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BULLETIN

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THE BRITISH HERPETOLOGICAL SOCIETY

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

The Captive Breeding Committee is actively involved in promoting the captive breeding and responsible husbandry of reptiles and amphibians. It also advises on aspects of national and international legislation affecting the keeping, breeding, farming and substainable utilisation of reptiles and amphibians. Special meetings are held and publications produced to fulfil these aims.

The Conservation Committee is actively engaged in field study, conservation management and political lobbying with a view to improving the status and future prospects of our native British species. It is the accepted authority on reptile and amphibian conservation in the UK, works in close collaboration with the Herpetological Conservation Trust and has an advisory role to Nature Conservancy Councils (the statutory government bodies). A number of nature reserves are owned or leased, and all Society Members are encouraged to become involved in habitat management.

The Education Committee promotes all aspects of the Society through the Media, schools, lectures, field trips and displays. It also runs the junior section of the Society - THE YOUNG HERPETOLOGISTS CLUB (YHC). YHC Members receive their own newsletter.

The Research Committee includes professional scientists within the ranks of the Society, organises scientific meetings on amphibian and reptile biology and promotes *The Herpetological Journal*, the Society's scientific publication.

Meetings
A number of meetings and events take place throughout the year, covering a wide range of interests.

Publications
The BHS Bulletin, Herpetological Journal and *YHC Newsletter* are all produced quarterly, and *The Natterjack* Newsletter is produced monthly. There are in addition a number of specialised publications available to Members and produced by the various Committees, such as notes on the care of species in captivity, books and conservation leaflets.

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

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

The Bulletin is edited and produced by
John Pickett and John Spence.
Contributions and correspondence arising from the Bulletin should be sent to:
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FRONT COVER
Adult male *Vipera ammodytes*. See *Observations on Reptiles and Amphibians of Andros*, by D. Buttle, p.5.

MEETINGS 1997

11th October **BHS Scottish Group - 50th Anniversary Day.** One day symposium on "Conservation of Reptiles and Amphibians in Scotland". To be held at Stirling University, commencing 10.30am. A series of 6-8 presentations will cover conservation law, species action plans and the status of Scottish herptiles. The meeting is open to all, subject to payment of a £10 registration fee which includes refreshments. Lunch is available in the University restaurant for £6.50 if booked in advance. Special rates are available for students. Further details from Bill Wales, 14 Dean Crescent, Stirling, FK8 1UW.

14th October **BHS Northwest** - Bob and Val Davies, title to be announced. To be held at WWT Martin Mere, Burscough. Commences 8.00pm.

25th October **Huddersfield Technical College** will host a BHS 50th Anniversary day and lecture for the Midlands region. Speakers will include John Baxter (well-known TV vet), Pat Wisniewski, Roger Meek and Roger Avery. Programme will also include a visit to Huddersfield Technical College's reptile and amphibian facility at Taylor's Hill.

9th November **Captive Breeding Committee - Annual Stock Sale.** To be held at New Denham Community Centre. Orders for tables now being taken - prices held from last year. Please contact John Spence, 23 Chase Side Avenue, Enfield, Middx, EN2 6JN. Tel no. 0181 366 8127.

2nd December **BHS Northwest Christmas Social** - To be held at WWT Martin Mere, Burscough. Speaker to be announced. Commences 8.00pm.

Other Herpetological Happenings. . .

Sunday 7th September
Zoologica 97 - This major event is to be held at the South of England Showground, Ardingly, Sussex. For this day the main pavilion is taken over by a huge range of commercial breeders of cold-blooded animals, equipment suppliers and many of the voluntary groups concerned with conservation and education. Warm-blooded animals are also well-represented and the whole day is enlivened by a programme of outdoor arena events. The YHC will be putting on a display in the pavilion and many members of the Society wanting either further information or to volunteer to help with the display should contact Julie Budgen on 01444 811641.

Saturday/Sunday 13th/14th September
Ninth Annual IHS Reptile Fair & Symposium - To be held at Alumwell Community Centre, signposted from Jct. 10 of the M6. Fair will be held over both days, symposium on Saturday evening, start 5.00 pm. Speakers include Sandra Barnett, Bob Clarke, Bernd Eidenmuller, Richard Gibson and Paul Rowley. Symposium fee: £5, Fair entrance: £2 for adults, 50p for children. Further details from Jon Coote, IHS Fair Organiser, 195B College Street, Long Eaton, Nottingham, NG10 4GF. Telephone 0115 972 9273.

Saturday 8th November
Herpetofauna Groups of Britain and Ireland SE Regional Meeting. To be held at The Woodhatch Centre, Whitebeam Drive, Reigate, Surrey. 10.00-4.00, fee £4.00. Details and tickets from Julia Wycherley, 31 The Crossways, Merstham, Surrey RH1 3NA.

THE ORIGIN OF THE WEST COAST NATTERJACKS – KERRY ACROSS TO MERSEY?

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INTRODUCTION

In the interest of healthy and objective scientific discussion, every idea should be aired. From the title of this article, it might already be obvious what I am about to suggest. I write with the aim of stimulating replies, whether in agreement or disagreement. Evidence which disproves particular scenarios, allows them to be eliminated (which is a positive step!). So how and when did the present-day Natterjack populations arrive? This is not a new question and has frequently been debated and discussed in previous literature (e.g. Beebee, 1978; 1993; Wilkinson, 1988; Yalden, 1980). There is still no conclusive evidence, but recent data throws a new light on the subject.

EVIDENCE

Sub-fossil finds of Natterjack (*Bufo calamita* Laur) suggested that this most thermophilous of our amphibians arrived in southwest Britain during the Lateglacial Interstadial (c. 13,000 to 11,000 years ago), a warm period towards the end of the last glaciation. A radiocarbon age of 11,080 ± 220 years was given for a Natterjack scapula from Broken Cavern, Torbryan Valley, Devon (Gleed-Owen, 1996; in press). I have identified other remains believed to be of this age, from caves in Devon, Gloucestershire and Pembrokeshire (accounts are in preparation). According to recent thinking (Wingfield, 1995), sea level at this time was still low enough for land to have extended from Brittany to Devon, and from Cornwall to Ireland. The implications for Natterjack colonisation are obvious, and it is possible that the Kerry Natterjacks arrived then. However, between about 11,000 and 10,000 years ago, an arctic climate (the 'Younger Dryas' period) returned and would have eliminated all Natterjacks from Britain until the climate ameliorated again. Sea level rise meant that the land-bridges had by then narrowed to the Dover Straits/southern North Sea, and to a northward-migrating strip of land from Ireland to Wales or northwest England. Colonisation routes were therefore more restricted, with all land-bridges probably gone by about 8,000 years ago. All of our non-arctic species must therefore have arrived early in this 'Holocene' period (10,000 to present day), but routes which they took and their origins are not clear.

ORIGINS

As it is only recently that sub-fossil records and detailed sea-level data have been available, none of the considerations by previous workers realised the potential importance of an initial colonisation during the Lateglacial Interstadial. We are now in a much better position to discuss Natterjack origins, though there are still many gaps in the record. The Natterjack populations around the south and east of Britain could easily have come via a land crossing, during the early Holocene. Those along the west coast are more difficult to explain, as explanations have to involve trans-Pennine crossings or coastal routes which ought to have left remnant populations in southwest Britain. The Irish populations have attracted the most debate, apparently inexplicable by traditional

theories. However, if the Younger Dryas climate was less severe in extreme southwest Ireland, then the Natterjacks from the original colonisation might have survived until the present day? This would require that the polar front shifted north in the summer, or another mitigating circumstance, but the possibility must be considered. During the early Holocene, when a narrow but more northerly land-bridge still existed to Britain, could they have 'returned' from the Irish coast to the west coast of Britain? Certainly, wide areas of low-lying sandy coastline have since been submerged around much of the Irish Sea. An ephemeral environment of salt-marshes, brackish pools and dunes, exposed but then drowned after a few hundred years, are likely to have suited the Natterjack. This route is also much shorter and surely more credible than one from Europe to southeast England, and then to northwest England. A colonisation from Ireland to the west coast of Britain, could have been synchronous with, but entirely unrelated to, the colonisation of southeast England from the continent. The land-bridge from Ireland is likely to have been relatively shortlived, only enabling establishment along immediate west coast areas. This also explains the apparent Holocene absence of Natterjack from Devon, Cornwall, and South Wales, where there are sizeable areas of seemingly prime habitat.

Finally, the last and perhaps least orthodox suggestion I have, concerns the issues of human introduction. It has been suggested before (e.g. Beebee, 1983) that the Kerry Natterjacks might have been introduced unwittingly, for example in sand ballast dumped from ships. It must also be considered, therefore, that this scenario is equally likely in other places, such as Merseyside, an area not unknown for its maritime history. If the Irish Natterjacks *did* colonise via an early land-bridge, and survived the Younger Dryas cold due to their extreme geographical position, then perhaps they were introduced *from* Kerry to Merseyside, and not the other way round? There may even be some corroborative circumstances, depending on the relationship of historical events and the earliest known Natterjack records for the respective areas. Beginning at around 1845, Ireland was in the grip of the potato famine, in which many thousands of people died, and large numbers emigrated to Britain. As far as I am aware, many Irish refugees landed in Liverpool during this period. In the event of a human introduction of Natterjacks, is it not possible and even more likely, that it took place in this direction? There must have been numerous ships arriving, over several decades, potentially bringing Natterjacks across with them. The idea could also be applied to other western sea-ports. Are there any reliable records of west coast Natterjacks dating from before the first immigrant, or from before the earliest Kerry records?

CONCLUSION

Previous ideas on the origins of the British and Irish natterjack populations have been unable to produce a watertight model for colonisation and establishment of such a fragmented distribution. Some new sub-fossil records, and recent data on past sea-levels, have inspired a new round of theories and hypotheses. Obviously these are only ideas, but they must be considered, even if only to be eliminated from the forum. Genetic work by Trevor Beebee (Sussex University) is likely to feature strongly in the future, and the results of such work are eagerly awaited. I would appreciate any feedback, particularly concerning historical records, and hope that some thought stimulation has been achieved!

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OBSERVATIONS ON REPTILES AND AMPHIBIANS OF ANDROS (CYCLADES, GREECE)

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INTRODUCTION

Despite its proximity and ease of access from the Greek mainland, just two hours by ferry from the port of Rafina, the island of Andros would appear to have been relatively overlooked by herpetologists in recent years. Brief references to the island's reptile and amphibian fauna are to be found in Boettger, (1888); Werner, (1930, 1937, 1938); Bird, (1935); Wettstein, (1953, 1957); a most useful and informative paper, dealing with the island's reptiles and amphibians in more detail, being that of Beutler & Frör (1980).

A large island covering an area of 380km2, Andros is the most northerly of the Cyclades, and a notable exception from the hilly, dry and sparsely vegetated islands so typical of this group. The interior rises to just over 1,000 metres, green valleys hold permanent rivers and streams, and as well as the familiar phrygana covered hillsides, wooded areas are still much in evidence, mainly of Chestnut *Castanea sativa*, and Plane Trees *Platanus orientalis*. Although situated just 12km south of the coastal island of Evia (Euboea), Andros is geographically a valid member of the Cyclades group, believed to have become separated from the mainland about 150,000 years ago (Beutler, 1979).

The present article is a summary of two weeks intensive investigation, commencing 4th May, 1996. Localities mentioned in the text are shown in Figure 1. After being examined and photographed, captured animals were released where found.

SPECIES ACCOUNT

BUFONIDAE
Bufo bufo (Linnaeus, 1758)
Adult male found under rock on damp grassy bank next to river in Ateni valley. Large adult female in excess of 15cm found in water culvert under road in same area; thousands of tadpoles of around 22mm TL present in nearby still, shallow pools. Andros is the only Cycladean island where this species is known to occur.

RANIDAE
Rana ridibunda Pallas, 1771
Found to be common in the river, streams and pools along Ateni valley; seen in some numbers in the coastal freshwater marshes of Ateni bay and Vori bay; a few found in small pools near Batsi. Numerous tadpoles observed.

EMYDIDAE
Mauremys caspica rivulata (Valenciennes, 1833)
Often seen in quite large numbers, especially in still water pools, along the riverine Ateni valley, in hillside streams around Katakilos, and in pools of coastal marshes at the bays of Ateni and Vori.

GEKKONIDAE

Cyrtodactylus kotschyi (Steindachner, 1870)

As is the case on many of the Cyclades, this gecko was found to be the most abundant reptile species on the island. In suitable habitats, such as rocky areas and the ubiquitous dry stone walls of Andros, found at all of the localities investigated. Seventeen subspecies have been listed for Greece (Chondropoulos, 1986); those from Andros and neighbouring Tinos having been described as *C. k. tinensis* by Beutler & Frör (1980).

Hemidactylus turcicus (Linnaeus, 1758)

Fairly common at all localities searched; underneath rocks it was often found together with *C. kotschyi*. This species was not listed for Andros in the checklist by Chondropoulos (1986).

LACERTIDAE

Lacerta trilineata Bedriaga, 1886

Extremely timid and difficult to observe, this lizard was occasionally seen in small numbers (total of just 15 specimens recorded) in most of the areas investigated. Usually close to bushes in well vegetated habitats, often near streams in wooded gullies. Probable reproductive activity, display and pursuit of female by male observed (7th May). All specimens clearly seen appeared uniform green in colour and had blue throats. This latter feature is typical in the subspecies *L. t. citrovittata*, Andros animals having been regarded as such by Frör (1979).

