The HERPETOLOGICAL BULLETIN

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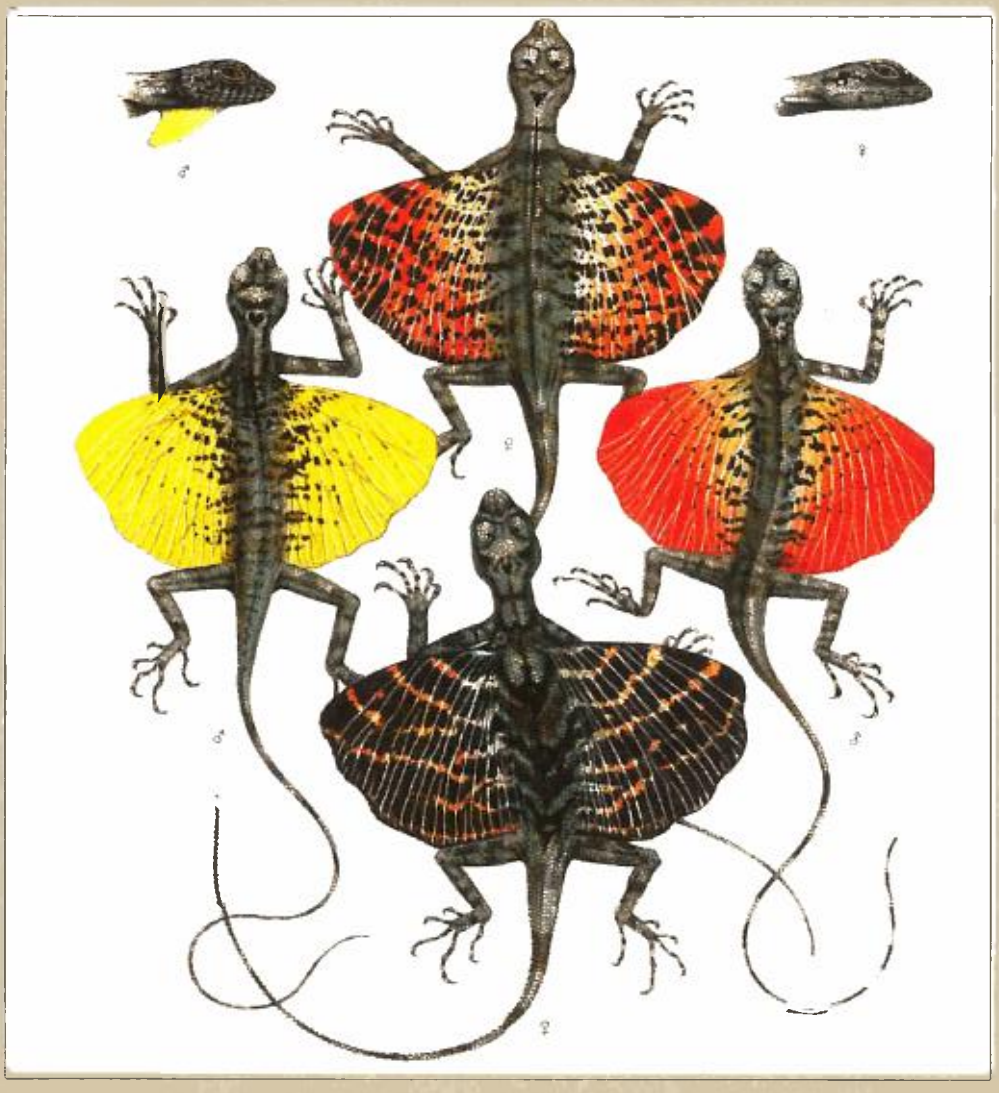

Herpetofauna of Abuko Nature Reserve, The Gambia • Invertebrate predation on larvae of Great Crested Newts • Advertisement call of *Physalaemus cuqui* • Learning ability of Hermann's Tortoise • Reptile observations on the Maria Islands, West Indies • Basking behaviour of *Tropidurus plica* • · Herpetofauna of the Palinuro Peninsula, Italy

THE HERPETOLOGICAL BULLETIN

The **Herpetological Bulletin** (formerly the British Herpetological Society Bulletin) is produced quarterly and publishes, in English, a range of articles concerned with herpetology. These include full-length papers of mostly a semi-technical nature, book reviews, letters from readers, society news, and other items of general herpetological interest. Emphasis is placed on natural history, conservation, captive breeding and husbandry, veterinary and behavioural aspects. Articles reporting the results of experimental research, descriptions of new taxa, or taxonomic revisions should be submitted to The Herpetological Journal (see inside back cover for Editor's address).

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The views expressed by the contributors to the Bulletin are not necessarily those of the Editor or the British Herpetological Society.

