda* Pall, dhe *R. esculenta* L. *Bul. Shkenc. nat.*, Tiranë, **(3)**: 47-55.

Haxhiu, I. (1986b). Studim mbi bretkosat e gjelbra të vendit tonë. II. Të dhëna krahasuese etologjike dhe bioekologjike per *Rana lessonae* Cam., *R. esculenta* L. dhe *R. ridibunda* Pall. *Bul. Schkenc. nat.*, Tiranë, **(4)**: 79-84.

Haxhui, I., Alimehilli, G. (1987). Emertime të Amfibëve në shqipen popullore. *Stud. filolok.*, Tiranë, **(1)**: 185-189.

Haxhiu, I., Bake, A. (1988). The Viper. The species indigenous in Albania. Their virulence and protection against them. *Shkenca dhe Jeta,* Tiranë, **(3)**: 82-83.

Hotz, H. (1983). *Genic diversity among water frog genomes inherited with and without recombination.* Zentralstelle der Studentenschaft, Universität Zürich, 136 pp.

Hotz, H. & Uzzell, T. (1982). Biochemically detected sympatry of two water frog species: two different cases in the Adriatic Balkans (Amphibia, Ranidae). *Proc. Acad. nat. Sci. Philadelphia,* **(143**: 50-79.

Hotz, H. & Uzzell, T. (1983). Interspecific hybrids of *Rana ridibunda* without germ line exclusion of a parental genome. *Experientia,* Basel, **39**: 538-540.

Hotz, H., Mancino, G., Bucci-Innocenti, S., Ragghianti, M., Berger, L. & Uzzell, T. (1985). *Rana ridibunda* Varies Geographically in Inducing Clonal Gametogenesis in Interspecies Hybrids. *Jour. exper. zool.*, **236**: 199-210.

Hotz, H., Uzzell, T., Günther, R., Tunner, H.G., Heppich, S. (1987). *Rana shqiperica,* a new European water frog species from the Adriatic Balkans (Amphibia, Salientia, Ranidae). *Notul. natur. Acad. N. Sci. Philadelphia,* **468**: 1-3.

Jablokov, A.V. (1976). *Prytkaja Jascerica* (Lacerta agilis). Nauka, Moskva, 374 pp.

Kammerer, P. & Wettstein, O. (1928). *Der artenwandel auf Inseln und seine ursachen ermittelt durch Vergleich und Versuch an den Eidechsen der Dalmatinischen Eilande, Zur systematik der Adriatischen, Insel-Eidechsen.* F. Deuticke, Wien and Leipzig, XIV-324 pp., 8 pl.

Karaman, S. (1928). Prilog Herpetologiji Jugoslavije. *Glasn. skopsk. nauc. dr., Skoplje,* **4**: 129-143.

Karaman, S. (1939). Uber die Verbreitung der Reptilien in Jugoslavien. *Ann. Mus. Serb. merid.*, Skoplje, **1**(1): 1-20.

Kattinger, E. (1972). Beiträge zur Reptilienkunde der südwestlichen Balkanhalbinsel. *Ber. Naturf. Ges. Bamberg,* **47**: 42-75.

Kemal Vlora, A. (1978-1979). La nuova Albania. Lineamenti fisici, antropoci ed economici. *L'Universo,* Firenze, **58** (5): 881-936, (6): 1209-1256, 1978 **59** (1): 65-121, 1979.

Klaptocz, A. (1910). Beiträge zur Herpetologie der europäischen Türkei. *Zool. Jhb. Syst.*, **29** (3/4): 415-421.

Kopstein, F. & Wettstein, O. (1921). Reptilien und Amphibien aus Albanien. *Verh. zool.-bot. Ges.* Wien, **70** (1920): 387-457.
Kramer, E. (1961). Variation, Sexualdimorphismus, Wachstum und Taxionomie von *Vipera ursinii* (Bonaparte, 1835) und *Vipera kaznakovi* Nikolskij, 1909. *Rev. suisse Zool.*, Genève, **68** (4): 627-722, 3 pls.
Lantz, L.A. (1926). Notes sur *Lacerta riveti* Chabanaud. *Bull. Soc. zool. Fr.*, Paris, **51**: 33-44.
Mancino, G. (1988). Barriere riproduttive e speciazione nel genere *Triturus* (Anfibi: Urodeli). *U.Z.I., II probl. biol. della specie*, Modena, **1**: 211-237.
Mantegazza, V. (1912). *L'Albania*. Bontempelli & Invernizzi, Roma, 277 pp., 4 map.
Markgraf, F. (1927). An den Grenzen des Mittelmeergebietes. Pflanzengeographie von Mittelalbanien. *Rep. spec. nov. Regn. veget.*, Berlin, **45**: 1-217, 19 pls., 1 map.
Markgraf, F. (1932). Pflanzengeographie von Albanien ihre bedeutung für vegetation und flora der Mittelmerländer. *Biblioth. botan.*, Stuttgart, **105**: 1-132, 7 pls., 1 map.
Matvejev, S. (1961). Biogeografija Jugoslavije. Osnovni principi. *Biol. Inst. N. R. Srbije*, Beograd, **9**: 1-232, 1 map.
Meek, R. (1984). Amphibians and Reptiles in Montenegro, Yugoslavia. *Brit. herpet. Soc. Bull.*, London, **9**: 43-49.
Mertens, R., Müller, L. (1928). Liste der Amphibien und Reptilien Europas. *Abh. senckenberg. naturf. Ges.*, Frankfurt am Main, **41**: 1-62.
Mertens, R., Müller, L. (1940). Die Amphibien und Reptilien Europas. *Abh. senckenberg. naturf. Ges.*, Frankfurt am Main, **451**: 1-56.
Mertens, R., Wermuth, H. (1960). *Die Amphibien und Reptilien Europas (Dritte Liste, nach dem Stand von 1 Januar 1960).* W. Kramer, Frankfurt am Main, XI-264 pp.
Müller, P. (1981). *Arealsysteme und Biogeographie.* Ulmer, Stuttgart, 704 pp.
Polunin, O. (1980). *Flowers of Greece and the Balkans, a field guide.* Oxford University, Oxford, XVI-592 pp.
Parenzan, P. (1932). Revisione delle specie del Gen. *Testudo* della Balcania. *Atti R. Ist. ven Sci. Lett. Art.*, Venezia, **91** (1931-1932): 1149-1169, 5 pls.
Parenzan, P. (1933). Relaxione su due spedizioni scientifiche in Albania (1929-1930). *Riv. Fis. Mat. Sci. nat., Napoli*, **7** (8-10): 1-43 (paper).
Pozzi, A. (1966). Geonemia e catalogo ragionato degli Anfibi e dei Rettili della Jugoslavia. *Natura*, Milano, **57** (1): 5-55.
Radovanovic, M. (1951). *Vodozemci i Gmizavi Nase Zemlje (Amphibien und Reptilien Jugoslaviens).* Naucna Knjiga, Beograd, 250 pp.
Radovanovic, M. (1964). Die Verbreitung der Amphibien und Reptilien in Jugoslawien. *Senckenberg. biol.*, Frankfurt am Main, **45** (3/5): 553-561.
Rechinger-Moser, F., Wettstein, O. & Beir, M. (1959). *Was finde ich in Italien, an den Mittelmeerküsten Frankreichs, Spaniens und des Balkans?* Franckh'sche, Stuttgart, 220 pp.
Saint Girons, H. (1978). Morphologie externe comparée et systématique des Vipères d'Europe (Reptilia, Viperidae). *Rev. suisse Zool.*, Genève, **85** (3): 565-595, 2 pls.
Saint Girons, H. (1982a). Influence des climats de type méditerranéen sur l'écophysiologie et la répartition des Reptiles. *Ecol. mediter.*, Marseille, **8** (1/2): 245-252.
Saint Girons, H. (1982b). Remarques générales sur la biogéographie des reptiles méditerranèens. *P. Cent. pir. Biol. exp.*, 13: 111-115.
Schmidtler, J.J., Schmidtler, J.F. (1983). Verbreitung, Okologie und innerarliche Gliederung von *Triturus vulgaris* in adristischen küstengebieten. *Spixiana*, Munchen, **6** (3): 229-249.
Schneider, H., Sofianidou, T.S. & Kyriakopoulou-Sklavounou, P. (1984). Bioacoustic and morphometric studies in water frogs (genus *Rana)* of Lake Ioannina in Greece, and description of a new species (Anura, Amphibia). *Z. zool. Syst. Evolut.-forsch.*, Hamburg and Berlin, **22** (4): 349-366.
Schreiber, E. (1912). *Herpetologia europaea. Eine systematische Bearbeitung der Amphibian und Reptilien welche bisher in Europa aufgefunden sind.* G. Fischer, Jena, X-960 pp.
Siebenrock, K.F. (1906). Zur Kenntnis der mediterranea Testudo-Arten und Über ihre Verbreitung in Europa. *Zool. Anz.*, Leipzig, **30**: 847-854.
Spurway, H. (1953). Genetics of specific and subspecific differences in european newts. *Symp. Soc. exp. Biol.*, 7: 200-237.