Podarcis erhardii (Bedriaga, 1882)

Abundant, present in large populations in all areas investigated, in habitats varying from dry, scrub covered open hillsides with dry stone walls, to lightly wooded rocky gullies. Often seen in pairs, an actual mating being observed on 14th May. Andros animals have been assigned to the subspecies *P. e. mykonensis* (Werner, 1933).

SCINCIDAE

Ablepharus kitaibelii kitaibelli Bibron & Bory, 1833

Common on some of the Cyclades islands, scarce or apparently absent on others of this group. It was rather infrequently seen on Andros, an average of just two or three specimens being found each day.

TYPHLOPIDAE

Typhlops vermicularis Merrem, 1820

In the Cyclades recorded only on Andros and Naxos (Chondropoulos, 1989), recently from Delos (Dimitropoulos, 1992). No specimens could be found during the two weeks spent on Andros. This species was also not found during previous brief visits to Naxos (Buttle, 1993) and would appear to be something of a rarity among the Cycladean snake fauna.

COLUBRIDAE

Coluber jugularis caspius Gmelin, 1789

The most abundant of the island's snakes, a total of twelve specimens being found plus numerous sloughs. Average length of adults seen was around 116cm, the largest being 150cm approx. Of interest was the variation in ground colour noted in adults. The most striking example of those clearly seen displayed a fairly bright, light olive green colouration, another specimen was straw yellow, two appeared light brown, the majority of adults being dark grey. All fairly uniform in colour apart from the typical longitudinal light narrow striping present through upper body scales; head region and venter yellowish to reddish. Found in variable habitats apart from heavily wooded areas,

presumably preferring more open biotopes.

Elaphe quatuorlineata (Lacépè, 1789)

At present the only evidence for this species' occurrence is a slough found on the island some thirty years ago, mentioned by Clark (1994). Due to the abundance of *C. j. caspius*, *E. quatuorlineata* is likely to be rare and localised on Andros, as it is fairly unusual for these two large colubrids to inhabit the same island (see discussion in Clark, 1990), though both have been recorded from the neighbouring island of Tinos.

Elaphe situla (Linnaeus, 1758)

A large adult was found active at Kalamaki, climbing the base of an olive tree at 14.50 hours, hazy sun, windy, temp. 23°C, next to a large dry stone wall on a terraced olive field with long grass. 102cm TL, dorsolateral stripes a rather dull dark brown. Usually attaining a TL of around 90cm, on Andros exceptional specimens approaching 120cm have been observed (Dimitropoulos, pers. comm. 1996). A further adult of 86cm TL, found under a large rock on the bank of a wheat field near Katakilos, displayed the more attractive colouration usually associated with this snake, having red dorsal blotches on a light grey ground colour. Several locals talked to falsely believed this snake to be highly venomous.

Natrix natrix (Linnaeus, 1758)

Fairly widely distributed on the island though appears to be localised and restricted to suitable habitats, e.g. the marshy areas and pools near Vori bay where it occurs in some numbers (Collinson, pers. comm. 1996). Listed by Chondropoulos (1989) as being intermediate between subspecies *N. n. persa* and *N. n. schweizeri*.

Telescopus fallax fallax (Fleischmann, 1831)

Only two individuals found. At Kalamaki a 32cm specimen under a large flat rock near dry stone wall of terraced grassy field, and a 20cm example near Batsi, a probable previous year's hatchling, under large rock in scree near wall on grassy hillside with scattered rocks and bushes. Ground colour grey, distinct brown dorsal blotches, venter pale dusty grey. One of the most widespread Cycladean snakes, though population density varies greatly from island to island. This seems to be directly related to the presence or absence of potential competitors, e.g. *Eryx jaculus* and *Vipera ammodytes*, for its predominantly lizard prey. On Andros the abundance of the ophiophagous *C. jugularis* may also be a significant factor in the relative scarcity of *T. fallax*.

VIPERIDAE

Vipera ammodytes meridionalis (Boulenger, 1903)

A total of eight specimens found; four on rocky, scrub covered hills with dry stone walls near Batsi, two near to walls of terraced fields around Paleopoli, two on open, rocky hillsides near Vori bay. The largest specimen examined was an adult female of 48cm TL. Information supplied by a local doctor, practising in the central western area of Andros, suggests that serious snakebite incidents involving this viper are a fairly unusual occurrence, with just a single case requiring treatment during 1995. Excluding *Coluber jugularis*, would appear to be the most common and widespread snake species on Andros.

DISCUSSION

Thirteen reptile species (1 terrapin, 5 lizard, 7 snake) and two amphibian species (1 toad, 1 frog) are presently recorded from Andros (see table 1). This represents a rich species assemblage by Cycladean standards, matched only on the similar sized island of Naxos, and exceeded only on neighbouring Tinos (16 species).

Plate 1. Biotope between Batsi and Katakilos

Plate 2. *Hemidactylus turcicus* on wall of disused building

Plate 3. Adult male *Podarcis erhardii* basking on dry stone wall

Plate 4. Adult *Telescopus fallax*

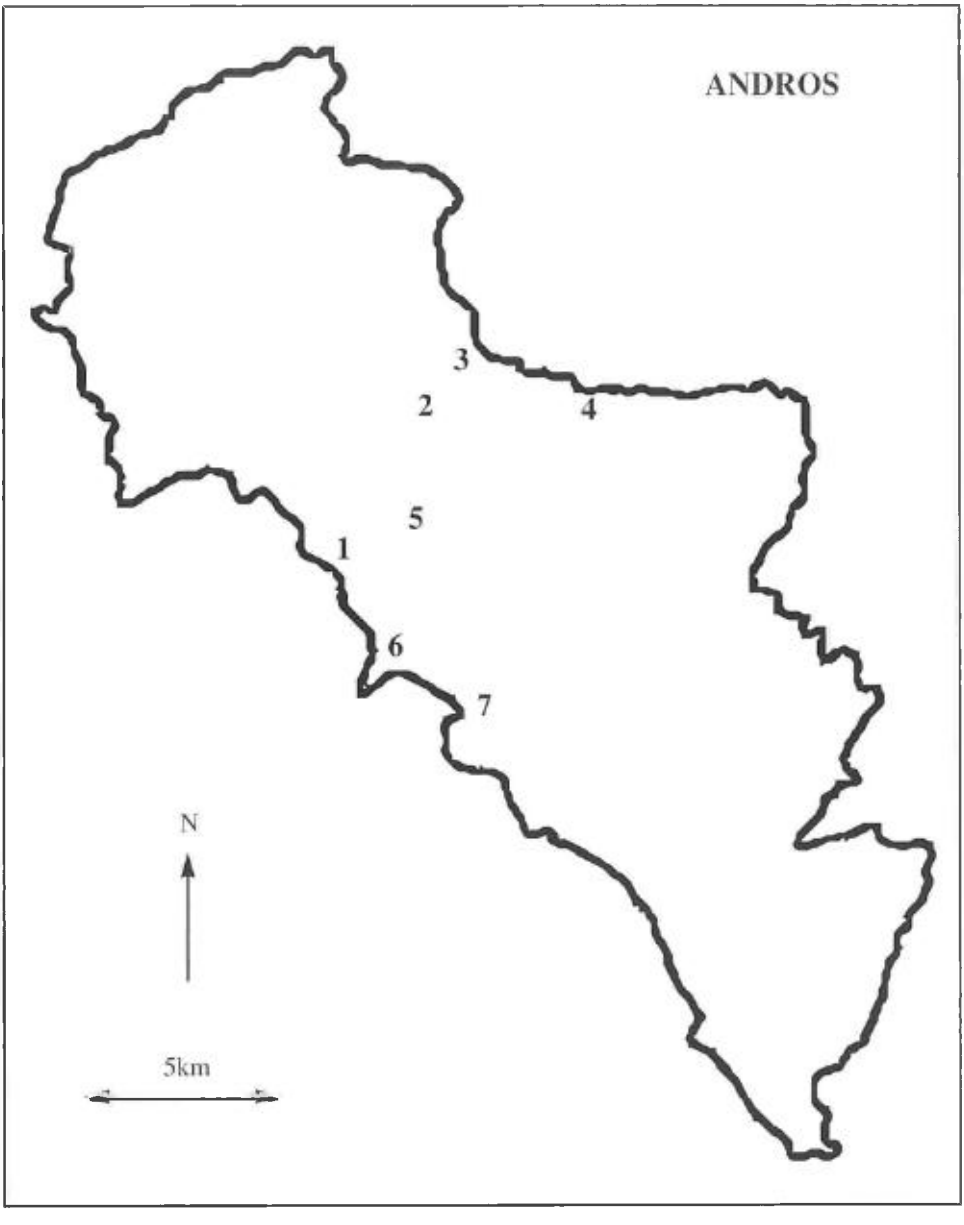

Figure 1
MAP OF ANDROS
KEY - 1 Batsi, 2 Ateni Valley, 3 Ateni Bay, 4 Vori Bay, 5 Katakilos, 6 Kalamaki, 7 Palcopoli

The species present on Andros are generally as might be expected for a northern Cyclades island. An obvious anomaly is the presence of *Bufo bufo*, its only Cycladean locality, and the apparent absence of *B. viridis*, the latter present on several Cycladean islands including neighbouring Tinos. Notwithstanding the comparative wealth of freshwater habitats available, amphibian diversity would appear to be as poorly represented on Andros as on other Cycladean islands. Apart from *Rana ridbunda, Bufo viridis* and *B. bufo*, just two other amphibian species have been listed for the Cyclades group, with doubt having been expressed about the present Cycladean occurrence of both these taxa. These are old records of *Hyla arborea* from Naxos and Tinos (Werner, 1938), regarded as questionable by Beutler & Frör (1980); also a very old record (Erber, 1867) of *Triturus vulgaris* from Tinos, considered doubtful by Werner (1938). Nevertheless, the possible occurrence of further amphibian species on Andros should not be excluded.

Further reptile species conceivably present on Andros, as yet unrecorded but known from nearby islands, including *Eryx jaculus* and possibly *Natrix tessellata*. The latter species is only known with any certainty to be present on Serifos among the Cyclades islands, though there is also an old record (Bird, 1935) from Tinos.

Given the island's size and diversity of biotopes, subsequent research is recommended, especially in the more remote and mountainous areas of Andros.

Table 1.
List of species recorded on Andros

Bufo bufo
Rana ridibunda
Mauremys caspica
Cyrtodactylus kotschyi
Hemidactylus turcicus
Ablepharus kitaibelii
Lacerta trilineata
Podarcis erhardii
Typhlops vermicularis
Coluber jugularis
*Elaphe quatuorlineata**
Elaphe situla
Natrix natrix
Telescopus fallax
Vipera ammodytes

*record based on evidence of exuviae.

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HERPETOLOGICAL OBSERVATIONS IN SOUTHERN ISRAEL

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ABSTRACT

One species of amphibian and 25 species of reptiles were seen in Israel (mainly around Elat in the southern 'Arava valley) during October, 1994. *Psammophis schokari* is reported for the first time from southern 'Arava, where only *Psammophis aegyptius* had been found until now. *Cytropodion scaber* is recorded for the third time from this country. Both *Tropiocolotes steudneri* and *T nattereri* were found, although not in the same area. A full list of localities is given for every species.

During a one-month stay in southern Israel, several species of reptiles and amphibians were observed, mainly in the southern 'Arava valley but also in Sede Boqer (Negev). An exhaustive list of these data is given. Most observations agree with the already known distribution of the taxa as published by Werner (1988) and modified by subsequent papers, although additional information is given for some species. Ecological and behavioural data are given as well since little has been published except in Hebrew on most of these species.

The field work took place between 30, September and 29, October 1994. The best prospected area is constituted by the immediate surroundings of Elat. Several trips were made to the Elat mountains and the 'Arava valley between Yotvata and the Red Sea. Casual observations were made every day during bird or reptile oriented trips. Around Elat, I tried to visit as many different habitats as possible, both at day and at night. Only day-time visits were made to more distant areas. This results in an unequal coverage of the prospected area.

METHODS

Identification was usually achieved in the field except for some specimens of more difficult genera *Acanthodactylus, Ptyodactylus* which were kept alive a few days for more careful examination before being released. For identification, I used published keys (Leviton *et. al.* 1992, Marx 1968) and papers such as Bafa El Din (1994) for *Tropiocolotes*, Heimes (1987) for *Ptyodactylus*, Marx (1988) for *Psammophis*, Salvador (1982) and Werner (1986) for *Acanthodactylus*. As many individuals as possible were photographed to confirm their determination. Localities followed by an asterisk are those from which pictures of the species are kept by the author.

Only when the subspecific identity of the populations was positively established on morphological grounds does the name of the subspecies appear at the top of the species text.

AMPHIBIA

Bufonidae

Bufo viridis (Laurenti, 1768)

MIDRESHET BEN GURION AT SEDE BOQER (30°51'N, 34°46'E), 470M A.S.L., 29-10-94, 2 IND.

Both were road kills found inside the campus, among lawns and gardens. The relatively fresh bodies indicated that the animals were active a few days earlier at most.

The systematics of this species is still too confused to propose any subspecific name.

REPTILIA

Gekkonidae

Bunopus tuberculatus (Blanford, 1874)

YOTVATA, 200 M SE OF THE PETROL STATION (29°53'N, 35°03'E), 70M A.S.L., 24-10-94, 1 IND.