All submissions and correspondence arising from the Bulletin should be sent to the Editor, Peter Stafford, c/o Dept. of Botany, The Natural History Museum, Cromwell Road, London, SW7 5BD. *E-mail: pjs@nhm.ac.uk*

Front cover illustration
Flying Lizard, *Draco spilonotus* (= *D. lineatus*). From *Proceedings of the Zoological Society of London*, 1897. Reproduction courtesy of The Zoological Society of London.

EDITORIAL

THE BRITISH HERPETOLOGICAL SOCIETY BULLETIN

Now that the 'Bulletin' has been successfully re-launched - with a new format and title under the editorship of Peter Stafford, it is an appropriate time to say a very big 'thank you' to those who went before.

Monica Green - to whom the Society owes an inestimable debt, re-established the Bulletin as the BHS Newsletter in January 1970 and continued to produce it until January 1976 (No. 13). Thereafter, it was edited by John Pickett and/or Simon Townson, sometimes together, or one of them with another co-editor, right through until the hand-over to Peter at the AGM 2000. Hence, the editorship of John Pickett and/or Simon Townson spanned the incredible period of *more than 20 years*, and only because of an unsustainable workload did John Pickett very reluctantly cease being editor in 2000.

During the past six years John Spence has played a crucial role in the editorship, working with either Simon Townson or John Pickett. Without his tremendous back-up - much of the time as receiving editor - quarterly publication of the Bulletin would have been impossible.

I would like to take this belated opportunity to thank all of those responsible for the Bulletin, from its inception by the late Alfred Leutscher in 1947, up to March 2000 when the new editor took over.

I am sure you will all wish to join me in wishing Peter Stafford every success with his new venture. If the past eighteen months are anything to go by, we are in for a series of treats. I particularly commend some of the beautiful lithographs used on the covers, such as the Fijian Iguana (*Brachylophus fasciatus*) on the winter 2000 edition.

H. Robert Bustard, PRESIDENT
28 June 2001

BULLETIN NEWS

A small but significant development planned for the *Herpetological Bulletin*, which will become effective with the first issue next year (Number 78), is the implementation of a more regular review procedure. At present only articles of a veterinary or welfare nature are subject to 'automatic' review, but where appropriate this will now be extended to other articles published in the *main* section (e.g. *Forum*, *Obituaries*, and other subsections excluded). I must emphasize that the purpose of this is not to subject articles to critical examination or the dreaded 'red pen treatment', but simply to identify factual errors and other possible points of controversy that an author (and myself) may be unaware of, and wish to change before his/her work goes to print. It should not, therefore, dissuade potential authors in any way from submitting their work! The views and comments provided by referees will be taken into full account, but the decision regarding an article's final acceptance will remain solely that of the Editor.

Peter Stafford

BHS WEBSITE

Details of the British Herpetological Society are available on-line at the following URL address:
http://www.thebhs.org/
Some of the pages are in the process of being updated and there are plans to expand the site in various ways. If you haven't yet dropped by, however, it is worth a visit. Membership details are available and the site also includes abstracts of papers recently published in Herpetological Journal.

SOME REMARKS ON 'THE AFRICAN SNAKE *BOTHROPHTHALMUS LINEATUS*' by B. Hughes

HERPETOLOGICAL BULLETIN
No. 74, pp. 28-29.

LUCA LUISELLI

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THE *Herpetological Bulletin* has recently published a short note by Barry Hughes (2000) on the African colubrid snake *Bothrophthalmus lineatus*. This note includes some data that need to be critically reconsidered, and also a number of misquotations concerning the text of a paper published by myself and associates on this snake species in Nigeria.

On page 29 of the article, Hughes wrote 'Luiselli et al. (1999) claim that *lineatus* is unknown from northern and western areas of the Niger Delta', and then proceeds to list a few localities in western Nigeria from where the species has been recorded in the past. In fact, this is not what we claimed. On page 319 in our 1999 paper we actually wrote 'we surveyed localities of *southeastern* Nigeria' [italics mine], and then listed the areas surveyed. Thus, we did not survey any area of western Nigeria for the purpose of the article. At page 320 we wrote 'during our extensive surveys throughout the Niger Delta and the territories of Aba, Ikot-Ekpene and Eket (all situated in south-eastern Nigeria), we...found *B. lineatus* only in the deltaic moist forests growing along the Orashi River course of the eastern Niger Delta'. Thus, our text would appear to have been interpreted incorrectly by Hughes (2000).