Stepanek, O. (1937). *Gymnodactylus kotschyi* und sein Rassenkreis. *Archiv. naturw.*, Leipzig, **6** (N.S.): 258-280.
Steward, J.W. (1969). *The Tailed Amphibians of Europe.* David & Charles, Newton Abbot, 180 pp.
Tomaselli, R. (1980). *Carte des alliances phytosociologiques forestieres en climat mediterraneen.* M.A.F. & A.A.F.R.S., Palermo, 14 pp., 1 map.
Thorn, R. (1969). *Les salamandres d'Europe, d'Asie et d'Afrique du Nord.* P. Lechevalier, Paris, 376 pp.
Tunner, H.G. & Heppich, S. (1982). A genetic analysis of water frogs from Greece: evidence for the existence of a cryptic species. *Z. zool. Syst. Evolut.-forsch.*, Hamburg and Berlin, **20** (3): 209-223.
Walter, H. (1985). *Vegetation of the Earth and Ecological Systems of the Geo-biosphere.* Springer, Berlin, etc., XVI-318 pp.
Werner, F. (1912). *Brehms Tierleben, Lurche und Kriechtiere-Erster Band.* Bibliographisches Institut, Leipzig and Wien, XVI-572 pp.
Werner, F. (1918a). Zur Kenntnis der Reptilenfauna von Südalbanien. *Bl. Aquar.-und Terr. Kunde*, Stuttgart, **29** (21): 250-251.
Werner, F. (1918b). Uber Reptilien und Amphibien aus Albanien gesammelt von Prof. R. Ebner and Dr. H. Karny im Sommer 1918. *Archiv. naturgesch.*, **84** (10): 140-150.
Werner, F. (1920). Zur Kenntnis der Reptilien-und Amphibienfauna Albaniens. *Zool. Anz.*, Leipzig, **51** (1/2): 20-23.
Werner, F. (1938). Die Amphibien und Reptilien Griechenlands. *Zoologica*, Stuttgart, **35** (94): 1-117.
Wolterstorff, W. (1923). Überficht der Unterarten und Formen des *Triton cristatus* Laur. *Bl. Aquarr.-Terrar. Kunde*, Stuttgart, **34** (5): 120-126.
Wolsterstorff, W. (1925). Katalog der Amphibien-Sammlung im Museum für Natur-und Heimatkunde zu Magdeburg. Erster Teil: Apoda, Caudata. *Abh. Ber. Mus. Nat.-u. Heimatk. naturw. Ver.* Magdeburg, **4** (2): 231-310.

ELAPHE MANDARINA (CANTOR 1842): A PROGRESS REPORT ON A PROBLEMATIC SPECIES IN CAPTIVITY

TREVOR SMITH
3 Juniper Close, Greasby, Wirral L49 3QX, UK

INTRODUCTION

Elaphe mandarina is considered by many herpetologists to represent the 'jewel in the crown' of Asian ratsnakes. It has also been the cause of much consternation as *E. mandarina* commonly languishes in captivity and often dies quickly. It is impossible to confuse *E. mandarina* with any other species. Their patterns and colours are unique and extremely distinctive. In appearance *E. mandarina* is typically grey with dramatic black saddles, each of which contains a bright yellow centre, bordered by yellow. The effect of this beautiful combination of colour and pattern is heightened by the polished appearance of the smooth scales. There can be a great variation between specimens and the grey body colour can show traces of red scales. Sometimes this occurs to an extensive degree and the animal appears to become bright reddish brown. The saddles are also variable in shape and intensity of pigment between specimens. Typically these saddles are diamond shaped and uniform; they can be so pronounced, however that they almost form tranverse crossbands, or so weak that the yellow pigment breaks through forming lacy patterns. There appear to be no geographical correlations regarding these variations. Specimens collected from one locality can exhibit a wide range of pattern and colour characteristics. The head is dramatically patterned with black bands, forming a typical 'bandit's mask and moustache' arrangement. The ventral surface is chequered with black, grey and white pigment. *E. mandarina* is a medium sized Colubrid, growing to lengths in excess of 1m; its body form suggests a semi-fossorial life style. In its most attractive colour phases, *E. mandarina* rivals any of the *Lampropeltis* 'tri colour' complex for aesthetic beauty.