SAMAR, SAND DUNES E OF THE ROAD ELAT-TEL AVIV AT KM 39 (29°48'N, 35°01'E), 80M A.S.L., 23-10-94, 1 IND.)*

ELAT, ACACIA TREES NEAR RODED FARM (29°36'N, 34°59'E), 20M, A.S.L., 22-10-94, 2 IND.*

These three locations are situated in the 'Arava valley, which is known to include the whole range of this species in Israel (Werner, 1988). The habitat at Yotvata and Roded farm was hard ground of stony alluvium with scattered acacia trees, at Samar an area of soft sand banks with scattered bushes and stones. The animals were found during daytime, under stones and under an old mattress (the two specimens at Roded farm).

Animals from Israel are often identified as *Bunopus blanfordii* (Strauch, 1887). I follow here Arnold (1980) and Leviton *et al.* (1992) in including *Bunopus blanfordii* in the species *B. tuberculatus*, although I do not have any personal opinion on this subject.

Cyrtopodion scaber (von Heyden, 1827)

ELAT, SOUTHERN PALM TREE PLANTATION (29°33'N, 34°58'E), <10M A.S.L., 7-10-94, 1 AD.*

An adult of this species was found in the early morning hiding inside the wood building of the ringing station. We were not able to discover any other specimen despite daily searching in this building during October. This individual accidentally died of overheating and is now in the collections of the Muséum National d'Histoire Naturelle in Paris, France (MNHN 1995-2358). This constitutes the third record of *Cyrtopodion scaber* in Israel (Werner, pers. com.), although the species was included in Israeli herpetofauna by Hoofien (1972) because of its presence in Sinai. The first record also comes from Elat (Hoofien & Sivan 1995), and J. Moravec observed it at this place (Werner pers. com.). The range of this species in the areas has been recently extended in Egypt by Baha El Din (1994) who first found it along the eastern Sinai coast at Sharm El Sheikh, and in June 1994 at Nuweiba (pers. com.). It has also been added to the herpetofaunal list of Jordan by Werner (1991). According to Baha El Din (1994), this species has good colonising abilities. Its presence in Elat probably follows the development of important urbanisation along the northern shores of the gulf of Aqaba.

Hemidactylus turcicus (Linnaeus, 1758)
ELAT, ELOT (29°34'N, 34°57'E), 80M A.S.L., 3-10-94, 1 JUV.*
ELAT, CITY CENTRE (29°33'N, 34°56'E), 80M A.S.L., 3-10-94, 1 IND.
ELAT, SMALL BRIDGE ALONG THE ROAD 90 TO TEL AVIV JUST SOUTH OF THE SEWAGE FARM (29°35'N, 34°58'E), 40M A.S.L., 9-10-94, 1 AD.
ELAT, PLANTATION CENTRE NORTH OF SOUTHERN SALT PANS (29°34'N, 34°58'E), 10M A.S.L., 25-10-94, 1 JUV.*
Widespread around Elat, but never abundant during my prospection. Found active at night, or during daytime under stones or hiding under the bridge on the road to Tel-Aviv.

The animals from this area are called *H. t. turcicus* when other subspecies are recognized.

Ptyodactylus guttatus (von Heyden, 1827)
MIDRESHET BEN GURION AT SEDE BOQER (30°51'N, 34°46'E), 470M A.S.L., 29-10-94, 1 AD.
ELAT, 400 M NNW OF THE CEMETERY (29°34'N, 34°56'E) 140M A.S.L., 19-10-94, 1 AD.
ELAT, SMALL BRIDGE ALONG THE ROAD 90 TO TEL AVIV JUST SOUTH OF THE SEWAGE FARM (29°35'N, 34°58'E), 40M A.S.L., 7 & 11-10-94, SEVERAL AD. AND JUV.*
In Sede Boqer, this species was found on the walls of the field centre inside the campus (one adult active there at night). Around Elat, it was only found far from habitations: under a small bridge in the 'Arava valley among acacia trees (both *P. hasselquistii* and *H. turcicus* were found there alongside *P. guttatus*), and on the vertical rock face of a very small wadi in the hills above the cemetery. In both places, *P. guttatus* was seen active during daytime, whereas only *P. hasselquistii* was found on a night time visit under the bridge mentioned above.

Ptyodactylus hasselquistii hasselquistii (Donndorff, 1798)
ELAT, CITY CENTRE (29°33'N, 34°56'E), 80M A.S.L., OCTOBER 1994, SEVERAL IND.*
ELAT, CEMETERY (29°34'N, 34°56'E), 100M A.S.L., OCTOBER 1994, MANY AD. AND JUV.*
ELAT, 500M NW OF HOF ALMOG (CORAL BEACH NATURE RESERVE) (29°30'N,34°54'E), 100M A.S.L., 11-10-94, 1 JUV.
ELAT, SMALL BRIDGE ALONG HE ROAD 90 TO TEL AVIV JUST SOUTH OF THE SEWAGE FARM, (29°35'N, 34°58'E), 40M A.S.L., 7 & 9 & 11-10-94.*
This is the most abundant house gecko in Elat. It was found in many streets around Hatermarim Blvd., although only one adult was seen inside town, other animals having been young specimens. In the cemetery, I saw numerous individuals of this species, both adults and young, as well as under the bridge along the road 90 to Tel Aviv (see *P. guttatus* above). This species was also found in natural habitat in the wadi above the entrance of the Nature Reserve at Coral Beach, where two young were found active after sunset. All these animals were found exclusively at dusk or at night, except under the bridge along the road to Tel Aviv. Despite nocturnal visits to the cemetery, none was seen after 11 October, probably as a result of much cooler nights.

The sympatric occurrence of these two congeneric Gekkonidae at the head of the Gulf of Aqaba has already been published (Heimes 1987, Werner & Sivan 1993). My casual observations also fit what is known of the more nocturnal habits of *P. h. hasselquistii* compared to *P. guttatus* (Frankenberg & Werner 1979, Werner 1982).

I did not find any of the meristic characters given by Heimes (1987) to be useful in assigning an individual *Ptyodactylus* to the correct species. As stated by Werner & Sivan (1993), adults of these two species are easily identified by colour pattern (see these authors and Heimes 1987 for a description). Young specimens of *P. hasselquistii* may be more puzzling since some of them show a distinctly spotted pattern rather like the other

species, although spot shape is somewhat different (see picture 1). Differences in tail length, head shape and nostril shape are also very useful (*P. guttatus* has a tail shorter than body, a more robust body, a much wider head and rounder snout and more protruding nostrils). The pictures in Werner & Sivan (1993) illustrate these differences well.

Stenodactylus sthenodactylus (Lichtenstein, 1823)
ELAT, WATER PUMPING STATION (29°33'N, 34°56'E), 170M A.S.L., 10-94, 1*
ELAT, SOUTHERN PALM TREE PLANTATION (29°33'N, 34°58'E), <10M A.S.L., 10-94, 1.
YOTVATA, 200 M SE OF THE PETROL STATION (29°53'N, 35°03'E), 70M A.S.L., 10-94, 1.
Widespread around Elat where single specimens were found active at night near the pumping station (on hard stony ground), in the palm tree plantation (on very soft earthy ground) and north of the southern salt pan (on hardy stony alluvium). One was found under a stone during daytime at Yotvata, on stony ground under acacia trees.

The eastern populations (including the animals from Israel) are usually included in the nominate subspecies *S. s. sthenodactylus* (see Werner 1988).

Tropiocolotes nattereri Steindachner, 1901
ELAT, NUMEROUS LOCALITIES, (29°33'-29°34'N, 34°55'-34°58'E), 30-200M A.S.L., OCTOBER 1994.*
One of the most easily found reptiles around Elat. Individuals of this species were discovered during day or night under stones, planks or mostly under small stone piles in the 'Arava valley and in the hills, always on rocky or stony substrate. Some were also seen active on the ground at nights. Its widespread occurrence in the southern 'Arava valley makes it almost certain that it occurs in Jordan as well.

Although already suspected by Werner (1988), the occurrence of this species in southern Israel was not firmly established until the work of Baha El Din (1994). All the specimens I saw corresponded to the statements of this author on the morphology and identification of this species, except that one individual had an indistinct dorsal pattern. It was in all other aspects identical to the other specimens seen around Elat.

I did not find *T. steudneri* in the southern 'Arava. The specimen of the latter species seen in the Negev (see below) was distinctly different in both colour and proportions (see picture).

Tropiocolotes steudneri (Peters, 1869)
MIDRESHET BEN GURION AT SEDE BOQER (30°51'N, 34°46'E), 440M A.S.L., 28-10-94, 1 IND.*
A small individual of this species was found under a small rock on a steep slope with boulders just south of the campus (see picture 2). See remarks under *T. nattereri*.

These observations confirm the presence of both *T. steudneri* and *T. nattereri* in Israel, a fact that was not previously firmly established (Werner 1988, Baha El Din 1994).

Agamidae
Laudakia stellio ssp (Linnaeus, 1758)
ABOUT 15 KM N OF ELAT, ABOUT HALFWAY UP NAHAL ETEQ, (≈29°42'N, ≈34°56'E), ≈450M A.S.L., 13-10-94, 1 AD.
One adult active at midday in Nahal Eteq was found in the shade, on a big branch of a dead acacia.

The *L. stellio* populations from southern Israel, southern Sinai and southern Jordan are either included in the subspecies *brachydactyla* (Schmidt & Marx 1956, Leviton *et al.* 1992) or considered to represent another (undescribed) subspecies (Werner 1988).

Laudakia stellio brachydactyla (Haas, 1951)
MIDRESHET BEN GURION AT SEDE BOQER (30°50' +30°51'N, 34°46'E), 360-460M A.S.L., 29-10-94, NUMEROUS IND.
Very abundant from the bottom of the En 'Avedat valley to the Sede Boqer campus, many adults and young being active there during the morning and early afternoon.

These specimens were seen in an area (central Negev) where the occurrence of the subspecies *brachydactyla* is widely recognised (Werner 1988). I was able to catch an adult male which conformed very well to the diagnosis of this subspecies given by Haas (1951a).

Pseudotrapelus sinaitus (von Heyden, 1827)
ELAT, NUMEROUS LOCALITIES, (29°33'-29°34'N, 34°55'-34°58'E), 10-200M A.S.L. OCTOBER 1994*.
ABOUT 15 KM N OF ELAT, ABOUT HALFWAY UP NAHAL ETEQ. (≈29°42'N, ≈34°56'E), ≈450M A.S.L., 13-10-94, SEVERAL AD & JUV.*
This agamid lizard was most abundant in the hills around Elat where it was active mainly at the hottest times of the day. It was observed in Nahal Eteq as well, and in the 'Arava valley around the Southern Salt Pans where it seemed to be much less numerous. All these animals were found active during day-time.

Trapelus pallidus pallidus (Reuss, 1834)
"ALAEMON NATURE RESERVE", ALONG THE ROAD 90 ELAT-TEL AVIV AT KM. 33 (29°43'N, 35°00'E) 90M A.S.L., 14 & 20-10-94, 2 IND.*
SAMAR, SAND DUNES E OF THE ROAD 90 ELAT-TEL AVIV AT KM 39 (29°48'N, 35°01'E), 80M A.S.L., 23-10-94, 1 IND.*
In these two places, the habitat consisted of soft sand banks with scattered bushes and stones. All specimens were found active during day-time.

Uromastyx aegyptius (Forsskål, 1775)
ELAT, JUST N OF THE AIRPORT (29°33'N, 34°57'E), 10M A.S.L., END OF OCTOBER 1994, 1 AD.
Its burrow was at the edge of a recently created earth-bank dominating the Northern Salt Pans, its entrance just beside a patch of dense green plants, in a very disturbed area. Several *Uromastyx* were reported to me from the 'Arava around Elat, probably belonging to this species, which is apparently widespread in this area.

Disi (1991) describes a pre-noon and a pre-dusk activity peak for this species in the 'Arava. Daily visits were made to this particular burrow at the end of the month, but the animal was only seen about once every second day, and only in late morning. Although little can be said from such casual observations, this fact, together with the lack of other contact with this species despite active searching in an area where it is said to be common (R. Yosef, pers. com.), suggests a reduced activity at this time of the year.

Populations of this species from the 'Arava valley have been included in the subspecies *microlepis* (Blandford, 1874), which may not be valid (see Leviton *et al.* 1992 for a short review).

Uromastyx ocellatus ornatus (von Heyden 1827)
ELAT, 500 M W. OF THE CEMETERY (29°34'N, 34°56'E), 180M A.S.L., END OF OCTOBER 1994, 1 AD.*
This animal had an horizontal burrow about 120 cm long in a steep rocky slope facing south and dominating a small wadi with scattered acacia trees. It was seen on several days at the end of the month. On 19 October, it was observed for a long time. It was already sunbathing on rocks close to its burrow when I arrived at the end of the morning. It stayed there for about one hour, when it left the slope to go down the wadi. It then fed on various plants on the ground before climbing on an acacia tree to eat leaves. It returned to the slope less than an hour later and disappeared. I do not know whether it went out again later that day.

The importance of plants in the diet is well documented for *U. aegyptius* (Foley *et al.* 1992) and *U. acanthinurus* (Bons 1959), so plant consumption has to be expected for *U. ocellatus* as well.

The granite mountains near Elat are the only place where *U. ocellatus* is known to occur in Israel (Werner 1988).