With respect to body size data, our 1999 study demonstrated that females are larger than males in this species, exactly as confirmed by Hughes. However, we have strong concerns about the way in which Hughes has made comparisons of his body size data with those of our sample (our specimens were smaller than several of his specimens). It is my opinion that no such comparison can be confidently made because of important methodological differences. Hughes (2000) provides information in his paper on snake specimens opportunistically collected over an enormous geographic area (West Africa), and general remarks on their body length. But these details do not take into consideration the population level itself, albeit that it is well known that strong inter-population (i.e. intra-specific) differences in eco-ethological and life history traits are apparent in snakes. What may we infer from purely descriptive analyses of sex-ratios and body sizes based on scattered specimens captured hundreds of kilometres apart? Almost nothing, I feel. In fact, it should be remembered that body size ranges of species depend on population-specific factors such as growth rates (which in turn depend on local prey availability, etc.), predation rates (which depend, for example, on habitat variability, density of predators, etc.), and genetic variability, etc. Thus, data such as those presented by Hughes are difficult to use when making comparisons of body sizes and sex-ratios between populations.

Concerning the records of capture of *B. lineatus* cited by Hughes (2000) for Nigeria, I take the opportunity to suggest that authors involved in faunistic research on African snakes should not use, indiscriminately, all the reliable locality records that are available in the literature. For instance, Hughes (2000) accepts Boulenger's 1893 record of *B. lineatus* from Lagos, but Boulenger's

citation of Lagos as a locality of *Bothrophthalmus lineatus* is clearly unreliable in the present day, as the whole of this area is deforested and populated by millions of people (note that *B. lineatus* is, in Nigeria, a forest specialist). To cite, in the year 2001, *Bothrophthalmus lineatus* as present in Lagos is as reliable as to cite *Salamandra salamandra* as occurring today in Rome (where it has been extinct for several decades), or even the Dodo as present in Mauritius! Thus, I strongly urge that, when and where possible (because of an author's personal recent experience), we need critical re-analysis of the distribution data and not a simple presentation of all the past records, which inevitably would achieve little more than the production of an 'ideal' map, a reflection of a species ancient distribution (as pictured by earlier explorer's journeys) rather than its current status.

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PARENTAL CARE IN CROCODILIANS

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I wish to briefly draw attention to a number of inaccuracies/omissions in an interesting note by Böhme & Nickel (2000) in the Winter issue of *Herpetological Bulletin.*

The authors of this article refer to 'the guarding of nests, eggs and hatchlings by parent *females*'. [italics mine]. All three of these activities may also be shared by the male. They continue: 'including mouth transport performed by the *latter* to transport their young safely to water' [italics mine]. Again, this activity may be shared by the male. These data are even provided correctly by the reference they cite - Magnusson et al. (1989). Maharana & Bustard (1981) describe male Gharial involvement with the young and cite comparable literature: in *Caiman crocodilus* in which the male took the main defensive role in nest guarding and the male opened the nest and liberated the hatchlings; in *Crocodylus moreletii* in which the male allowed the hatchlings to bask on his back; in *Crocodylus porosus* in which the male assisted in nest defence in captivity; in *C. novaeguineae* in which the male also helped to open the nest at hatching time and also picked up hatchlings in his jaws for transportation from the nest to water.

Böhme and Nickel go on to say 'gharials being uncapable of mouth transport due to the peculiar shape of their snout'. They cite Magnusson et al. (op. cit.) as confirmation of this. Overlooking the '*peculiar* shape of their snout' (Gharial are fish-eaters and have the elongated snout of a specialised fish-eating crocodilian), I consider it incorrect that they cannot transport their young in the gular pouch (floor of mouth). In an *eight-year* study of the ecology of the Gharial (*Gavialis gangeticus*) we published data which indicated that the parent(s) transported the young to the water in their gular pouch, although we never actually witnessed it (Basu & Bustard, 1981). Furthermore, a careful reading of Magnusson et al. (op. cit.) does not say that Gharial are incapable of this task. The authors actually write only that 'The parents are *probably* unable to pick up their young at hatching time' [italics mine]. This was a reasonable view and one held by us (Singh & Bustard, 1977) until we obtained evidence strongly indicating gular throat transportation.

Finally, on the basis of the Wadi Mathendus rock carving at Fezzan, Libya, Böhme and Nickel state 'crocodile parental care was *obviously* known to

humans 10,000 years ago' [italics mine]. Firstly, this conclusion cannot be assumed from the Wadi Mathendus rock carving - the authors are reading into the carving an interpretation to suit their argument. That this rock carving portrays parental care is only one interpretation of many that could be made looking at the carving. At best it is a very tenuous one. Secondly, it is not profitable to speculate who was the first to observe parental care in crocodilians (the title of their note) for we will never know. From my Australian days I know aborigines have long been aware of this, being a tribal people with excellent knowledge of their local fauna and flora. As anthropologists push the date of the colonisation of Australia further and further back, I could perhaps conclude that they knew about this 20, 30, 40, 50,000 or more years ago. So what? It was probably known to native (i.e. pre-Aryan) Indians long before this. It is all pure conjecture!