There is little useful literature appertaining to natural history, biotope and captive care for *E. mandarina* and regimes devised on its behalf have amounted to little more than intelligent guesswork. After maintaining a pair of *E. mandarina* with limited success for a period of six months I decided to submit an appeal to keepers of this species via society journals in Britain, Europe and America. The aim of this appeal was to determine the current status of *E. mandarina,* assess common factors regarding successful husbandry and disseminate this information in the form of an article. Many positive responses were received and this article represents a synopsis of this new information, supplemented by my own observations and conclusions. I hope that enthusiasts who are currently maintaining *E. mandarina,* or who are considering this enigmatic species, will find some useful information here.

NATURAL HISTORY

The range for *E. mandarina* has been given as Upper Burma, South China (including Chekiang, Fukien, Kwangtung, Kweichow, Szechwan), North Vietnam (including the apparently fertile region for *Elaphe* sp., Tong King). (Pope, 1935; Smith, 1931).

It is acknowledged as a montane species occuring at elevations of 700-2300m. Little is known of *E. mandarina's* habits; high lying mountain woods are given as typical habitat, especially in the vicinity of water, (lakes, etc.) By examining the habits of related species *(E. perlacea, E. conspicillata)* it is speculated that *E. mandarina* inhabits rodent burrows, also tunnelling beneath rocks and logs, and particularly matted grass.

Preferred prey items include small mice, voles and shrews.

Specimens are often nervously aggressive and extremely shy. Individuals can be decidedly feisty, striking and vibrating their tails; this may be considered a desirable trait when acquiring wild stock, as it is likely to reflect vigour.

SYSTEMATICS

There is common reference to *E. m. takasago* (Maki 1931) as a distinct subspecies, restricted in its range to Taiwan. Reddish coloured specimens have been wrongly attributed to this form. The three specimens collected apparently possessed higher ventral scale counts than the mainland forms and were similar in colour to specimens collected from Fukien.

As far as I can discover, these are the only records for *E. mandarina* on Taiwan. This species has apparently not been recorded prior to, or subsequent to Maki's discovery and this may challenge its credibility.

The most closely related species to *E. mandarina* are *E. perlacea* (Stejneger 1929) and *E. conspicillata.* They are found in Szechwan and Japan respectively. Neither species possesses the attractive markings of *E. mandarina,* but are similar in body form, habits and scutellation. The dramatic head patterns are similar in all three species.

CARE IN CAPTIVITY

A number of elaborate environmental regimes have been devised for *E. mandarina.* These have included naturalistic arrangements, outdoor vivaria, 'sweater box' type accommodation and foam rubber sheeting. A variety of substrates have been incorporated including soil, peat, bark mulch, sphagnum moss, pine shavings, vermiculite, etc. These have been selected to accomodate *E. mandarina's* fossorial habits.

There have also been many experiments regarding heating, lighting and humidity.

The consistent factors for successful maintenance appear to be:

a) Security
The psychological needs of *E. mandarina* are such that it requires to feel totally secure before offering a positive feeding response. This has been accomplished by a number of means.

1. Loose substrates (for burrowing purposes).
2. Natural substrates with secure hiding sites.
3. Foam rubber (specimens hide and feed between sheets of foam).
4. Minimal disturbance.

b) Temperature
E. mandarina is a montane species which requires cooler conditions than typically associated with *Elaphe* sp. 'Hot spots' can be provided within the vivarium, but in conjunction with much cooler areas.

Hatchlings have also been successfully raised at lower temperatures, although they appear to be more adaptable in this respect, with specimens thriving under conditions provided for other Colubrid juveniles.

Most sources quote a temperature range of 20-27°C (day), 16-20°C (night). The ideal temperature considered by certain keepers is 25°C. When temperatures approach 29°C *E. mandarina* becomes very reluctant to feed.

It is possible to provide temperature gradients also. The ambient temperature in one keeper's vivarium was 27°C, while readings taken from hiding sites indicated 23-25°C. Heat tapes/ cables restricted to one end of a vivarium have also been employed with success.

c) Humidity
Humidity is a poorly researched aspect of reptile husbandry. The indications are that *E. mandarina* requires a damp environment. This has been achieved in a variety of ways, most commonly by providing permanently moist areas within the vivarium (a minimum of 25% floor area has been recommended). Again hatchlings are less demanding in this respect.

d) Feeding
E. mandarina possesses a light appetite and a preferrence for small prey items. "Pink" or

"fuzzy" mice and "pink" rats are the most frequently accepted food items, with certain individuals accepting weaned mice. Attempts to feed other prey items in captivity (e.g. amphibians) have been largely unsuccessful. Live prey is sometimes demanded by imported specimens. I have found them to react badly to forcefeeding attempts.

e) Lighting

The role that lighting plays in the successful husbandry of *E. mandarina* is speculative. Certain specimens remain entirely nocturnal, whereas others will regularly bask, especially in the early morning. Certain enthusiasts have felt that U.V. lighting has been beneficial, while others consider its influence to be inconsequential. My own experiments in this respect did not reach any firm conclusions.

f) Health

The acquisition of healthy specimens is an obvious prerequisite for the successful maintenance of *E. mandarina,* or any species. For such a shy and specialised animal the route *E. mandarina* must take before arriving in a collection represents an extremely stressful experience. This may lower their resistance to disease and parasitic burdens. Importers/exporters frequently house species from different global localities within close proximity and a degree of cross infection can also be anticipated. Factors which adversely affect the health of specimens often confound the efforts of enthusiasts.

Problems which have been related have included dehydration, endo & ecto parasites, enteric necrosis, amoebic dysentery, bacterial infections and suspected organ removal. There have also been doubts raised over whether the disease or the 'cure' eventually killed certain specimens. Dehydration appears to be one of the major problems encountered by herpetologists. Individual specimens have suffered dehydration to the degree that they are beyond redemption, with certain organs being extensively damaged.

Recently imported specimens frequently experience problems with sloughing. One particular keeper found a specimen to have two previous sloughs still adhering to its body. Warm water soaking appears to be effective in cases such as these.

Oxfendazole and Levamisole HCL have proved effective in the treatment of worms, however one specimen developed a secondary bacterial infection after treatment (Golder, 1974). This condition responded to treatment with Spectinmycin.