Scincidae
Chalcides ocellatus ocellatus (Forsskål, 1775)
ELAT, HOTELS AREAS (29°33'N, 34°57'E), < 10M A.S.L., 30-09-94, 1 AD.
ELAT, SOUTHERN PALM TREE PLANTATION (29°33'N, 34°58'E), < 10M A.S.L., 3-10-94, 1 AD & 22-10-94, 1 AD*
YOTVATA, SEWAGE LAGOON (29°53'N, 35°03'E), 70M A.S.L., 20-10-94, 2 IND.
YOTVATA, 1 KM SW OF THE GAS STATION (29°53'N, 35°02'E), 70M A.S.L., 24-10-94, 1 IND*.
Some were found active: sunbathing in a flower-bed in the hotel area around midday or in the morning around the ringing station under *Suaeda* bushes. Others were found beneath a plank under the base of a *Tamarix* bush on sandy ground at the Yotvata sewage and beneath a plank inside a small bush among acacia trees on hard ground 1 km south of Yotvata on 24 October. All the specimens I have seen conformed to the description of the nominate subspecies given by Mateo *et al.* (1996).

Eumeces schneideri (Daudin, 1802)
ELAT, WATER PUMPING STATION (29°33'N, 34°56'E), 170M A.S.L., 16-10-94, 1 AD.*
An adult was seen there moving (foraging?) around and inside a big bush, near midday. Specimens from southern Israel belong to the subspecies *schneideri* (Werner 1988).

Sphenops sepsoides (Audouin, 1829)
YOTVATA, SEWAGE LAGOON (29°53'N, 35°03'E), 70M A.S.L., 24-10-94, 1 AD.*
This individual was found in the sand beneath a plank under a *Tamarix* bush at Yotvata sewage farm, in an area of bushes on earthy ground far away from the sand banks. One *C. ocellatus* was found under the same plank.

Although this situation does not seem to be typical for the species according to the published material (Werner 1968), it may not be too unusual since its close relative *S. boulengeri* is often found in the same micro-habitats in Morocco (Ph. Geniez pers. com). Our specimen from the 'Arava lacked any spots on the tail, whereas the two specimens from the Negev depicted in Werner (1968) show an obviously spotted tail, as it is the case in *S. boulengeri*.

Lacertidae

Acanthodactylus boskianus (Daudin, 1802)

ELAT, GARDENS AND PARKS IN TOWN (29°33'N, 34°56' & 34°57'E), 10-80M A.S.L., OCTOBER 1994, SEVERAL AD.*

ELAT, ACACIA TREES AROUND SEWAGE FARM (29°35'N, 34°58'E), 20M A.S.L., 22-10-94, SEVERAL JUV.*

ABOUT 15 KM N OF ELAT, ABOUT HALFWAY UP THE WADI ETEQ, (≈29°42'N, ≈34°56'E) ≈450M A.S.L., 13-10-94, 1 JUV.*

Specimens from acacia trees around the sewage farm were syntopic with *A. opheodurus*. This species and the following may be difficult to tell apart even in the hand. The colour of the underside of the tail of the young (red in *A. opheodurus*, blue in *A. boskianus*) is said to be a useful clue to separate the two species in Arabia (Leviton *et al.* 1992). All the specimens I identified had a red or pale underside of the tail, and only one briefly seen young *Acanthodactylus* from north of Elat had a blue tail. The tail colour thus cannot be used to separate *A. boskianus* from *A. opheodurus* at least in southern Israel. In Morocco, young *A. boskianus* may have a red or blue undertail, although red is far more frequent (pers. obs.). Adults of *A. boskianus* can usually be identified by their larger size, more contrasting colour pattern on the back, with lines of black spots and white flecks, darker dorsum of the tail and bigger and less numerous dorsal scales. The snout shape is also different, being blunter on *boskianus*. When present, the central dorsal stripe (formed on *boskianus*, reaching head without fork on *opheodurus*) is the most useful character, being especially well marked on young specimens. Nevertheless, I found some animals (*A opheodurus* with poorly marked dorsal pattern) to be tricky, even in the hand. The pectination of the toes did seem to differ - based on examination in the field in any of the specimens I have caught. Eyelid pectination is a useful character, but is difficult to assess even in the hand.

Salvador (1982) does not recognise the subspecies *asper* (Audouin, 1829).

Acanthodactylus opheodurus (Arnold, 1980):

11 KM N OF ELAT, NEAR THE DOUM PALMS (29°37'N, 34°59'E), 30M A.S.L., 13-10-94, SEVERAL AD.*

"ALAEMON NATURE RESERVE", ALONG THE ROAD 90 ELAT-TEL AVIV AT KM. 33 (29°43'N, 35°00'E), 90M A.S.L., 14-10-94, 1 AD. & SEVERAL JUV.*

SAMAR, SAND DUNES E OF THE ROAD 90 ELAT-TEL AVIV AT KM 39 (29°48'N, 35°01'E), 80M A.S.L., 15-10-94, 1 AD. & SEVERAL JUV.*

ELAT, ACACIA TREES AROUND SEWAGE FARM (29°35'N, 34°58'E), 20M A.S.L., 22-10-94, SEVERAL AD. & JUV.*

YOTVATA, ACACIA TREES AROUND THE GAS STATION (29°53'N, 35°03'E), 70M A.S.L., 24-10-94 SEVERAL IND.*

MIDRESHET BEN GURION AT SEDE BOQER (30°51'N, 34°46'E), 460M A.S.L., 29-10-94, NUMEROUS AD. & JUV.*

This species is widespread along the 'Arava valley between Elat and Yotvata, in most habitats from sandy areas to hard gravel ground with acacia trees. The syntopy with *A. boskianus* was observed in acacia trees north of Elat. All these observations fall within the range of *A. opheodurus* published by Werner (1986).

Acanthodactylus pardalis (Lichtenstein, 1823):

MIDRESHET BEN GURION AT SEDE BOQER (30°51'N, 34°46'E), 460M A.S.L., 29-10-94, 1 AD. M.

I could find only one individual of this species despite active searching in an area with loess soil just outside the campus. It was active in a dense green bush at mid-afternoon.

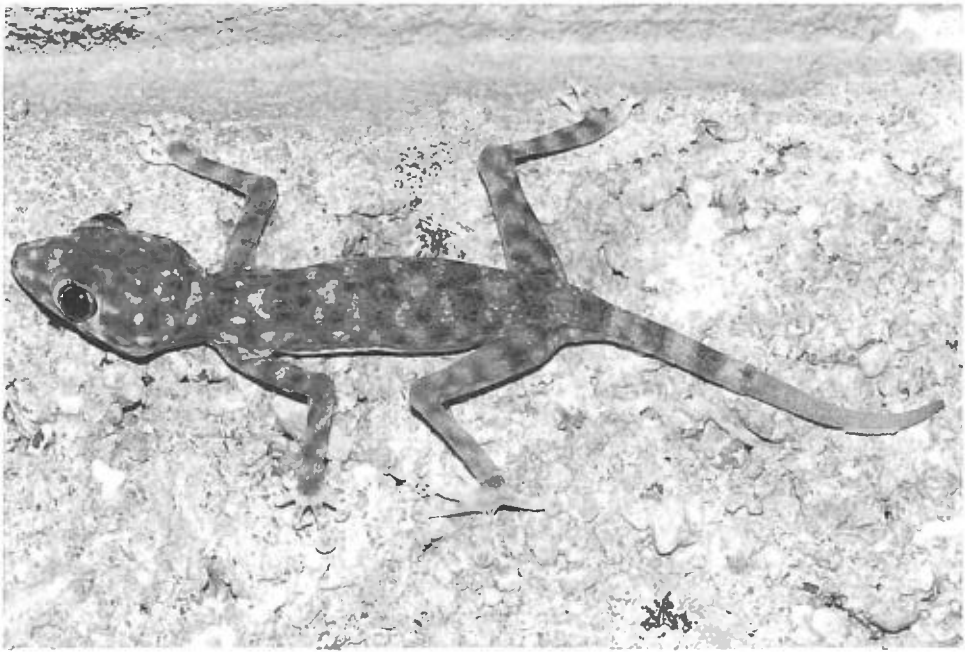

Plate 1. Young specimen of *Ptyodactylus hasselquistii hasselquistii* from Elat, southern Israel. Compare coloration with specimens in plate 2.

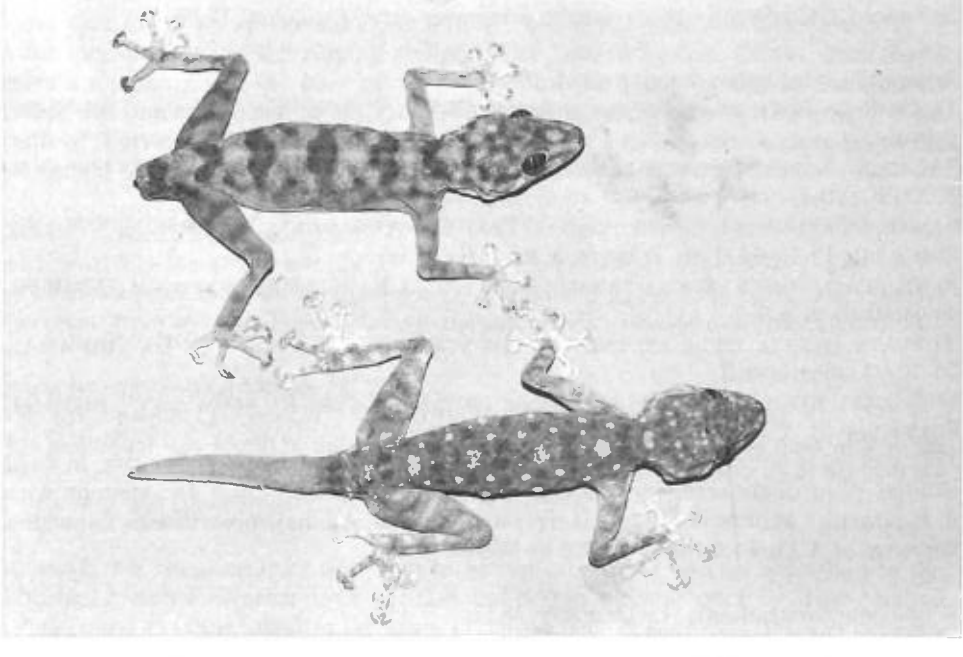

Plate 2. Adult specimens of *Ptyodactylus guttatus* (below) and *Ptyodactylus hasselquistii hasselquistii* (above) from Elat, southern Israel.

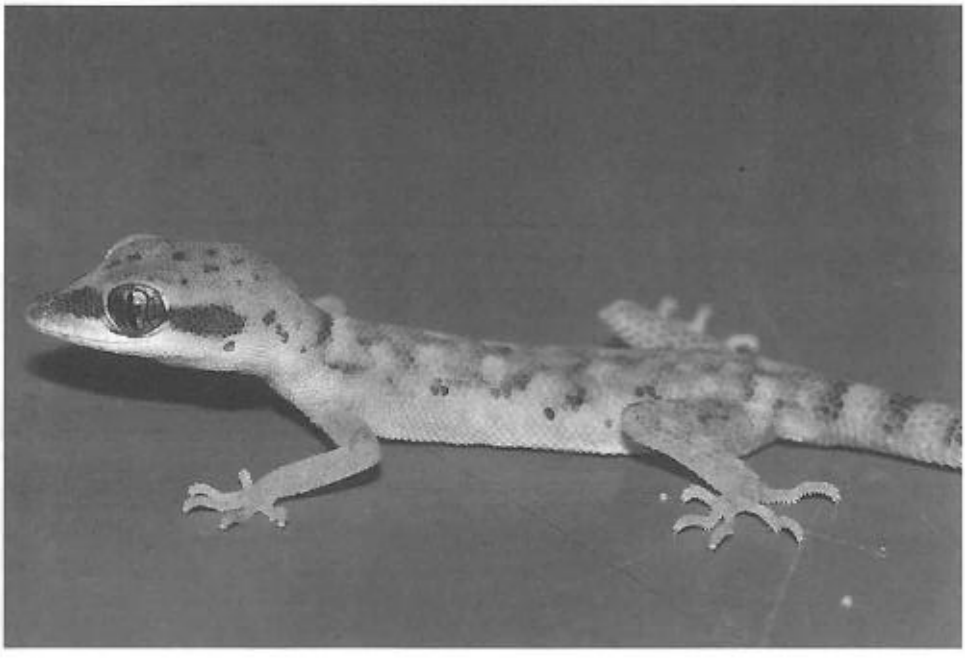

Plate 3. *Tropiocolotes nattereri* from Elat, southern Israel.
A specimen with poorly marked dorsal pattern.

Plate 4. *Tropiocolotes steudneri* from Sede Boqer, central Negev.
Compare colour and proportions with the specimens in plate 3 and in Baha el Din (1994).

Mesalina olivieri (Audouin, 1829):
"ALAEMON NATURE RESERVE", ALONG THE ROAD 90 ELAT-TEL AVIV AT KM. 33 (29°43'N, 35°00'E), 90M A.S.L., 10-10-94, 2 AD.
MIDRESHET BEN GURION AT SEDE BOQER (30°51'N, 34°46'E), 460M A.S.L., 29-10-94, 1 AD.
In both these localities, this species was found on soft ground (sand in the 'Arava, loess in the Negev). It is morphologically clearly distinct from the following species by different colour, pattern and more robust habitus (especially head shape).

The animals from Israel are sometimes included in the subspecies *schmidti* (Haas, 1951).

Mesalina guttulata (Lichtenstein, 1823):
MIZPE RAMON, 28-10-94, 1 AD
MIDRESHET BEN GURION AT SEDE BOQER, ALONG THE ROAD TO EN' AVEDA (30°50'N, 34°46'E) 400M A.S.L., 29-10-94, 1 AD.
In these two places it was found in rocky habitats (bare stones with little vegetation in Mizpe Ramon, rocky slope between the campus and En 'Avedat in Sede Boqer). At Sede Boqer both *M. guttulata* and *M. olivieri* occurred. The ecological segregation between these two lizards is already well known (Haas 1952, Pasteur & Bons 1960, Werner 1982).