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Hairy Frog, *Trichobatrachus robustus*. A reproductive male showing hair-like capillary growths for increasing cutaneous respiration. From *Proceedings of the Zoological Society of London*, 1901. Reproduction courtesy of the Zoological Society of London.

ARTICLES

THE HERPETOFAUNA OF ABUKO NATURE RESERVE, THE GAMBIA

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THE Gambia is situated on the North Atlantic coastline of West Africa. It is a small country of only 11,300 km^2, with a population of 1,038,175 in 1993 and an annual population growth rate of nearly 5% (Baldeh et al., 1997). The Gambia is entirely surrounded by the much larger country of Senegal to the north, east and south, whilst in the west it is bounded by the Atlantic. With a typical tropical climate, The Gambia has two well-defined seasons. The rainy season extends from June through to October, while November to May forms the dry season. Although small, The Gambia is important zoogeographically as it sits astride a number of habitat transition zones and is also the northernmost outpost for lowland forest in the region. In the west of the country the main habitat is southern Guinea savannah, which develops into Sudan savannah as one travels eastward. On the north bank of the River Gambia the Sudan savannah is slowly being encroached by the Sahel. Lowland forest is represented in the country by a few patches of swamp forest and remnant gallery forest, the most famous of which is Abuko Nature Reserve.

Herpetological recording in The Gambia

There has been very little recording of amphibians and reptiles in The Gambia as a whole. Many of the existing records have been centred on the south bank of the River Gambia, particularly in the west of the country (Håkansson, 1974 & 1981; Miles et al., 1978; Moiser & Barber, 1994; Pauwels & Meirte, 1996). Abuko is the location that has received most of the attention with Ängeby (1976), Johnson (1997) and Starin & Burghardt (1992) confining their work to within the nature reserve. Gruschwitz et al. (1991a & 1991b), Håkansson (1974 & 1981), Moiser & Barber (1994) and Pauwels & Meirte (1996) have also contributed significantly to our knowledge of the herpetofauna at Abuko. Before the present study took place, there were seven species of amphibian and 30 species of reptile recorded at Abuko. Only a few expeditions have recorded amphibians and reptiles further east in The Gambia, most notably Andersson (1937) and Gruschwitz et al. (1991a & 1991b) on MacCarthy Island and in the River Gambia National Park respectively. Almost nothing is known about the amphibian and reptile fauna on the north bank of the River Gambia, except for at the sacred crocodile pool at Berending (Håkansson, 1981; Moiser & Barber, 1997.

Abuko Nature Reserve

Located only 25 km from the capital city of Banjul, in the Western Division, Abuko is the smallest nature reserve in Africa being only 105 ha

in size. The main part of Abuko was established as a nature reserve in 1968, and extended to its present size in 1978. Previously it had been fenced and protected as a water catchment area since 1916 (Gorman & Wally, 2000). A patch of gallery forest stands along the banks of Lamin Stream within the reserve, and this gradually dries out to form Guinea savannah the further you go from the stream towards the boundaries of the reserve. The extent and quality of the gallery forest appears to be diminishing, due at least in part to the increasingly low water table in the country as a whole. Lamin Stream once flowed throughout the year but now only flows during the rainy season. The stream bed has been dammed in a few places to preserve the water levels in four pools throughout the drier part of the year. Abuko Nature Reserve is surrounded on three sides by an unfenced buffer zone of similar size to the reserve itself. The headquarters of the Department of Parks and Wildlife Management (DPWM) are located in the buffer zone adjacent to the reserve. The buffer zone has suffered badly from the effects of illegal grazing and wood harvesting.

Renovation of the Dwarf Crocodile pools at Abuko Nature Reserve.

Dwarf Crocodile Pools

A Bristol University Dwarf Crocodile Project (DCP) was undertaken at Abuko from 1988 to 1990. As a part of this project the Bristol team created four small pools in the gallery forest, in the hope of attracting Dwarf Crocodiles and improving their breeding success in the reserve. In 1990 the staff of the reserve added a fifth pool. In an effort to 'rediscover' this species during the present survey, the senior authors inspected the DCP pools during the rainy season of 1999 and found that the original butyl rubber linings had rotted through. Only one pool held a significant amount of water, even immediately after heavy rainfall. However, the original irrigation system of buried pipes set up by the DCP was still functioning. Funds were sought and obtained from the conservation committee of the British Herpetological Society to reline four of the pools, this time with gravel and cement, in order to make them more permanent features. The work on the pools was completed in June 2000, just before the onset of the rainy season. In addition a hide was constructed overlooking one of the pools to aid future research efforts.