Although commonly alluded to, the practice of organ removal from live snakes before export (a practice personally witnessed by myself in a Chinese village) has not been substantiated by post mortem records. Veterinary advice I have received on the subject suggests that snakes thus mutilated (for their gall bladders) could survive for up to two months, and would exhibit the symptoms reported.

From my own observations it would appear that specimens of *E. mandarina* which have been imported into Britain recently have displayed an improvement in their physical condition. There are also more frequent shipments of this species it seems. I am aware of a number of recently imported animals which have adapted well to captivity and their potential is promising. However, specimens such as these remain in the minority and are easily outnumbered by specimens which have languished and eventually expired over a similar period.

To summarise, the most consistent factors appear to be: Secure hiding sites; cool conditions; high humidity; small prey items; naturalistic furnishings.

BREEDING

As with many species it appears that captive bred *E. mandarina* present few, if any, of the problems associated with their wild caught counterparts. All indications are that they are hardy, adaptable and thrive in similar conditions to those provided for other *Elaphe* juveniles. They remain, of course, at a premium, but inevitably more will be produced each year and will eventually become available to herpetologists in limited numbers. Most examples of captive born specimens are the result of imported females which have been gravid before purchase. There appears to be a high incidence of fertility associated with eggs laid in this manner, with 100% hatch rates being regularly recorded. I have heard of only one report where raising the resulting hatchlings has proved problematic.

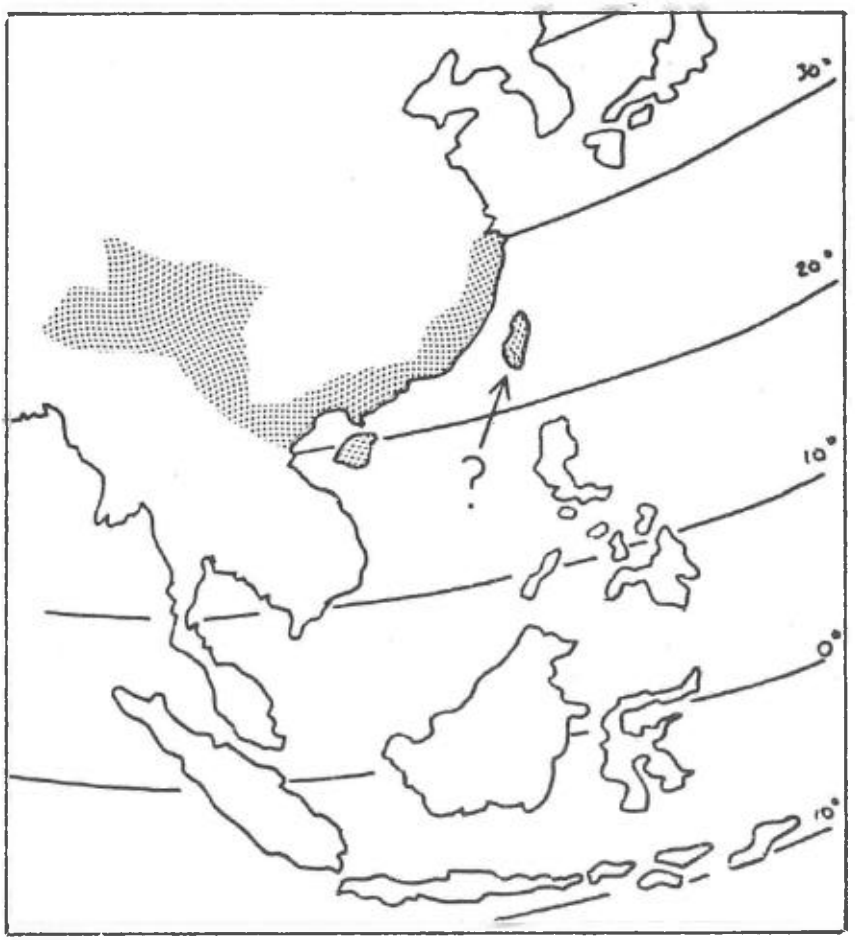

Fig. 1. Distribution of *Elaphe mandarina*

To my knowledge there has only been one incidence of true captive breeding with *E. mandarina*. This was accomplished by Bill Gillingham of California in 1988. Bill acquired two pairs of long term captive specimens via three other keepers (initiated by Mike Nolan), which had been in captivity since 1982. It is not unusual for species from highly seasonal environments to take a number of years to readjust their cycles before breeding behaviour can resume. Romer states a case where a pair of *E. porphyracea nigrofasciata* required nine years of captivity before breeding. Originally four specimens (2.2) were obtained in May 1987 and were housed separately for their first month. One of the females died from a respiratory infection during this period. The remaining animals were housed together in June 1987. The vivarium consisted of an all glass tank arranged in a 'naturalistic' manner. The substrate consisted of damp bark mulch and sphagnum moss; this was decorated with living plants and pieces of slate afforded hiding sites. Illumination was provided by a four foot "Grolux" tube. The room was space heated to 26°C, with a 4-5°C drop at night. Temperature readings taken from beneath the slate pieces indicated cooler conditions of about 22°C. All three snakes shared one primary hiding site. "Pink" and "fuzzy" mice were scattered within the vivarium during the evening and would be eaten overnight.

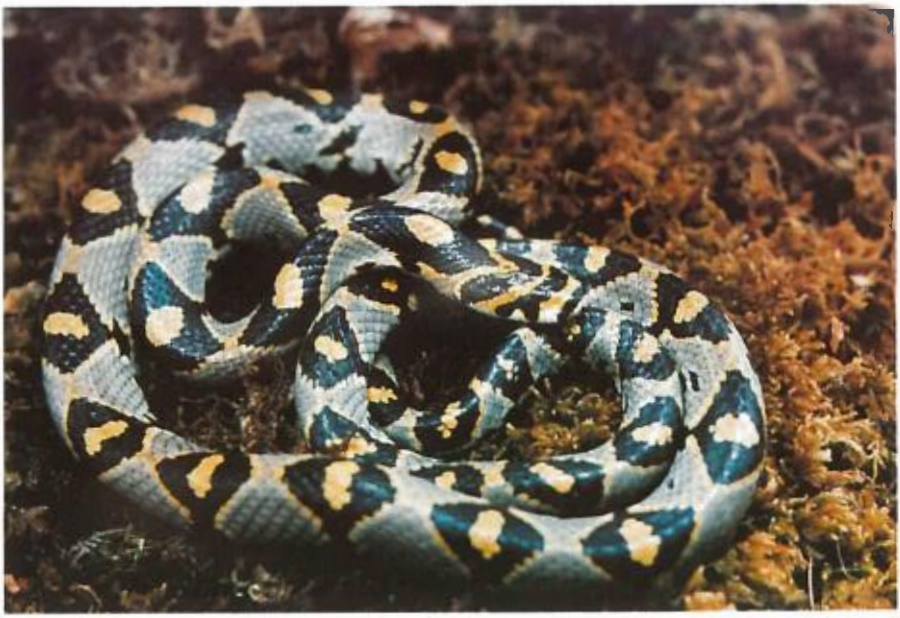

Plate 1. Adult *Elaphe mandarina* (Bill Gillingham)