Ophisops elegans (Ménétriés, 1832):
MIDRESHET BEN GURION AT SEDE BOQER (30°51'N, 34°46'E), 460M A.S.L., 29-10-94, 1 AD.*
Active during the morning in gardens near the Mitrani centre.

According to Werner (1988), only the subspecies *ehrenbergii* (Wiegmann, 1835) occurs in Israel.

Psammophis schokari (Forsskål, 1775)
ELAT, JORDAN-ISRAEL BORDER CROSSING POINT (29°34'N, 34°58'E), 9-10-94, 1 JUV. DEAD ON ROAD*
ELAT ACACIA TREES SW OF SEWAGE FARM (29°35'N, 34°58'E), 20M A.S.L., 9-10-94, 1 AD. DEAD* (KILLED BY PREDATOR?)
Both localities are in the 'Arava valley, on hard ground of stony alluvium with scattered acacia trees. These two specimens are now in the collections of the Muséum National d'Histoire Naturelle de Paris (juv: MNHN 1995-2359; ad: MNHN 1995-2360). They agree with the diagnosis of *P. schokari* given by Marx (1968, 1988). They have 170 and 171 ventral scales respectively and a clear brown mid ventral band.

Werner (1988) reports the presence of *P. aegyptius* in southernmost Wadi 'Arava. These findings represent an interesting range extension for *P. schokari* in Israel and establish the sympatric occurrence of both species in southern 'Arava.

Spalerosophis diadema cliffordii (Schlegel, 1837)
ELAT, SOUTHERN PALM TREE PLANTATION (29°33'N, 34°58'E), < 10M A.S.L., 9-10-94, 1 AD.* & 18-10-94, 1 AD.*
These two individuals were found active soon after sunrise. The first one was mobbed by numerous birds of several species (mainly *Passer domesticus, Pycnonotus xanthopygos, Turdoides squamiceps*) in the *Sueda* bushes near the ringing station. The other was apparently sunning in a patch of dense green vegetation inside the date plantation.

Telescopus dhara dahra (Forsskål, 1775)
ELAT, NEAR THE CEMETERY (29°34'N, 34°56'E), 100M A.S.L., 2-10-94, 1 AD.*
Found at night, moving on bare rocky ground in the hills, but not far (less than 300 m) from the cemetery, which is planted with many trees and plants.

This specimen and the published photographs of this species from the Middle-East that we have seen obviously differ in colour pattern from the three Moroccan specimens we have been able to examine in colour pattern (head black on specimens from Morocco), arguing for the recognition of the north-African populations at least as a distinct subspecies: *T. d. obtusus*.

DISCUSSION

Although it is difficult to draw general conclusions from observations made during such a short period, it may be interesting to compare our list of data from the southern 'Arava with the list of species that could be expected in this area (Salvador 1982, Werner 1988, Werner & Sivan 1993). I found all the Geckonidae that could be expected from the published material except *Tropiocolotes steudneri* and *Stenodactylus doriae*. According to Baha El Din (1994), the former species is probably erroneously cited from the southern 'Arava valley, because of misidentification of *Tropiocolotes nattereri*. The latter species inhabits soft sand areas where it can best be found at night. I visited such habitats around Samar and Yotvata, but only during day time. Around Elat, where I searched for reptiles at night, there is no area of sand dunes. My list of Agamidae, Scincidae and Lacertidae include all the species that are known to inhabit this area, a fact reflecting their conspicuous and mostly diurnal habits. Snakes are notoriously difficult to find, and my observations are not representative of the local snake fauna.

ACKNOWLEDGEMENTS

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HELP NEEDED!

THE PLIGHT OF THE GIANT TORTOISES OF CHANGUU ISLAND, ZANZIBAR

The giant tortoises (*Geochelone gigantea*) of Changuu Island, Zanzibar, are believed to have originated from Aldabra, in the Indian Ocean, in the early 19th century. Until recently Changuu remained a safe haven for these magnificent, yet vulnerable, tortoises. In the 1950's it was reported that there were 200 tortoises on the island. However, in 1990 the population had dropped to 50. In 1996 Mr. Steve Tolan drew attention to the threats that faced this unique group of animals. A survey later in the year by the World Society for the Protection of Animals (WSPA), together with Professor John Cooper, revealed that only nine adults remained on the island. It appeared that tortoises were being stolen, probably to supply the international trade, and that any adults would remain by the millenium, seemed extremely unlikely.

At the time of the 1996 survey there were also 84 baby tortoises on Changuu but these were kept in poor conditions in a locked shed. Originally babies were released on the island when they reached five years of age, but the likelihood of them being stolen meant that they now had to remain in the shed, with dwindling numbers of hatchlings joining them each year. It was disturbing news that the 1996 survey revealed no small to medium-sized tortoises, even though each year a new batch had been released from the rearing shed.

Something had to be done quickly to ensure that the giant tortoises would survive, so WSPA, in conjunction with the Zanzibar Tourist Corporation and with the assistance of Drs. Meredith Kennedy and Dennis Doughty, both veterinarians, developed a rescue plan. In September 1996 all 84 babies were relocated to a fenced compound in the grounds of Livingstone House on the main Zanzibar Island, while the nine remaining adults were numbered and closely monitored on Changuu.

Disaster struck soon after, when in November 1996 over half the youngsters were stolen from their compound on Zanzibar, and two adults (a male and a female) disappeared from Changuu. However, this setback was turned to advantage. A 500 US dollar reward prompted an informer to come forward and as a result, a man was arrested in Dar es Salaam. Nine adult tortoises were seized (including the two recently marked ones stolen from Changuu), and all were returned to Zanzibar. Further information led the authorities to another person who was found to be in possession of 13 adults, 8 mid-age tortoises and 30 youngsters.

These seizures have quadrupled the Zanzibar population of adult giant tortoises and show what can be achieved by dedicated effort in a relatively short space of time. However, stronger security measures, better vigilance, veterinary tests on confiscated animals and funding for the larger food bill, are all essential to increase the population on Changuu and to provide the tortoises with a secure future. We are therefore seeking the assistance of herpetologists, naturalists, and other concerned persons in order to provide these. Cheques should be made payable to the"Changuu Tortoise Appeal" and sent to the address below. Information about the appeal and its achievements will be published in herpetological and conservation journals.

JOHN E. COOPER

STEVE TOLAN
Changuu Tortoise Appeal
Account no. 70634980, Barclays Bank plc. P.O. Box 8, 13 Library Place, St Helier, Jersey JE4 8NE, Channel Islands

THE MADAGASCAN FROG *PLETHODANTOHYLA INGUINALIS* EATS SCORPIONS

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The Madagascan microhylid frog *Plethodontohyla inguinalis* Boulenger, 1882 is recorded for the first time as a predator of the scorpion *Grosphus madagascariensis*. Other instances of predation by anurans on scorpions are cited, and it is suggested that large terrestrial amphibians may be effective agents in the control of scorpion populations worldwide.

INTRODUCTION

An exhaustive list of the predators of scorpions was prepared by Polis *et al.* (1981). Predation on scorpions was later analysed by McCormick & Polis (1990). These authors established that approximately 150 taxa, mainly composed of vertebrates, prey on scorpions. They gave the percentages of predators of scorpions represented in each group of vertebrates. These include birds (37%), lizards (34%), mammals (18%), frogs and toads (6%) and snakes (5%). Of predators listed by Polis *et al.* (1981), only seven species of anuran amphibians were cited. [These are: *Bufo cognatus, B. compactilis, B. terrestris americanus* and *Scaphiopus couchii* in the U.S.A.; *B. melanostictus* in Singapore; *B. regularis* and *B. adsperus* in South Africa.] *B. regularis* is actually widespread throughout most of Africa except for the North West, and could therefore be an important agent in the regulation of scorpion populations over a large area.

In a more recent paper, Lourenco & Cuellar (1995a) identified a new amphibian predator of scorpions, the large terrestrial South American frog *Leptodactylus pentadactylus* (family Leptodactylidae). This was the first record of this species preying on scorpions, and the first instance of predation by Anura reported from South America. Moreover, this species may feed extensively on scorpions and specifically on *Tityus bastosi* Lourenco, since the four cases observed all involved this species. In this note we identify a new amphibian predator of scorpions, the terrestrial Madagascan frog *Plethodontohyla inguinalis* Boulenger, 1882. This is the first record of preying on scorpions in the family Microhylidae and is also the first instance reported from Madagascar of anurans preying on scorpions.

The initial observation was made by F.G., who examined the stomach contents of a male *Plethodontohyla inguinalis* deposited in the Zoologisches Forschungsinstitut und Museum Koenig (ZFMK 14646). This specimen had been collected at Niagarakely, eastern Madagascar (Fig. 1). Its stomach contained two scorpions as well as fragments of leaves, almost certainly from the forest floor, a few unidentified beetles and a stick-

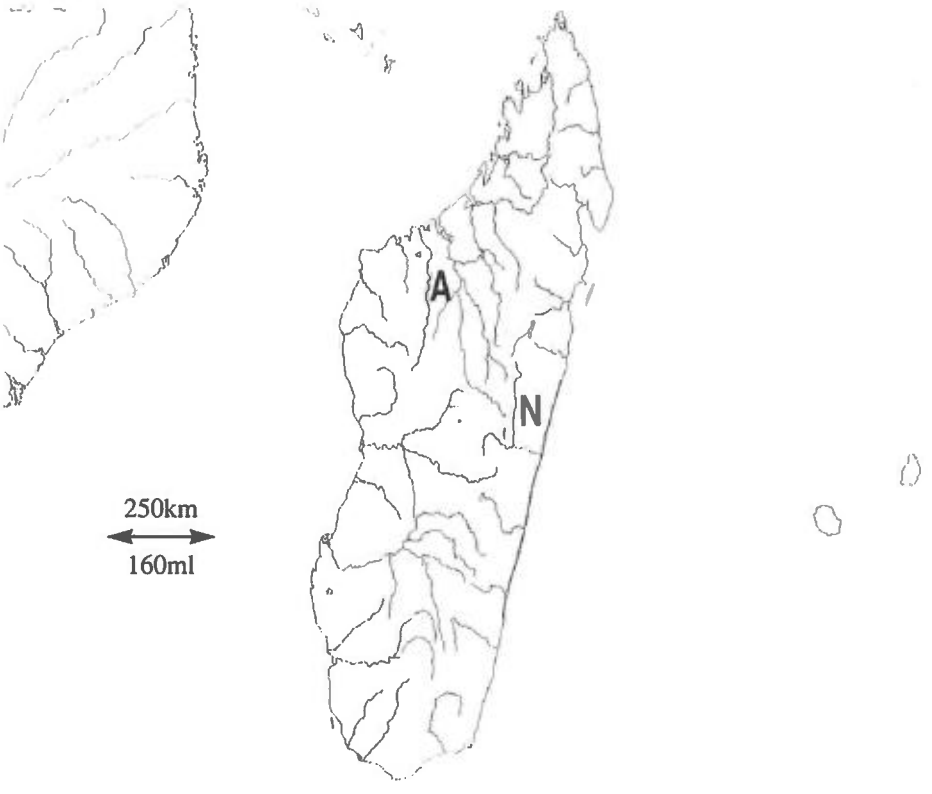

Fig 1.
Map of Madagascar, showing localities mentioned in the text
A: Réserve naturelle intégrale de l'Ankarafantsika
B: Niagarakely

insect. The scorpions were forwarded to W.R.L., who identified them as *Grosphus madagascariensis* (Gervais), one of the species most common in Madagascar. The specimen of *P. inguinalis* averaged about 100 mm in snout-vent length, while the two scorpions were both adults, one male and one female, ranging from 45 to 50 mm in length. It is possible that the scorpions were mating when captured by the frog.

This new record of predation on scorpions by frogs is of interest not only because it is the first case involving a Madagascan frog but, secondly because it shows that large terrestrial frogs may be active predators of scorpions and effective means of controlling their populations.

Several species of scorpions are extremely venomous and pose important health problems as a result of the fact that they live in close proximity to human beings in several regions of the world (Lourenco & Cuellar, 1995b; Lourenco *et al.*, 1996). This situation is not so common in Madagascar, but due to human activities in that country other problems arise. A biological programme of reproduction and reimplantation has been created by the Jersey Wildlife Trust for the endangered species of tortoise *Geochelone yniphora* (Juvik *et al.*, 1980-81), in the area of the 'Réserve naturelle intégrale de l'Ankarafantsika' (Fig. 1). However, young tortoises in the reserve have

been killed by scorpion stings (Razanarimamilafiniarivo in litt, 1995). The agent responsible by these incidents was identified as *Grosphus bistriatus* Kraepelin, a species very similar in size to *Grosphus madagascariensis*. The presence of effective scorpion predators in the reserve might help to control the scorpion populations in the area, which are responsible for the deaths of *G. yniphora*.

With the alarming decline of amphibian populations worldwide (Barinaga, 1990; Phillips, 1990; Wake *et al.*, 1991), studies are needed to determine the precise extent to which frogs prey on scorpions, and to assess the status of frog populations in Madagascar. Scorpions may be losing some of their effective predators and the agents that control their populations worldwide.

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NOTES ON HAWKSBILL TURTLE NESTING ON GOLDEN SEAS BEACH, ORACABESSA, JAMAICA

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In July 1993, I visited Jamaica for three weeks. My intention was to visit the Hope Zoo in Kingston, Cinchona Gardens in the Blue Mountains and also see the Jamaican Iguana (*Cyclura collei*) in the Hellshire Hills.