Herpetological Survey of Abuko Nature Reserve

The senior authors have been living adjacent to Abuko since March 1999, when they took up their present posts with DPWM. They have recorded all amphibian and reptile species found in the reserve on a casual basis during this period.

From June to the end of December 2000, two drift fences were established in Abuko with the purpose of recording amphibians, reptiles, and small mammals. The first fence was erected in an area of gallery forest adjacent to a large permanent

pool. The second one was erected in Guinea savannah adjacent to an area that has been known to flood in the recent past, forming a large shallow pool. Each fence was 30 m long, with pitfalls placed every 3 m. The fences were constructed from local materials (rice bags sown together for the barriers and cooking oil containers with their tops removed as the pitfalls) in an effort to find a cheap and reliable method of gathering data on amphibians and reptiles in The Gambia. This design met both of these criteria and the system will be extended to record the herpetofauna of the other protected areas in The Gambia by DPWM staff. Miss Christina Santoni, of St Mary's College of Maryland, worked at Abuko with DPWM staff for two and a half weeks during June and July 2000. She inspected the drift fences every morning and identified (as far as was possible) the catches. Miss Lyndsay Gale, a volunteer conservation worker from England, continued to check the fences with staff during August and September for amphibians and reptiles, although her main area of interest lay in small mammals.

In addition the authors also undertook regular nocturnal searches during the summer of 2000, primarily for the Dwarf Crocodile. Other amphibians and reptiles encountered were also recorded on a casual basis. On three nights counts of the Nile Crocodiles in the reserve were also carried out.

A small number of voucher specimens of most species, including all new species for The Gambia, were sent to Greg Schneider of the Zoology Museum of Michigan University for determination. Colin McCarthy of The Natural History Museum (London) kindly identified *Lamprophis fuliginosus* from a preserved specimen and *Pelusios castaneus* from photographs.

SPECIES ACCOUNTS

AMPHIBIANS

Silurana tropicalis

The Forest Clawed Toad has been previously recorded in Abuko by both Gruschwitz et al. (1991a) and Jones (1990). During the present survey it was frequently encountered in the gallery forest drift fence throughout the rainy season, though in far greater numbers during August and September. One individual was also captured in the Guinea savannah drift fence during September.

Bufo maculatus

Previously unrecorded in The Gambia, two specimens of this toad were encountered during the present survey in Abuko, one in the savannah part of the reserve and another in the gallery forest drift fence. According to Rödel (2000) this species occupies humid savannahs and gallery forest habitats in West Africa, with Guinea and Sierra Leone being the nearest countries to The Gambia where it has been previously recorded.

Bufo pentoni

Penton's Toad was recorded in Abuko for the first time during the present survey, where small numbers were caught in the savannah drift fence in June and July.

Bufo regularis

The Common African Toad was the most commonly recorded of the *Bufo* species in Abuko during the present survey but surprisingly has only been recorded previously by Håkansson (1974), who states that one was found being eaten by *Crotapholpeltis hotamboeia*. Commonly encountered during both the dry and rainy seasons in all habitats, large congregations of this toad were especially common around the lights of the DPWM headquarters (located in the buffer zone). On one occasion a specimen of *Naja melanoleuca* was observed to eat three large *B. regularis* in the space of only five minutes. *Bufo regularis* was also observed to be a prey item of *Varanus niloticus.*

Bufo xeros

The Savannah Toad was recorded in Abuko for the first time during the present survey, where small numbers were caught in both drift fences in June, August and September.

Hemisus marmoratus
The Shovel-nosed Frog was recorded in Abuko for the first time during the present survey. Many hundreds of these frogs were captured at the beginning of the rainy season in the gallery forest drift fence, especially following a night of rain. Smaller numbers were recorded throughout the rest of the rainy season in both drift fences and one specimen was excavated from the soil below a small tree stump (about 30 cm deep) in September 1999.

Ptychadena oxyrhynchus
The Sharp-nosed Rocket Frog was not found in Abuko during the present survey but has been previously recorded by Gruschwitz et al. (1991a) during October and November 1990.

Ptychadena trinodis
This grass frog was recorded in Abuko for the first time during the present survey. One specimen was caught in the buffer zone during October 2000.

Ptychadena bibroni
The Broad-banded Grass Frog has been recorded previously by Gruschwitz et al (1991a) in Abuko, under the synonym *P. maccarthyensis* (see Rödel, 2000). During the present survey one adult of this species was located in December 2000 inside the sewerage system serving the wildlife department headquarters, in the buffer zone.

Hoplobatrachus occipitalis
The Groove-crowned Bullfrog has been recorded previously by Gruschwitz et al (1991a) in Abuko. This species was recorded in large numbers around the permanent pools during the rainy season, as well as in the surrounding gallery forest. A number of these frogs were trapped in the underground reservoir of the old pumping station adjacent to the pools, where they could be observed from the vertical access shafts throughout the year. Adult frogs were found after the rainy season in the Dwarf Crocodiles pools, where a few large tadpoles, presumably of this species, were also located.