Plate 2. Hatching *Elaphe mandarina* **(Bill Gillingham)**

The room was cooled during winter to 15.5-12°C. Heating was gradually re-instated from February onwards and feeding was resumed in March. By late March the female began to exhibit physical signs that she may be gravid. One of the males was not allowed to share the primary hiding site at this time. By April it was confirmed that she was indeed gravid. The post coital slough occurred on May 27th and the female was transferred to a plastic box containing damp vermiculite. Six eggs were laid on June 7th (eleven days after post-coital slough), which were removed for incubation. Incubation temperatures ranged from 27°C (day) to 24°C (night), lower than were provided for the other colubrids which were reproducing in the same room (28.3°C). Despite this cooler incubation regime the first egg began to hatch on July 26th, 49 days after being laid. The remaining eggs all hatched over a 36 hour period.

The hatchlings were identical to their parents and represented a perfect sex ratio of 3/3. They weighed 10-12 grams each and their total lengths were 30cm. Their neonatal skins were sloughed on August 4/5th (9 days after hatching) and they began to feed on "pink" mice without problems. The juveniles were raised in individual plastic boxes, containing damp bark mulch (later replaced by aspen bedding), a piece of bark as a hiding site and a small water bowl. A feeding regime of one "pink" mouse every 4-6 days was introduced; meals which were too large were rejected. They have continued to thrive and have attained lengths of 50cm after six months.

Factors which have contributed to true Captive Breeding

a) Well acclimated and conditioned adults.
b) Favourable environmental and psychological conditions.
c) Hibernation.

Table 1. Breeding information

Source (keeper)	Clutch Size	Hatch Rate	Inc. Temp.	Inc. Period	Sex Ratio	Feeding
Gillingham	6	100%	24-27°C	49-52 d	3.3	+
Gillingham	2	100%	25.5.-27.7°	54 d	0.2	+
Bartz	N/K	N/K	N/K	N/K	1.0	+
Nolan	N/K	N/K	N/K	N/K	2.1	+
Schultz	N/K	N/K	N/K	N/K	3.2	+
Muezenmeir	6 + 5	100%	N/K	N/K	N/K	-

N/K = Not known

CONCLUSIONS AND COMMENTS

E. mandarina is arguably the most desirable Asian ratsnake in collections due to its beautiful colours and patterns. It is also one of the most demanding species to maintain successfully in captivity.

Wild caught specimens typically present problems regarding feeding, health and stress. Young specimens are more adaptable and less problematic than adults. Captive bred/born specimens present few, if any, problems, adapting well to captive conditions and feeding satisfactorily. Breeding captive reared specimens should be unproblematic.

E. mandarina exhibits variations in both colour and pattern. It is a montane species which requires cooler conditions than typically associated with *Elaphe* sp. It requires higher humidity levels than typically associated with *Elaphe* sp. It requires a high degree of security. Specimens are frequently aggressive.
E. mandarina possesses a light appetite and prefers small prey items. Specimens which feed voluntarily often do so on "pink", "fuzzy" or freshly weaned mice, or "pink" rats.

Breeding has been achieved following a prolonged period of captivity and hibernation.

As I had long suspected, the problems typically associated with *E. mandarina* have dissipated with the advent of an F.I generation.
A small populationn of captive raised juveniles are now in existence and represent a viable

gene pool for future breeding programmes. This population will inevitably increase over subsequent years through the accomplishment of true captive breeding, and the further acquisition of gravid females from the wild. These specimens should establish a foundation of healthy, vigorous stock which will adapt well to captivity, and hopefully breed as reliably as other members of the genus. This can only represent a welcome development due to the desirability of *E. mandarina*, and in providing a viable alternative to imported animals.

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REFERENCES

Fleck, J. (1985). Bemerkungen zur Haltung von *Elaphe mandarina*. *Salamandra* **21**, 157-160.

Golder, F. (1974). Zur kenntnis von *Elaphe mandarina*. *Salamandra*. **10**, 22-26.

Maki, kM. (1931). A monograph of snakes of Japan pp 105-107. Tokyo.

Pope, C.H. (1935). *The Reptiles of China*, New York. American Museum of Natural History.

Romer, J.D. (1979). Captive care and breeding of a little known Chinese snake *(Elaphe porphyracea nigrofasciata). International Zoo Yearbook.* (**9**, 92-94.

Schulz, K.D. (1989). Asian Rat Snakes of the *Elaphe* genus. Part XII, *Elaphe conspicillata* (Bole 1826). *The Snakekeeper*, Feb. 1989.

Smith, M.A. (1931). *The fauna of British India, Ceylon and Burma, including the whole of the Indo-Chinese Subregion.* Vol. IV, Reptilia and Amphibia: Serpentes. Taylor & Francis, London.

Stejneger, (1925). Chinese amphibians and reptiles in the United States National Museum. *Proceedings of the U.S. National Museum, Washington,* **66**, 84.

NOTES ON REPTILES AND AMPHIBIANS OF NORTHEASTERN GREECE AND THE ISLAND OF SAMOTHRAKI

DAVID BUTTLE

2 Manchester Place, Norwich NR2 2SH, England

INTRODUCTION

The northeastern Greek mainland was visited for seventeen days, 31st May to 16th June 1988, during which sixteen reptile and four amphibian species were observed. A further four days, 18th to 21st June, were spent on the northeast Aegean island of Samothraki, resulting in nine reptile and two amphibian species being recorded. On several days, particularly during the latter part of the trip, mid day air temperatures exceeded 30°C and consequently searching proved more productive during the cooler hours of early morning and late afternoon.

A checklist of the Greek reptiles and amphibians was presented by Ondrias (1968), much of it based on records in the classic works of Werner (1938) and Wettstein (1953, 1957). More recently Chondropoulos has been working on an updated checklist of Greek reptiles, the first part of which, on the lizards, was published in 1986. A comparitively small amount of recent research has been carried out in the northeastern Greek mainland and the herpetofauna of the large northeast Aegean islands, including Samothraki, has received little attention.