Partly due to the exorbitant cost of vehicle hire and partly due to a stiff neck caused by a maniac driving into the back of my car, writing it off and rearranging my neck muscles, a week before departure, I only managed a short visit to Hope Zoo. Four wheel drive is necessary, as all roads, except the A1, which runs from Montego Bay to Ocho Rios, have potholes - some of them very deep.

Our base was *The Golden Seas Beach Hotel*, Oracabessa. To find the hotel, take the A3 from Ocho Rios East, past developments like Huddersfield, plantations like the Prospect Estate and great houses like Harmony Hall and it is on the left at a dusty bend in the road opposite a petrol station. A few minutes walk along the road, over the Rio Nueva, is Oracabessa town, where Ian Fleming's house *Goldeneye* can be found. Here he wrote many of his *007* books, naming the hero after his friend, the ornithologist James Bond. You can visit James Bond Beach, but Goldeneye can only be viewed by boat. Not far away, high on a hill, is *Firefly*, with its "Room with a view" overlooking Port Maria. Here Noel Coward spent many of the last 23 years of his life until he died there in 1973 (Zach, 1989). This place can be visited and is well worth the trek up the hill.

Once it became clear that I was not going to be able to gallivant all over the island, we decided to visit Kingston. A visit to Jamaica's capital is not for the faint-hearted, and the bustle and apparent, if not actual, chaos can be frightening. There are parts even regular visitors do not enter, so a map is essential, and it is not advisable to look lost, *even if you are!*

On my visit to the Hope Zoo, I was delighted to see a group of juvenile iguanas that were being reared for eventual release. The iguanas all had numbers painted on them and had been electronically tagged. They had originated from a wild nest found in the Hellshire Hills and had been confined to give them a head start before release back into the wild (Rhema Kerr, pers. comm; Vogel & Kerr, 1992). There are many hazards for young iguanas, and not the least of these are the under-fed dogs brought in by local charcoal burners [it was one of these dogs belonging to such a person which had inadvertently rediscovered the Jamaican Iguana after it was thought to have been wiped out in the 1940s] (Vogel & Kerr, 1992). The zoo also had a fine collection of the Jamaican Boa or Yellow snake (*Epicrates subflavus*), but did not have facilities for breeding the snake. The animals are in the excellent care of senior curator Rhema Kerr, who was very helpful in providing answers to my many questions. Rhema also suggested I keep an eye out for turtles on the Golden Seas Beach. You hear all sorts of stories about travelling abroad, and when you say you are going to Jamaica, some people react as if you have

booked a one-way ticket to the end of the world! To be honest, I always take other people's stories, good and bad, with a large helping of salt, after all, a good friend told me they had flown home, at extra cost, 5 days early on a fortnight's break to Jamaica because they "had done everything"! Jamaica can be nerve-racking, especially if you are driving through Kingston, but, generally, the locals are very friendly. They can be *extremely* helpful if you are lost, although some of the directions can confuse. On our way back from Hope Zoo we decided to visit *World's End Distillery*, home of Dr Ian Sangster's liqueur factory. We were told to drive to Gordon Town and ask for directions. This we did and were told to "follow de road straight". Ten miles, thirty minutes and a hundred bends later the place was found - *closed*, although a very helpful employee did open up for us and we had a nice tasting session, coming away in, and with some, wonderful spirits!

The journey back from Kingston in the dark, by a "short cut", actually took an hour longer than the other route because the road must have had 90% of Jamaica's pot holes in it! This did not do my neck much good, so, apart from the organised trips, most of the holiday was spent at Oracabessa. This meant plenty of time exploring the local area, and, especially, the Golden Seas Beach. I did find plenty of *Anolis lineatopus* in and around the hotel and one *Typhlops jamaicensis* under a stone across the road. I only saw one *Anolis garmani*, and that was at the University Marine Station at Discovery Bay.

During the first week the weather was very hot and the sea very calm. One night a plague of flying termites appeared and covered the patio and our room with discarded wings. Ants had removed all trace of any termites which failed to survive their wedding night by the next morning. A few days into the holiday, I found a set of turtle tracks on the beach. They ended in what must have been a nest, but the turtle had not gone far up the beach due to a large washed up log barring its way. Hawksbill (*Eretmochelys imbricata*) turtles usually nest at the back of beaches, often under vegetation, but this one was out in the open. I quickly covered the tracks as I was not sure whether turtle eggs were safe or not. I know turtle eggs are eaten on the south coast and large numbers of turtle shells are illegally exported (Grohall & Jones, 1992), so it was better to be safe. I thought the nest was high enough up the beach as there were some small almond tree (*Terminalia catappa*) seedlings between it and the sea.

Grohall & Jones (1992) state that "there are seven species of turtle found in Caribbean waters. These are the Green Turtle (*Chelonia mydas*), the Loggerhead (*Caretta caretta*), the Olive Ridley (*Lepidochelys olivacea*), the Hawksbill (*Eretmochelys imbricata*) and the Leatherback (*Dermochelys coriacea*). The most frequently observed nesting on Jamaican beaches is the Hawksbill, followed by the Loggerhead with less than half the number of nesting events, followed by the Green with even fewer nestings." I had not seen the turtle, but it was most likely to be a Hawksbill. Bustard (1972) states "In this species, nesting is more diffuse than in most other species both seasonally and geographically with the result that a substantial proportion of the natural egg production is not molested."

Also during the first week preparations for Jamaican Independence Day took place. Golden Seas Beach extended beyond the Golden Seas Beach Hotel, and most of it was accessible to the locals. The public area was backed by a steep wooded slope with some fine houses perched some way up. Part of the beach had been developed into a garden with tropical flowers visited by Doctor birds (streamer-tailed humming birds - *Trochilus polytmus*) and butterflies during the day and by bats (large moths!) and rat bats (bats!) at night. Peeny Wallies and Blinkies (luminous click beetles and fireflies) could also be seen flying along the beach at night. Some of the bigger fireflies flew very fast, and were

seen to great effect when returning from the Blue Mountains, in the dark, through Fern Gully, a picturesque wooded valley leading down to Ocho Rios on Jamaica's north coast. Near the beach garden a large tree had crashed down the sheer face of the cliff backing the beach, from the road above. Here it lay, a tangle of branches, covering a large part of the back of the beach. As independence day approached, a lone Jamaican began to tidy up the beach, sweeping up almond seeds, leaves and all sorts of flotsam into neat piles. One by one the piles were either burned or removed to the back of the beach, until the beach was clear. The fallen tree was set alight, but the burned remains were just left. The far part of the beach by the turtle's nest was not disturbed. Independence Day was a holiday; everybody was on the beach and Reggae music boomed out. The source of the music was Oracabessa town nearly 3 miles away! The bank of loud speakers was bigger than some of the houses there! The day following the local holiday the weather turned for the worse and it rained for a day and a half. Then the weather cleared but the sea became rough and the beach became covered in dead leaves, which must have been washed down the nearby river. During this time the sea reached my turtle nest, and over the next week the almond seedlings on the beach died. Relating this in a telephone conversation with Rhema Kerr later in the week, she said the eggs would not hatch. Bustard (1972) states that both the salt and saturation with water kills eggs of turtles. The rough weather also dumped, or exposed, large numbers of flint pebbles on the beach in front of the hotel. These were removed by beach boys with rakes, shovels, and wheelbarrows and dumped at the back of the beach at each end of the hotel. This process was reducing the area above the high tide mark and rendering this area of the beach useless for turtle nesting. This had been going on for years, judging by the volume of pebbles along the back of the beach! There was now more area covered by dumped pebbles than exposed beach. In front of the hotel, a wall prevented any turtle nesting and at the far end, about 500 yards from the hotel, the wooded slope came down to the sea, with no dry exposed sand.

Bustard (1972) states, "the Hawksbill nests very rapidly", and Grohall & Jones (1992) indicate that turtles return almost fortnightly to nest, so after I had first seen the tracks in the sand I had a nightly walk along the beach with a torch to see if any turtles returned to the beach, or if any nests hatched. No turtles were seen until two days before departure, then, at around midnight, a Hawksbill turtle was found. She had dug a hole at the bottom of the woody slope under an almond tree and, from the tracks she had left, it was clear she had come up the beach to the back, followed the curve of the cliff in a clockwise direction and was now facing the sea. I rushed back for my video and still cameras and filmed her laying eggs using torch light. I was careful not to shine the light in her face, and she completed her egg laying. So as not to disturb her with my flash gun, I refrained from using the still camera until she had started her journey back to the sea. Her care in covering the nest was very thorough and she was fully two metres from the nest before she stopped arranging the sand, then a slight pause and she started down the beach. I knew the batteries in the flash gun were low, but I had not taken her speed into consideration. I only managed three shots before she vanished under the waves.

The next day I visited the spot, only to find sets of human foot prints right over the nest. The nest did not appear to have been disturbed, but there were turtle eggshells in the sand. I met a local who said, "a turtle visit de beach and dig up another nest", and I suppose that is what had happened. There are some white objects in one of my photos and these could be eggs? I could not see anything in the dark, and did not think to check with the torch. With space at a premium, especially on such a small, and ever-shrinking, beach it is little wonder that nest sites coincide. A brief check of the beach revealed four other sets of turtle tracks. One at the far end where there was no suitable sand above the high tide mark and two in front of the dumped stones, again just above the high tide

mark. These were just horse-shoe shaped sets where the turtle had come ashore and gone straight back into the sea. Perhaps these were "exploratory beachings". This is where the turtle beaches the night before she intends to lay, takes a view and "so having made a Semi-circular March", returns to the sea (Bustard, 1972). The fourth set ended in an excavated "scrape" - by the steps down to the beach from the hotel's pool. I saw no tracks from the scrape, but there were plenty of dog paw prints. The hotel guards had a dog, so this might have disturbed the turtle, or she may have given up, as the site was only about a metre from the high tide mark. There was no way of knowing whether any or all of these sets of tracks were made by one or more individuals.

On Golden Seas Beach the area suitable for turtle nesting was reduced naturally at one end due to the topography, it being a rocky promontory leading round to the mouth of the Rio Nuevo. The hotel was reducing what was left not only by being there, but by the management of the hotel beach. No one likes a stony beach, but, by dumping the stones (5-10 cm in diameter) along the beach from the hotel, the turtles are being forced into nesting closer together, and consequently increasing the chances of nests being dug up by later nesting females. If the nests on Golden Seas Beach are left undisturbed, there should be a good chance of hatchlings reaching the sea, as the suitable areas are well away from the lights of the hotel, and the beach is relatively steep, giving a short journey to the water. As Jamaicans eat a lot of the big ghost crabs, the beach has few of these predators.

This was my experience from just a short stay in Jamaica. With competition for beach space, there can be little doubt that turtles have an uphill struggle to nest successfully as more and more hotels are built. I thoroughly enjoyed my stay at Golden Seas as it was away from the noise and bustle of Mo'bay or Ocho Rios. Most of the tourists kept to the beach in front of the hotel, or the pool side, so what was suitable for turtles remained relatively undisturbed most of the time. Time will tell if this remains the case.

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British Herpetological Society Bulletin, No. 60, 1997

ORANGE FROGS: A WARNING SIGN?

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SUMMARY

The following report summarises information on 124 UK sites forwarded in response to national publicity surrounding the discovering of albino Common Frogs in Truro, Cornwall, in 1994 and subsequently. Most, but not all, records are recent in origin. A range of albino and partial albino conditions has been observed, resulting in orange frogs, typically, but also in a range of other colours. Patterns of development from spawn to adulthood are reported. Possible factors including albinism are suggested. A southerly bias to the records is shown which, it is argued, may be related to climatic differences. The potential of albino frogs as indicators of climatic change is discussed.

INTRODUCTION

In Spring 1994, a member of the public, Patrick Fielder, alerted the Cornwall Wildlife Trust to a bright orange frog in his garden in Truro. The creature turned out to be an albino variant of the Common Frog *Rana temporaria*. Albinos of this species have long been known, although Frazer (1983) describes them as typically golden yellow and Beebee (1985) as creamy yellow.

Seeing potential for publicising its work, the Trust issued a press release on the find. This led to extraordinarily heavy coverage by local and national television, radio, newspapers and magazines, and media interest was even stronger in 1995.

The resulting flood of calls and letters has brought to light a wealth of records, past and present. Three correspondents, in particular, had already made studies of unusually coloured frogs.

Ernest Ibbetson of Hertfordshire had regularly reared such creatures from spawn to adulthood over a number of years from 1972; his discoveries were in fact featured by several national television programmes in the 1980s.

Jean Webb of Somerset forwarded a copy of her 1975 article in The Countryman, which summarised records to date and reported on her own observations in Somerset and those of Arthur Price and CJ Leeke in Berkshire.

More recently, Jane Burton has been rearing albinos from tadpoles to adulthood at her home in Surrey since 1989; the last albino tadpoles appeared in 1984.

The information provided by these and many other contacts is summarised here with a view to presenting the phenomenon to a wider audience, seeking clarification and (where necessary) correction of interpretations suggested, and posing the question of whether the observations hold any ecological significance.