Phrynobatrachus latifrons
This small puddle frog was recorded in Abuko for the first time during the present survey. Two specimens were caught in the gallery forest drift fence, one each in June and July.

Phrynobatrachus francisci
This small puddle frog has been previously recorded in Abuko by Gruschwitz et al. (1991a) in the gallery forest. During the present survey 51 specimens were caught in the gallery forest drift fence but only six in the Guinea savannah drift fence, all during the early part of the rainy season in June and July.

Leptopelis viridis
This tree frog was recorded in Abuko for the first time during the present survey. It was caught in low numbers in both drift fences. It was also observed on a few occasions in the gallery forest during nocturnal searches.

Leptopelis bufonides
This tree frog has been previously unrecorded in The Gambia. During the present survey two specimens were caught in the Guinea savannah drift fence, one each in June and July. According to Rödel (2000) this frog occurs in arid open savannahs of the Guinea and Sudan zone, and has previously been recorded in Senegal.

Hyperolius concolor
This tree frog has been previously unrecorded in The Gambia. During the present survey one specimen was caught in the buffer zone of Abuko, during September 1999. According to Rödel (2000) this species occurs in gallery forests and savannah ponds in the vicinity of gallery forests, and the nearest country where it has been previously recorded is Guinea.

Hyperolius occidentalis
This tree frog has been previously recorded in Abuko by Gruschwitz et al. (1991a) and Joger (1981). It was not recorded during the present survey.

Kassina senegalensis, the Senegal Running Frog.

Leptosiaphis nimbaense, previously unrecorded in The Gambia.

Afrixalus fulvovittatus
This reed frog was recorded in Abuko for the first time during the present survey. One specimen was caught in the gallery forest drift fence in June and several males were captured whilst calling from grass stems in a flooded area adjacent to the reserve in August.

Kassina senegalensis
The Senegal Running Frog was recorded in Abuko for the first time during the present survey. Large numbers were heard calling from the banks of a flooded area adjacent to the reserve and smaller numbers within the reserve itself during August and September 2000. Two voucher specimens were taken from the pool for confirmation.

Kassina fusca
The Pale Running Frog was recorded in Abuko for the first time during the present survey. A small number of this species were caught in the Guinea savannah drift fence during June. One other specimen was captured in a flooded temporary pool adjacent to the reserve during August.

REPTILES

Chelonians

Kinixys belliana nogueyi
Bell's Hinged Tortoise has been previously recorded in the savannah of Abuko by Mr. Eddie Brewer (Gruschwitz et al., 1991a). This species was not recorded during the present survey.

Pelusios c. castaneus
The West African Mud Turtle was recorded in Abuko for the first time during the present survey, although Gruschwitz et al. (1991a) recorded an unknown species of *Pelusios* in 1990 and 1991. One large specimen was caught in the gallery forest drift fence in August.

Snakes

Typhlops punctatus
The Spotted Blind Snake has been previously recorded in Abuko by Gruschwitz et al. (1991b) in 1990. During the present survey one specimen of this species was caught in the gallery forest drift fence in July and one in the Guinea savannah drift fence in August.

Leptotyphlops narirostris
Previously unrecorded in The Gambia, six specimens of this thread snake were caught in the Guinea savannah drift fence in June and July. One specimen of a *Leptotyphlops* species was previously recorded by Håkansson (1974) from Sifoe, in The Gambia (25 km from Abuko). *Leptotyphlops narirostris* is widespread in West Africa (Colin McCarthy, pers. comm.).

African Rock Python with DPWM staff and the authors at Abuko Nature Reserve. The specimen was caught after it had eaten a vulture, and was later released back into the reserve.

Python regius
The Royal Python has been previously recorded in Abuko by Gruschwitz et al. (1991b) and Håkansson (1981). The principle authors also found a 1.3 m python in a public toilet during a previous visit to Abuko in April 1998. During the present survey one 1.3 m specimen was found in a storeroom at the DPWM headquarters (located in the buffer zone) during July 1999. This was later released near the education centre.

Python s. sebae
The African Rock Python is a well-recorded member of the herpetofauna in Abuko (e.g. Brewer, 1985; Grushchwitz et al., 1991b; Håkansson, 1974 & 1981 and Starin & Burghardt, 1992). During the present survey a 3.3 m python was observed twice (late in the evening on both occasions) during the summer of 1999 in the same patch of Guinea savannah. In 1999 a 4.6 m python was retrieved from the hyena cage in the animal orphanage (after eating a Hooded Vulture, *Necrosyrtes monachus*) and in 2000 a 4 m python was retrieved from another cage in the animal orphanage after eating a captive Black-crowned Crane, *Balearica pavonina*. Both snakes were released near the education centre in the reserve. Various anecdotal accounts gathered from tourists visiting the reserve include one account of a large python observed eating a Bushbuck, *Tragelaphus scriptus*, in the savannah. Starin & Burghardt (1992) reported that several pythons had been killed and eaten by Nile Crocodiles, *Crocodylus niloticus*, in the permanent pools in Abuko.