PRINCIPAL SITES

The locations of the eight mainland areas investigated and Samothraki island are shown in Figure 1.

AREA 1 Filippi. Dry rocky hills near ancient ruins.

AREA 2 Kavalla. Well vegetated rocky hillsides and agricultural areas to the east of town.

AREA 3 Nestos river. Well vegetated river banks. Also rocky scrub covered hills near villages of Toxotes and Galani.

AREA 4 Kutson. Cultivated fields and marshy areas west of Lake Vistonis.

AREA 5 Xylagani. Dry scrub covered hillsides.

AREA 6 Aratos. Well vegetated and agricultural land near river.

AREA 7 Makri. Small irrigated fields (mainly olives) with dry stone walls. Dry scrub covered rocky hills.

AREA 8 Lutros. Marshy area and cultivated land with irrigation rivers to south-east near Evros delta. Also dry stony large riverbed with small river south-west of Lutros.

SAMOTHRAKI
Dry rocky scrub in west and south of island. Low mountainous areas with small wooded valley streams near Hora (Samothraki) village.

SPECIES LIST

BUFONIDAE

Bufo viridis Laurenti 1768. Green Toad

Vast numbers of recently metamorphosed juveniles beside small river in wide dry riverbed of area 8. Juveniles equally abundant edges of fields in area 4. So numerous in places at both localities that care had to be taken to avoid stepping on them walking. Juveniles also common at area 6 in small marshy wood. Single adult found at area 3 buried under rock in moist sand. Adult found dead on road in village of Samothraki.

FIGURE 1

HYLIDAE

Hyla arborea (Linnaeus 1758). Common Tree Frog

At area 8 young specimens of 25-30mm abundant in low vegetation, reeds and bushes beside the river. Several of similar size found at area 4 beside irrigation canal.

RANIDAE

Rana dalmatina (Bonaparte 1840). Agile Frog

Adult of a pale grey ground colour found at area 3 in small wooded area near stream.

Rana ridibunda (Pallas 1771). Marsh Frog

Common in suitable habitats in areas 3, 4, 5, 6, 7, 8, several seen on Samothraki, tadpoles in area 2. Extremely variable:- green with dark spots; brown with dark spots and green vertebral stripe; the majority basically brownish with dark spots.

EMYDIDAE

Emys orbicularis (Linnaeus 1758). European Pond Terrapin

Numerous at areas 4 and 8, several at area 6. In area 8 three *E. orbicularis* together with three *Mauremys caspica* found dead in small stretch of water next to which were abandoned empty containers of agricultural chemicals.

Mauremys caspica (Gmelin 1789). Stripe-necked Terrapin

Numerous at areas 4 and 8, common at area 7 where it was often seen in small concrete irrigation channels. Several seen at area 6 and on Samothraki, a few seen in areas 2 and 3. At the three localities where it was sympatric with *E. orbicularis* the two species were to be found in roughly equal numbers.

TESTUDINIDAE

Testudo graeca (Linnaeus 1758). Spur-thighed Tortoise

Six found at area 3, four at area 1, three at area 7, two at areas 2 and 8, one at areas 4 and 6. Six found on Samothraki including a 28cm specimen.

Testudo hermanni (Gmelin 1789). Hermann's Tortoise

Twelve found at area 6, nine at area 3, eight at area 5, seven at area 7, two at area 8. Sixteen of the thirty eight specimens examined (42%) had only single instead of the paired supracaudals usually typical of this species. All had the large scale on tail tip absent in *T. graeca* (Arnold et al 1978). The populations and ecology of the two sympatric tortoise species in N.E. Greece has recently been studied by Hailey (1988), Hailey, Wright & Steer (1988), Wright (1988).

GEKKONIDAE

Hemidactylus turcicus (Linnaeus 1758). Turkish Gecko

Two adults active during evening in rented room at Kamariotissa on Samothraki.

ANGUIDAE

Ophisaurus apodus (Pallas 1775). European Glass Lizard
Two found at area 3, single specimens at areas 1, 2 and 7.

LACERTIDAE

Lacerta trilineata (Bedriaga 1886). Balkan Green Lizard
Often difficult to distinguish from *Lacerta viridis* in the field (see Frör, 1979). Several specimens identified as this species were seen in areas 1, 2, 5, 6, 7, 8 and on Samothraki.

Lacerta viridis (Laurenti 1768). Green Lizard
Common in area 7 and particularly beside the Nestos river in area 3. Quite common on Samothraki. Several seen in areas 4 and 8, a few in area 6. Apparently more abundant than *L. trilineata*, noticeably so in moister habitats.

Ophisops elegans (Ménétriés 1832). Snake-eyed Lizard
Seen in dry rocky areas with sparse vegetation, three at areas 1, 3, 5 and 7, two at area 2.

Podarcis erhardii (Bedriaga 1882). Erhard's Wall Lizard
A predominantly brown small *Lacerta* with light dorsolateral stripes seen on stony scrub covered hillside 1km N.W. of Hora on Samothraki. The subspecies *P. e. riveti* occurs on the island (Chondropoulos, 1986).

Podarcis muralis (Laurenti 1768). Common Wall Lizard
Single adult seen on tree shaded rocks beside mountain stream south-east of Paleopoli on Samothraki. Dark greenish brown dorsal with dark spots. The nominate form *P. m. muralis* is found on the island (Werner, 1938). Likely to replace *P. erhardii* at higher altitudes and in more humid habitats (Arnold et al 1978).

Podarcis taurica (Pallas 1814). Balkan Wall Lizard
Quite common on riverside grassy banks and field edges in area 8, two seen in roadside verges at area 4.

TYPHLOPIDAE

Typhlops vermicularis (Merrem 1820). Worm Snake
Three found in area 7, two in areas 2 and 3. All revealed by turning large rocks, two amongst the nests of ants which, with their larvae, are preyed upon by this fossorial snake.

BOIDAE

Eryx jaculus (Linnaeus 1758). Sand Boa
Young specimen of 29cm total length found under rock in centre of small rock scree on dry stony slope in area 7 between olive fields and coast. Buff ground colour with light brown dorsal blotches which broke up laterally.