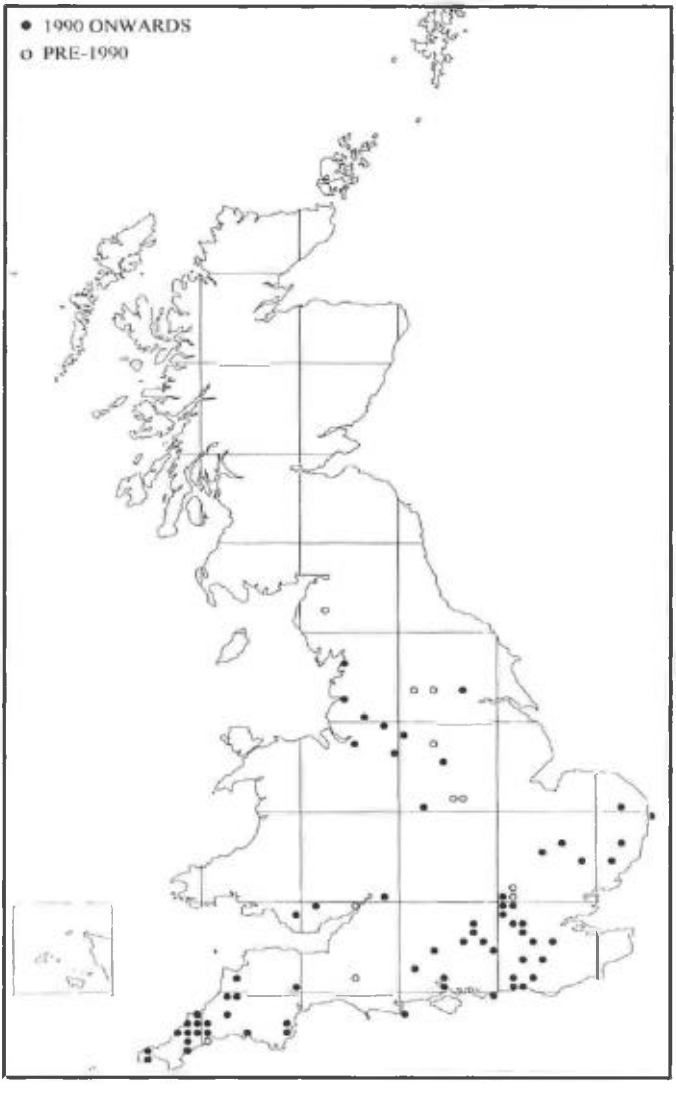

Fig. 1 Distribution of albino or partially albino Common Frogs

INFORMATION RECEIVED

SUMMARY OF RECORDS

Records of frogs considered to be albino or partially albino, or of albino spawn or tadpoles, have been received from 124 sites nationally. Some sites have yielded several (or many) albinos, sometimes over the course of several years. In the vast majority of cases (102) the earliest record for albinism at the site was from 1990 or later, although information was invited and received for older instances. Of the 22 "older" sites, only 7 records dated from earlier than 1960.

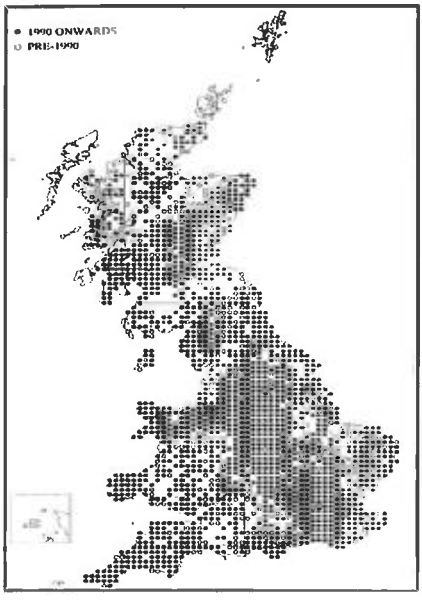

Fig. 2 Distribution of Common Frog as a whole

Fig. 3 Distribution of albino or partially albino Common Frog sites on a broad regional basis

COLOURS

Orange frogs have been mentioned at 73 of the sites, this being by far the most common colour for albinos reported here. In eight cases the colour was described as "peach" or "pinky orange", and in fact the original Truro frog turned this colour whenever subjected to prolonged light.

Yellow (or gold) was the next most popular colour, being mentioned for 23 sites, followed by pink (9), white (4) and cream (2), while three reports mentioned variegated colour patterns. There were also four instances in which frogs were described as having translucent skin and appearing pink (2), "golden" (1) or "pale" (1).

Sites at which the frogs were described as red have not been included within the 124 under discussion here, except for one in which the frog was confirmed to have red pupils to its eyes. Red (or pink) eyes have been taken as a sign of true albinism, while reddish skin is considered to fall within the "normal" colour range of the species. Frazer (1983) mentions that red frogs are particularly common in Scotland; the opposite appears to be the case for the skin colours considered as albino here (see later).

In most cases eye colour was not confirmed, but it appears that both red pupils and normal dark pupils are possible with any of the skin colours found. The red-eyed animals in the study have been described as true albinos, while those with "albino" skin but dark eyes are considered to be partial albinos.

Logically, it might be assumed that a frog with no pigmentation would have translucent skin through which the pink or red colour of its underlying flesh would be visible, as was the case in two of the sightings. Beebee (1985) attributes yellow colouring to lymph fluid under the skin. Close observation of normal frogs in the field shows that their undersides are often yellow, cream or white in colour. In the absence of the typical dark pigments, therefore, it would appear that a variety of other colouring and masking factors combine in different strengths to determine the overall appearance.

LIFE HISTORIES

Observations of mating by several recorders suggest that an albino female always produces albino spawn (i.e. with white or cream embryos), whatever the colour of her partner. This is perhaps to be expected, as the male's genes can have no influence until the embryos start to develop after external fertilisation.

In each of the "white spawn" cases described, every embryo in the clump of spawn was albino. Where development was studied, the white or cream spawn produced white tadpoles. At some sites, these gradually became normal in colour; presumably in these cases the male's genetic input was sufficient to make up for the deficiency. In other cases, the tadpoles became transparent - either colourless or with a red, orange or yellow tint. This allowed a very clear view of their internal organs. By the time of metamorphosis, the eventual adult colour appears to be fixed.

A different picture of development emerges from Ernest Ibbetson's frogs. These were said to arise from normal spawn with an almost imperceptible purple tint. The tadpoles appeared normal for at least their first ten weeks, and the adults (which included red, pink, white, orange, yellow and mixed-colour individuals) invariably had dark, not red, eyes. In Mr Ibbetson's view, an unusually coloured male would always pass its own colour on to its offspring.

Another case of male dominance was reported by Arthur Price, in which a pink frog with pink eyes fertilised black spawn. The tadpoles hatched black, but in some the melanin later broke into patches and then disappeared.

As well as lacking camouflage colouring, some albinos exhibit other deficiencies. Jean Webb sometimes found albinism to be linked with a distortion of the pelvic girdle, producing a kink in the tadpole's tail, while Arthur Price and CJ Leeke found that this led to a deformed shape in the adult. Kinked albino tadpole tails were also noted by Mark Cooper in Cheshire. In some cases the white tadpoles Jean Webb studied were less active than their normal counterparts and died a few days after hatching. Jane Burton found all of her albino adults to suffer from spinal deformities. Furthermore, they were *all* male.

Given the low survival rate of normal, camouflaged common frogs, it is surprising to find so many of these conspicuous creatures surviving in the wild at all, and that several recorders have observed the same (assumed) individual over three or four breeding seasons.

POSSIBLE CAUSES

The earliest albino records summarised by Jean Webb date from 1891, with several in the 1930s, so it can be assumed that this phenomenon was occurring long before pollution and other human abuses of the environment started to be blamed for aberrations in nature. Whether or not factors like pollution, increased ultra-violet radiation and global warming have increased the frequency of occurrence of the mutation causing albinism - or altered the survival chances of albinos - is another matter.

Ernest Ibbetson found unusually coloured frogs were a feature of most ponds in his home area, and blamed weedkillers for causing genetic changes.

To complicate matters, there is evidence that the unusual colours reported here can also be produced by directly environmental rather than genetic influences. Mrs P Wood recalled a population of white frogs being found in a boarded-up air raid shelter in Derbyshire in the 1950s; on release to a pond, they became darker. Andrew Greening told of the discovery of about 30 bright red frogs (albeit with normal eyes) trapped in an old drainage shaft; again the implication was that lack of light had affected pigmentation.

DISTRIBUTION

The distribution of albino sites on a 10km square basis is shown in fig. 1, while fig. 2 plots the distribution of *Rana temporaria* as a whole for comparison. Absence of albino records from Scotland and comparative rarity in the north of England are evident.

Numbers of albino sites are summarised on a broad regional basis in fig. 3. Even excluding the Cornwall records, whose numbers might be expected to be high due to local publicity, and the Devon records, which may have been influenced by publicity in Cornwall, there is a clear southern bias. The most northerly record received was from Keswick in Cumbria.

DISCUSSION

Comparison between the observed albino site distribution (fig. 1 and fig. 3) and the distribution of "normal" frogs (fig. 2) suggests that the southern bias suggested for albinism is not simply the result of recorder or pond distribution. Nor can it be argued to

be the result of proximity to Cornwall, the source of the original story, as the national publicity - by definition - covered all areas.

Perhaps the most obvious factor varying between north and south which might be used to explain this distribution is climate. Without dark pigments to help them absorb warmth from the sun, albino spawn and tadpoles are likely to develop more slowly than normal ones. In fact, Jean Webb did find that white spawn took longer to hatch than normal spawn in her study ponds.

Given this slower development, and the huge predation faced by frogs at their spawn and tadpole stages, it is surprising that any albino tadpoles survive to metamorphosis. Their chances of doing so, however, may be higher in the milder climate of the south, where warmth is not such a limiting factor.

Assuming that albino tadpole survival *is* higher in a warmer climate, it is perhaps logical to assume that numbers of albino frogs will be on the increase if global warming is taking place.

The information presented here cannot confirm whether albinism *is* becoming more common, but does lend support to such a notion.

The fact that so few of the reports related to older records is surprising if albino frogs have always been so common, as the presentation of "orange frogs" as a new phenomenon by the media tended to provoke contradiction by those who knew better.

Surely bright orange frogs must always have been a sufficiently alarming sight to be worthy of note, so why have so few been recorded or publicised before now if they are not actually more common today?

APPEAL FOR INFORMATION

Any information which might help yield a more accurate picture of what (if anything) is happening with regard to frog colouring, and why, will be much appreciated. Are there any other old records on naturalists' files? Has anyone seen an albino frog in the far north of England - or even Scotland? Does anyone have similar information from other countries?

Can anyone shed light on the physiological basis of colour variation in frogs? And have albino frog records been taken within a long-term pond study which might indicate trends (or otherwise) in their numbers?

ACKNOWLEDGEMENTS

The author wishes to thank the many fellow naturalists and members of the public who have taken time to share their information and views, without which this report would not have been possible.

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Photo: Jim Fisher (Frog life)

Plate 1. Orange tadpole of *Rana temporaria*

Photo: Stuart Hutchings

Plate 1. Orange froglets, *Rana temporaria*

FUNNY-COLOURED FROGS

TREVOR BEEBEE

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Albino, orange and other odd-coloured frogs received rather a lot of publicity in 1997. Much of this interest arose because of efforts to link an apparent increase in numbers of these curious animals with environmental causes, especially climate change. The story goes that as the weather gets warmer, frogs no longer need dark-coloured eggs (or tadpoles) to soak up the early spring sunshine and thus can afford to dispense with pigment production.

I find this a very unconvincing proposal, which seems to be based solely on an increased number of records mainly from southern and central England over recent years. If increasing temperatures do relax a need for pigment production, we would of course expect this to be manifest along the southern edge of the Common Frog's range in Europe. To the best of my knowledge, this is not the case. It also presupposes that losing pigment has no drawbacks. This seems very improbable; pale tadpoles and bizarrely-coloured frogs are highly conspicuous, and are very likely to suffer enhanced predation rates. If so, losing pigment would have very little benefit (presumably just saving the small metabolic cost of synthesising it) but would constitute a significant survival risk. Such a change would never spread under selection.

However, it may be no coincidence that most records of unusual colour varieties in frogs hail from garden habitats. Our studies on the genetics of garden and countryside frog populations in the Brighton area have shown that the former have become very isolated and somewhat inbred, with genes apparently undergoing rapid fixation by drift rather than selection. This fine-scale isolation of frog populations is presumably caused by intersecting roads and other inhospitable terrain in the urban environment. In these gardens we sometimes find populations with numerous pale or orange individuals, together with the distinctive unpigmented spawn they produce. We don't, however, see them in the larger and more genetically diverse rural frog populations. To me this suggests that curious colour morphs, and quite probably vulnerability to frog disease (another primarily garden phenomenon), occur because "bad" genes become fixed locally due to drift (essentially chance) in small isolated populations. These are plenty of examples of this kind of thing in populations of other organisms all over the world.

Apart from the biological questions involved here, there is surely a matter of principle about the associated publicity. It seems to me quite wrong to launch an idea about possible effects of climate change into the national press without any substantive scientific support, and without the benefit (or otherwise) of any kind of peer review. As a result, the climate change explanation was put across on national TV almost as established fact rather than the speculation that it really is. No other possible causes were considered. All this is rather reminiscent of the "cold fusion" fiasco, in which prominent scientists made important claims via the media rather than after the normal scientific scrutiny processes - and were subsequently discredited to the embarrassment of all concerned. Climate change is an important and controversial matter, and those involved in establishing its significance (or otherwise) are poorly served by red herrings.

THE ASTONISHING ADDER *VIPERA BERUS*

BERNARD GOOCH

When I was five I still vividly remember being taken for a walk and meeting a man who warned us to be very careful not to tread on an Adder, saying that a man he had just passed had caught one and was playing with it. This filled me with amazement and fear.