Grayia smithi / G. tholloni
Smith's Water Snake has been previously recorded in Abuko by Gruschwitz et al. (1991b), based upon a photograph published in Brewer (1985). However, Pauwels & Meirte (1996) appear to cast some doubt on this record as it is not verified by collected material. They also mention the presence of *G. tholloni* in The Gambia, presumably inferring that this latter species might be the one photographed in Abuko. This species was not recorded during the present survey.

Lamprophis fuliginosus
The Common House Snake has been previously recorded in Abuko by Gruschwitz et al. (1991b), and Håkansson (1981) as *Boadon fuliginosum*. During the present survey one small (30 cm) specimen of this species was found by reserve staff under a stone at the DPWM headquarters, located in the buffer zone.

Lycophidion semicinctum albomaculatum
The Wolf Snake has been previously recorded in Abuko by Gruschwitz et al. (1991b) during 1990. One specimen of this species was found dead on a road adjacent to the reserve during September 2000. This specimen had recently caught and eaten a female Agama, *A. agama*.

Lycophidium irroratum
Previously unrecorded in The Gambia, one small specimen of this wolf snake was caught in the gallery forest drift fence in June. The nearest country to The Gambia where this species has been previously recorded, is Sierra Leone (Colin McCarthy, pers. comm.).

Prosymna meleagris
The Shovel-snouted Snake was recorded in Abuko for the first time during the present survey. One specimen was caught in the Guinea savannah drift fence in September.

Gastropyxis (Hapsidrophys) smaragdina
Håkansson (1981) has previously recorded the Emerald Snake in Abuko during 1975 and 1976. This species was not recorded during the present survey.

Psammophis elegans
The Slender African Beauty Snake has been previously recorded in Abuko by Gruschwitz et al. (1991b) and Håkansson (1981). During the present survey this species proved to be the most commonly seen in the reserve.

Psammophis sibilans
The African Beauty Snake was recorded in Abuko for the first time during the present survey. Several specimens were encountered in both gallery forest and Guinea savannah.

Psammophis phillipsi
The Olive Sand Snake has been previously recorded in Abuko by Gruschwitz et al. (1991b) and Håkansson (1981). This species was not recorded during the present survey.

Philothamnus irregularis
The Common Bush Snake has been previously recorded in Abuko by Gruschwitz et al. (1991b). This species was not recorded during the present survey.

Dasypeltis fasciata
The Savannah Egg-eating Snake was recorded in Abuko for the first time during the present survey. A single specimen was encountered in the gallery forest in July 2000 being mortally wounded by a party of Brown Babblers, *Turdoides plebejus*, that were possibly protecting their nest site.

Crotaphopeltis hotamboeia
Håkansson (1974 & 1981) has previously recorded the Herald Snake in Abuko. He records one specimen found in the evening eating a toad (*Bufo regularis*). This species was not recorded during the present survey.

Telescopus variegatus
The West African Cat Snake has been previously recorded in Abuko by Gruschwitz et al. (1991b). This species was not recorded during the present survey.

Dispholidus typus
The Boomslang has been previously recorded in Abuko by Gruschwitz et al. (1991b). This species was not recorded during the present survey.

Elapsoidea semianulata moebiusi
The Ground Cobra has been previously recorded in Abuko by Gruschwitz et al. (1991b). This species was not recorded during the present survey.

Naja melanoleuca
The Forest Cobra has been previously recorded in Abuko by Gruschwitz et al. (1991b), Håkansson (1981) and Starin & Burghardt (1992). This species was recorded several times during the present survey in both main habitats as well as around the wildlife department headquarters in the buffer zone. One shed skin found in December 2000 was 2.34 m long, with a girth of 10 cm at mid-body.

Naja nigricollis
The Spitting Cobra has been previously recorded in Abuko by Gruschwitz et al. (1991b). This species was not recorded during the present survey.

Dendroaspis viridis hallowelli
The Green Mamba has been previously recorded in Abuko by Gruschwitz et al. (1991b), Håkansson (1974 & 1981) and Starin & Burghardt (1992). During the present survey a large specimen over 2 m in length was encountered several times around the headquarters of the wildlife department in the buffer zone of the reserve.

Bitis a. arietans
The Puff Adder has been previously recorded in Abuko by Gruschwitz et al. (1991b), Håkansson (1981) and Starin & Burghardt (1992). This species was not recorded during the present survey.