COLUBRIDAE

Elaphe longissima (Laurenti 1768). Aesculapian Snake
A slender dark brown snake of 120cm approx. with small white flecks on scale edges was observed at close quarters moving slowly on the top of dense scrub. Although the head was not seen and the snake evaded capture, being familiar with captive specimens, I felt confident of its identity. Found on a lightly wooded, dry, rocky slope just N. of Hora on Samothraki (19.6.88). Not previously recorded from the island (Ondrias 1968, Dimitropoulos, pers. comm. 1988).

Elaphe situla (Linnaeus 1758). Leopard Snake
A 65cm approx. specimen found in partly collapsed dry stone wall between olive fields in area 7. Typical pattern of black edged reddish brown blotches on grey ground colour.

Malpolon monspessulanus (Hermann 1758). Montpellier Snake
Two adults found in areas 3, 6 and 7, one in area 5 and on Samothraki, sloughed skins areas 2 and 8. Found in variable habitats, probably the most common of the Greek snake species.

Natrix natrix (Linnaeus 1758). Grass Snake
Five found beside the river in area 8, one in areas 2 and 3. Three from area 8 lacked the

dorsolateral stripes usually associated with *N. natrix* in south-east Europe. The subspecies *persa* occurs in both striped and unstriped phases in mainland Greece (Dimitropoulos, 1986).

Natrix tessellata (Laurenti 1768). Dice Snake
Common at area 8 where eight were found, single specimens in areas 3 and 6. In the author's experience shows a preference for clear rivers and streams with stony or rocky banks.

TABLE 1

Summary of reptile and amphibian species observed in northeastern Greece and the island of Samothraki (S) and their localities.

	SITES								
SPECIES	1	2	3	4	5	6	7	8	S
Bufo viridis			X	X		X		X	X
Hyla arborea				X				X	
Rana dalmatina			X						
Rana ridibunda		X	X	X		X	X	X	X
Emys orbicularis				X		X		X	
Mauremys caspica		X	X	X		X	X	X	X
Testudo graeca	X	X	X	X		X	X	X	X
Testudo hermanni			X		X	X	X	X	
Hemidactylus turcicus									X
Ophisaurus apodus	X	X	X				X		
Lacerta trilineata	X	X			X	X	X	X	X
Lacerta viridis			X	X		X	X	X	X
Ophisops elegans	X	X	X		X		X		
Podarcis erhardii									X
Podarcis muralis									X
Podarcis taurica				X				X	
Typhlops vermicularis		X	X				X		
Eryx jaculus							X		
*Elaphe longissima**									X
Elaphe situla							X		
Malpolon monspessulanus		X	X		X	X	X	X	X
Natrix natrix		X	X					X	
Natrix tessellata			X			X		X	

*Slight doubt. The definite occurence of *E. longissima* on Samothraki requires confirmation.

DISCUSSION

The twenty species found in the mainland areas investigated are, for the most part, typical and widespread representatives of the Greek herpetofauna. An exception is *Ophisops elegans* which has a limited distribution in northeast Greece. As far as is known to the author the specimens found at Filippi (area 1) are likely to represent the approximate westernmost limit of this lizard's present range in Greece(see map in Arnold et al. 1978, Darewskij & Beutler, 1981). The high number of *Testudo hermanni* with only single supracaudals is of interest and though it is tempting to speculate that this may be a result of hybridization with *T. graeca* further study is required (Hailey, 1988). Although the sighting of *Elaphe longissima* on Samothraki was not entirely satisfactory the snake's occurence on the island would not be unexpected as, though not common, it is widespread on the adjacent Greek and Turkish mainland.

REFERENCES

Arnold, E.N., Burton, J.A. and Ovenden, D.W. (1978). *A field guide to the reptiles and amphibians of Britain and Europe.* London & Glasgow; Collins.

Chondropoulos, B.P. (1986). A checklist of the Greek reptiles. 1. The lizards. *Amphibia-Reptilia* 7: 217-235

Darewskij, I.S. and Beutler, A. (1981). *Ophisops elegans* Ménétriés 1832 Schlangenauge. In: Böhme, W. (ed.). *Handbuch der Reptilien und Amphibien Europas*, Band 1: 461-477. Akad. Verlagsges., Wiesbaden.

Dimitropoulos, A. (1986). Some notes on the colour and pattern variation of the Greek snake fauna in relation to geographic distribution. Third conference on the zoogeography and ecology of Greece. Patras, Greece. *Biol. Gallo-Hellenica* **12:** 463-471.

Frör, E. (1979). Intraspecific differentiation of the green lizards *(Lacerta trilineata* and *Lacerta viridis)* of Greece. *Biol. Gallo-Hellenica* **8**: 331-344.

Hailey, A. (1988). Population ecology and conservation of tortoises: the estimation of density, and dynamics of a small population. *Herpetological Journal* **1**(7): 263-271.

Hailey, A., Wright, J. and Steer, E. (1988). Population ecology and conservation of tortoises: the effects of disturbance. *Herpetological Journal* **(1)**(7): 294-301.

Ondrias, J.C. (1968). Liste des amphibiens et des reptiles de Grèce. *Biol. Gallo-Hellenica* **1:** 111-135.

Werner, F. (1938). Die amphibien und reptilien Griechenlands. *Zoologica* **94:** 1-117.

Wettstein, O. (1953). Herpetologia aegaea. *Sitz-Ber. Österr. Akad, d. Wiss., math.-naturw. Kl.*, Wien **162:** 651-833.

Wettstein, O. (1957). Nachtrag zu meiner Herpetologia aegaea. *Sitz-Ber. Österr. Akad. d. Wiss., math. -naturw. Kl.*, Wien **166:** 123-164.

Wright, J. (1988). Population ecology of two Mediterranean tortoises in northern Greece – Account of the UCNW-UEA exploration clubs tortoise expedition, Greece 1985. *British Herpetological Society Bulletin* **25:** 12-13

IDENTIFICATION OF *BUFO CALAMITA* AND *BUFO BUFO* ON THE BASIS OF SKELETAL ELEMENTS

J. ALAN HOLMAN

Michigan State University Museum, East Lansing, Michigan 48824-1045, U.S.A.

Identification of *Bufo calamita* bones from sites at Ightham, Kent, and Cow Cave, Devon, that represent times just after the last British glaciation (Holman, 1985, 1988) have sparked recent articles in the Bulletin by David Wilkinson and Trevor Beebee. More discussion will probably ensue, since records of *B. calamita* are forthcoming from additional ancient sites in Britain and outside of the present range of the species. Thus, the veracity of the identification of species of *Bufo* on the basis of skeletal elements is an important issue.