One Spring in my early teens, I caught my first Adder, a young one seven inches long and immensely fat. Covering my hand with my handkerchief, I picked up this charming little animal. In a fury it attacked the handkerchief and I saw the flash of the fangs from which oozed two drops of amber-coloured poison. In a sudden impulse, I let it go again, placing it on bare ground with my hand in front of it, palm upwards. Reaching my warm hand it pushed its little blunt nose between my fingers.

I tried this a second time with the fingers hanging down, and this time it held on to my fingers and in this position it astonishingly allowed me to take it back to school. This was quite a long walk of about 20 minutes during the whole of which the little snake clung to my fingers. As I put it down into a vivarium, it was evidently frightened and tried to bite me but missed and hit the glass instead. By the next day it had disgorged an adult Viviparous Lizard (*Lacerta vivipara*), much larger than itself. A day or two later it ate four or five little frogs. It quickly learned to enjoy lying on my warm hand.

Soon after this, I caught a large Adder; they can be picked up with a bare hand if grasped just forward of the tail and lifted at the same moment with the head hanging down. They cannot climb up their own bodies as some snakes can, to bite the hand that holds them. This delightful animal tamed so quickly that I was loathe to let it go in two or three weeks when it would need to feed. So I decided to try and keep it a little longer by forcible feeding. Using a thistle funnel. I filled the snake up with beaten-up raw egg. Not only did it appear to thrive on this unnatural diet, but it even held its head up afterwards as if not wishing to waste a precious drop. Five weeks later it escaped in the Isle of Wight, giving me a bite as a parting gift. Perhaps this strange diet was making it liverish and irritable.

A few years later, in 1926, when reading Zoology at Cambridge, I was shown an intriguing model in wood, with elastic bands to show that when an Adder opens its mouth its fangs erect ready to bite, and when it shuts its mouth they fold away. The snake has no option. I pointed out that when it yawns it often raises and lowers its fangs when its mouth is open. This, I was told, was quite impossible. All the muscles that the viper has, were shown in the model. So I had to lay on a couple of Adders to prove my point. They duly opened their mouths and moved their fangs up and down. To get them to do this in the Zoological laboratory would, I could see, be very difficult. As I expected they would not open their mouths as a crowd of people had tapped on the glass, hoping to get them to move or strike. As they knew nothing about Adders, they were duly astonished as I lifted one out with my bare hands, using the usual piece of wire to lift it out of its vivarium so as not to frighten it. It was not until 1992 that they agreed that Adders can move their fangs up and down when their mouths are wide open, so that as they said "We are both right".

My next encounter with Adders was when my wife and I went to live in Dartmoor, just below the 1.000 ft contour, to find seven or eight Adders living fairly close together in one part of the garden where they got the most sun. To our surprise, one February after a snowfall, the snakes came out to find their favourite basking places where the snow had already melted. Where it had not, they crept under the snow and also did not hesitate in some cases, to crawl several yards on top of the snow; at this time the temperature was 49ºF. One of these garden Adders became astonishingly tame and reliable and did not bite. For example, it used to climb up onto my shoulder. There it saw my left ear which it used as a convenient step to get up on to my head from which, of course it fell off. But it persisted until one day it put its head between my spectacles and my eye. Clearly I could not allow it to establish a right of way behind my glasses, so I removed the snake and my glasses and disentangled them on my lap.

Years later we moved to Dorset, and in our Swanage garden were delighted to find two Adders on one side of our kitchen garden, and three more in a field on the other side. To find out how effective they were as mousers, I picked up these five and put them in a bag overnight, to find in the morning that four of them had disgorged a partly digested mouse as is their custom when captured after having fed.

Many herpetologists state that new-born Adders probably feed on insects, spiders and worms. As my first Adder I caught was seven inches long, I did not see why new-born Adders at six and a half inches long should not be able to do the same. I saw that I must test this, but it was not until we moved near to the Chesil beach that I had the opportunity to do so. I took in a large pregnant female and put it in my sun-porch to wait events. When the sun was too hot, more than 120ºF, it could and did get into our bedroom to find some shade. Adders rarely eat in captivity but this one ate a dead shrew given us by our neighbour's cat. One morning we saw eight most wonderful little snakes. When we went near them, they struck at us to violently that they slid forward on the tiled floor. We put them all into a jam-jar which my wife turned upside down onto my bare hand, which they did not bite as they were not frightened. I then tipped them into a small vivarium. The astonishing results were published in "British Journal of Herpetology" Vol. 3, No. 6, pp 161-162. Here I need only recap and say as expected a full-grown Viviparous Lizard (*Lacerta vivipara*) was attacked and swallowed by an Adder much smaller than itself. The swallowing took seventeen minutes. Quite unexpectedly they tried to bite the glass or anything that the lizard had touched, including each other. In some of these attacks the fangs were not used, in some they were. So it seems they are immune to their own venom. They ignored young Slow-Worms born in their vivarium, but would obviously have eaten them if they had come into contact with a lizard and got the lizard smell.

An unexpected encounter occurred when we were in Vienna. A Curator in the Natural History Museum there kindly invited me to come and see his snakes. They turned out to be three or four *Vipera berus*. I asked if I could take them out and he said they had never been handled and I would be bitten. However, a suitable piece of wire having been found, I fished them out of their small vivarium one after another without frightening them and lowered them onto my hand where they at once settled down to enjoy the warmth, much to the surprise of the Curator.

On one occasion, as so often, I was asked to remove an Adder from a neighbour's garden, and instead of letting it go in mine, I put it in a small glass vivarium to show a friend whom I was expecting to call on me any minute. When he came I managed to remove the lid of the vivarium without being bitten, and surprisingly the Adder climbed straight out onto my hands and then on to my arms where, not being alarmed it settled down in the warmth of my hands and I was able to handle it freely.

One final word, this time a warning. Adders do sometimes attack human beings. I have managed to arrange this more than once: it is only necessary to put one's foot between an Adder basking in the open and its nearest cover. If one tries to stop it with one's foot it will violently attack the foot instead of going round. Anyone in unsuitable footwear stepping between an unseen Adder and a bush outside of which it was lying, is liable to be bitten several times before escaping.

RESEARCH IN YOSEMITE CONFIRMS AMPHIBIAN DECLINES IN PRISTINE HABITAT

One of the most disturbing aspects of recent reports of declines in the populations of amphibians around the world is that many came from national parks, nature reserves and other protected and supposedly pristine habitats. To date, many of these reports have been anecdotal, but a recent study by Charles Drost and Gary Fellers in an area near Yosemite National Park, California, provides clear evidence that amphibian declines in undisturbed and protected habitats are dramatic and real.

Drost and Fellers surveyed a transect in the Sierra Nevada mountains that was carefully studied in the early 1900s by Grinnell and Storer. Of the 7 frog and toad species listed in the earlier survey, at least 5 have suffered serious declines. One species, the Red-Legged Frog (*Rana aurora*), has disappeared altogether and another, the mountain Yellow-Legged Frog (*Rana muscosa*) now survives in only a few remnant populations, having previously been the most abundant amphibian in the area.

Only one species, the Pacific Treefrog (*Hyla regilla*), remains nearly as widespread as it was 80 years ago, though even it has declined at higher elevations (>4000ft). This situation is mirrored at many sites in the West Coast states, where marked declines in toads (*Bufo* species) and *Rana* species have been noted, while *Hyla regilla* has remained abundant. Possible causes for these declines include introduced predatory fish, pollution and loss of habitat due to long-term drought. But Drost and Fellers conclude that the overall cause remains a mystery.

The significance of the Drost and Fellers study is that, because it is based on an older study that provided data on past amphibian abundance, it provides unequivocal and quantitative data on amphibian declines. Other recently-detected declines, such as those in Central America, South America and Australia do not have the same depth of historical data.

Reference: Drost, C.A. & Fellers, G.M. (1996) Collapse of a regional frog fauna in the Yosemite area of the California Sierra Nevada, USA. *Conservation Biology:* **10**; 414-425.

FROG DISEASE SPREADING IN CENTRAL AMERICA?

New field work suggests that a disease that kills frogs is spreading southwards from Costa Rica into Panama. Biologist Karen Lips of St. Lawrence University, New York, USA, carried out extensive surveys of 50 streams in Chiriqui Province, Panama in December 96 and January 97 and found 53 dead animals belonging to 10 frog species. Similar mortalities were observed by Karen Lips in southern Costa Rica four to five years ago. The cause of these deaths has not yet been determined, but some kind of infectious disease is strongly suspected. Dr. David Earl Green, Chair of the DAPTF Disease and Pathology Working Group, is coordinating the pathological analysis of the dead animals.

Recently, outbreaks of lethal diseases have been reported among frogs in southern England, Israel and Australia. It is not clear whether there is any connection between these outbreaks but, in two of these other cases, it is thought that exotic diseases may have been brought into these countries with non-native pets, such as fish or reptiles, that have escaped or been released into the wild.

Diseases are one of many potential causes of the dramatic population declines that are affecting amphibians throughout the world and which are being investigated by the Declining Amphibian Populations Task Force. Other potential causes include habitat destruction, pollution and climate change.

A NEW PREDATOR OF NATRIX

KENNETH BLACKWELL

The 'Handbook of the Birds of Europe' lists a number of poikilothermic vertebrates which are prey of the Starling, *Sternus vulgaris*.

These being Frog, Rana, Newt, *Triturus* and Lizard, *Lacerta*.

Now it is possible to add Grass Snake, *Natrix*, to this list.

On the 25th, May 1997, a fine sunny day, a Starling pair were observed making frequent visits to their nest to feed a noisy brood. One bird was seen to be carrying what appeared to be a large Earthworm, *Lumbricus*. However, on flying over a garden table it dropped its prey. This resulted in a young 15cm Grass Snake landing instead of a worm. The snake appeared uninjured by the fall.

Bearing in mind the time of year, this animal must have hatched the previous year, and probably entered hibernation almost immediately. The warm day causing it to venture forth from its hibernaculum.

Whether a young Starling could have ingested a live snake is open to question.

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LETTERS TO THE EDITOR

"Predation of Cobras upon Fish is, to our knowledge, a rarely reported occurrence in the scientific literature"

Luiselli et al 1997, BHS Bull. (59)

Dear Sirs,

The Niger Delta, built up by discharge of the Niger River from which Nigeria gets its name, has been in the news of late for political and zoological reasons. Of the latter, the discovery of a new monkey *(Procolobus badius epieni)*, is noteworthy for one might expect Primates - to which we ourselves belong, to be the best known order of mammals. On the reptile front your Bulletin (no. 59: 13-14) chooses to publish a note by Luca Luiselli (University of Rome) and two? Nigerian collaborators on the taking of fish by *Naja melanoleuca* and *N. nigricollis* (Forest and Spitting Cobras). This, however is nothing new and is referred to in well-known texts on African snakes to which anyone with anything thought to be new should first turn:

(N. melanoleuca) "- - is also expert at catching fish, - - " *Broadley*, D.G. 1990 *Fitzsimons' snakes of Southern Africa* p. 292

" - - omnivorous; according to local conditions may become aquatic feeding entirely on fish - huge 2529 mm (8ft 71/2 ins.) example Mjanji contained 2 lbs. silurid (*Clarias* sp.); at Ripon Falls, Jinja, another, 1575 mm (5 ft. 2 ins.), seen catch *Barbus*." *Pitman*, C.R.S. 1974 *A Guide to the Snakes of Uganda*, p. 185, on *N. melanoleuca*.

"The Black Cobra eats a wide range of animals - -. In Central Africa some live almost entirely in the lakes, taking only fish." *Cansdale*, G.S. 1961 *West African Snakes*, p. 52.

These are not the original sources which would take more of my time than merits the occasion to find and pertain only to *N. melanoleuca*. But *N. nigricollis* is well known to also be omnivorous and is likely to have been recorded taking fish if the literature were to be searched.

One complication to a literature search is that the "Spitting Cobra" (*N. nigricollis* of old) is now known to constitute several species: *N. nigricollis, N. katiensis, N. pallida, N. mossambica,* apart from the South African Ringhals (*Hemachatus haemachatus*) which also "spits".

Luiselli (op. cit.) refers to sympatry between *N. melanoleuca* and *N. nigricollis* in the Niger Delta. To my recollection this has been published only once before from West Africa, by Jim Menzies (1966, Copeia (2): 169-179) in Sierra Leone. He attributed this admixture of forest *(N. melanoleuca)* and savanna *(N. nigricollis)* snakes to forest destruction; is this the background to sympatry found in the Niger Delta? Or have *N. nigricollis* penetrated forest country from along the coasts of Cameroons and Gabon in the south where contact with European traders has led to destruction of the forests which once fringed the shoreline? If "Forest Cobras are especially common in primary and secondary swamp forests" and "Spitting Cobras are more common in semicultivated and drier habitats" we might expect a comparative study of food habits, activity times, etc. etc. from Luiselli and his collaborators. And when undertaking such a study, please ensure that specimens collected, if killed, are preserved and deposited in a museum where they can be studied by a systematist like myself who needs long series of specimens from restricted areas in order to establish variation in standard taxonomic characters (mostly scalation) as baseline data for description of new taxa.

Yours faithfully,

Barry Hughes
(formerly of the University of Ghana - 1960-86)

Breeding Reptiles & Amphibians

A collection of papers selected from the
BRITISH HERPETOLOGICAL SOCIETY BULLETIN
1980-1992
Edited by
SIMON TOWNSON

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