Since my first paper on British fossil amphibians and reptiles (Holman, 1985), I have seen additional fossil and modern skeletons of European *Bufo* species, have found an important additional literature reference to skeletal variation in *Bufo* (Sanchiz, 1977), and have had helpful comments from my colleague in Paris, J. C. Rage. The following discussion has a two-fold purpose: (1) to establish the veracity of the identifications of fossil *Bufo clamita* and *B. bufo* in Britain, and (2) to provide criteria for identification of spoiled field specimens of modern *Bufo*. Toad bones might be expected to turn up in carnivore scats; owl pellets; in the stomachs of fishes, snakes or birds; or in decomposing carcasses or flattened road-kills in the field.

I have previously identified fossil and modern *Bufo calamita* and *B. bufo* on the basis of frontoparientals (Holman, 1988, p. 216, Fig. 3), sacra (Holman, 1988, p. 216, Fig. 4) and ilia (Holman, 1985, 1988). I am presently convinced that the ilium is by far the most reliable element upon which to identify species of *Bufo*. There is quite a bit of intraspecific variation in other *Bufo* skeletal elements, including the frontoparietal and the sacrum. In fact, I suggest that persons without enough modern *Bufo* skeletons to determine the extent of these variations, should restrict themselves to the ilium in making specific identifications.

Fortunately, the anuran ilium is one of the more durable skeletal elements, and often appears in fossil deposits, stomach contents and scats of predators, or in spoiled field specimens. Moreover, the ilium is easy to detach from a dead specimen in hand with a little practice. The only tool needed is a small scissors. First, one should find the puboischiatic symphysis, the prominent bony spur that projects from the posterior end of the animal. The ilia project anteriorly from this symphysis as a pair of prominent lateral rods (see Ballasina, 1984, p. 13, Fig. 1). A small cut in either side will expose an ilium which may be grasped between ones index finger and thumb. The bone is first worked free from its sacral attachment anteriorly, then bent outward to separate it from its posterior symphysis. This technique becomes very simple after a few trials. Tissue may be removed from the ilium either by drying the bone and picking the material away with a forceps; or by macerating the bone in a vial of warm water for a few days. The latter method is least pleasant, but it produces a very clean specimen whose diagnostic characters may be easily observed. The bones should be looked at under at least 10X magnification.

I believe that the ilium of *Bufo* is an especially useful skeletal element for identification purposes because it reflects differences in locomotion. The differences in movements between *Bufo clamita* and *B. bufo* are obvious to all field observers of these forms. *Bufo calamita* makes short "mouse-like" dashes that do not occur in *B. bufo*. Thus, as one might expect, the ilia of *B. calamita* and *B. bufo* are morphologically distinct (Fig. 1).

In my previous papers I stressed the differences between the dorsal prominences in the two species. *Bufo clamaita* has a relatively high and triangular prominence, whereas *B. bufo* has a low rounded or roughened one. An "unusual" morph also occurs in an occassional ilium of *B. bufo* (Holman, 1989, p. 10, Fig. 1) where the dorsal prominence arises from the ilial shaft as a low, irregular, sharpened crest.

Happily, another character (Fig. 1) has been described (Sanchiz, 1977; J. C. Rage, personal

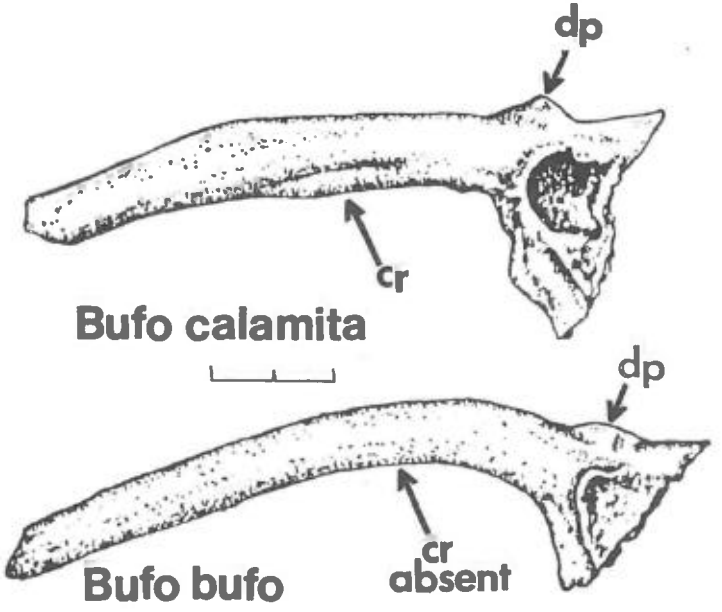

Fig. 1

Left ilia in lateral views of modern *Bufo calamita* and *Bufo bufo* (remade from Holman, 1988). Abbreviations are: cr = "*calamita* ridge"; dp = dorsal prominence. The line = 4 mm. and applies to both specimens.

communication) that may be more reliable than the dorsal prominence shape. This character, which I term the "*calamita* ridge" (abbreviated cr in Fig. 1) should, in combination with dorsal prominence shape, provide positive identification of *B. calamita* and *B. bufo* in fossil and modern populations in Britain. J. C. Rage, in his communication to me, described this feature as the "*calamita* blade", but in specimens that I have seen, the structure is more ridge-like than blade-like. The "*calamita* ridge" may be described as an elongate ventral ridge on the posterior part of the ilial shaft of *B. calamita*, separated from the upper part of the shaft by an indented area. This structure is absent in *B. bufo*.

Both *Bufo calamita* and *B. bufo* may be separated from the third European species of *Bufo*, *B. viridis*, on the basis of the ilium. *Bufo viridis* has a deep fossa that occurs just anterior to the acetabulum and a two-lobed dorsal prominence that is lacking in *B. calamita* and *B. bufo*.

COMMENT

I here suggest that ilia of *Bufo* found in scats or stomach contents of predators or extracted from spoiled specimens in the field may be utilized to make positive identifications of *Bufo calamita* and *B. bufo*. I further strongly urge that when these skeletal elements are recovered, that they be saved, with proper data, for future variational and comparative studies.

REFERENCES

Ballasina, D. (1984). *Amphibians of Europe, a Colour Field Guide*. David and Charles, London.

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

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

Holman, J.A. (1989). Additional herpetological records from the Middle Pleistocene (Cromerian Interglacial) Freshwater Bed, West Runton, Norfolk. *British Herpetological Society Bulletin* **27**, 9-12.

Sanchiz, F. B. (1977). La Familia Bufonidae (Amphibia, Anura) en el Terciario Europea. *Trabajos sobre Neogeno-Cuatanario* **8**, 75-111.

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