Lizards

Mabuya affinis
The Brown-flanked Skink has been previously recorded in Abuko by Gruschwitz et al. (1991a) and Håkansson (1981). During the present survey this species was common in both main habitats throughout the year and three were caught in the gallery forest drift fence in June. In September 1999 a batch of four eggs of this species were found half-buried in sand and were hatched successfully in captivity. Juveniles have also been recorded on several occasions during the rainy season.

Mabuya perrotetii
The Orange-flanked Skink has been previously recorded in Abuko by Gruschwitz et al. (1991a), Håkansson (1981) and Pauwels & Meirte (1996). During the present survey this species was recorded only during the rainy season.

Leptosiaphis nimbaense
Previously unrecorded in The Gambia, one specimen of this Snake-eyed Skink was caught in the Guinea savannah drift fence in June. This species commonly appears in the literature as *Panaspis nimbaensis* or *P. nimbensis*. It has been previously recorded from Guinea and Ivory Coast (Colin McCarthy, pers. comm.).

Varanus n. niloticus
The Nile Monitor is a well-known species in Abuko, where it has been recorded several times (e.g. Brewer, 1985; Gruschwitz et al, 1991a; Håkansson, 1981; Moiser & Barber, 1994 and Starin & Burghardt, 1992). During the present survey, Nile Monitors were frequently encountered in every habitat throughout the year. Most adult specimens recorded were between 1-2 m in length. Juveniles were recorded during the early part of the rainy seasons.

Varanus e. exanthematicus
Brewer (1985), Gruschwitz et al. (1991a) and Håkansson (1981) have previously recorded Bosc's Monitor in Abuko. This species was not recorded during the present survey.

Agama agama
Only Brewer (1985) has previously recorded the Agama, or Rainbow Lizard, in Abuko. During the present survey this lizard was the commonest species seen, possibly because of its large size and confiding habits. It was recorded in gallery forest and Guinea savannah, as well as around buildings. Juveniles were also commonly recorded.

Chamaeleo gracilis
The Graceful Chamaeleon has been previously recorded in Abuko by Gruschwitz et al. (1991a). During the present survey several specimens were recorded during 1999 and 2000 in the gallery forest and Guinea savannah, but only during the rainy season.

Chamaeleo senegalensis
The Senegal Chamaeleon has been previously recorded in Abuko by Gruschwitz et al. (1991a) and Håkansson (1981). During the present survey several specimens were recorded during 1999 and 2000 in the gallery forest, but only during the rainy season.

Tarentola ephippiata
The Fig Tree Gecko has previously been recorded at Abuko by Gruschwitz et al. (1991a) and Håkansson (1974 & 1981). During the present

survey this species was found to be common around the offices of the DPWM headquarters (situated in the buffer zone) as well as inside several of the man-made structures such as hides and toilets in the gallery forest and Guinea savannah areas.

Hemidactylus brooki angulatus
Brook's House Gecko has been previously recorded in Abuko by Gruschwitz et al. (1991a) and Håkansson (1974). This species was not recorded during the present survey.

Crocodiles

Crocodylus niloticus
The Nile Crocodile is a well-known species in Abuko, where it has been recorded several times (e.g. Brewer, 1985; Gruschwitz et al., 1991a; Håkansson, 1974 & 1981; Moiser & Barber, 1994 and Starin & Burghardt, 1992). Johnson (1997) counted a maximum number of ten individual animals on two occasions in June 1997 and stated that two nest sites were known to be used in that year. The Nile Crocodile was present throughout the present survey and three nocturnal counts were carried out between May 1999 and June 2000. The number of animals present varied between 18 and 20, including all age classes. At least one nest site was used during 1999 and four hatchlings were observed just a few hours after hatching in July. One adult crocodile of 3-4 m in length has been observed on several occasions.

Osteolaemus tetraspis
The Dwarf Crocodile was shown to have bred in Abuko during 1989 by the DCP. The last known breeding prior to this appeared to be in 1981/82 (Jones, 1990). Starin & Burghardt (1992) reported six dwarf crocodiles (ranging in size from 0.2-1.2 m) in one puddle, some time between 1978 and 1983. The DCP drew to a close in 1990 and it is unknown whether Abuko's Dwarf Crocodiles have bred again since then, or indeed, even if the small population of crocodiles is still extant within the reserve. During the summer months of 2000 regular nocturnal searches for Dwarf Crocodiles were conducted around the pools and in other areas of the flooded forest and adjacent Raphia Palm swamps. Unfortunately this species was not recorded during the present survey. Abuko and its surroundings are thought to be the only location in The Gambia where Dwarf Crocodiles have ever occurred (Gruschwitz et al., 1991a; Håkansson, 1974 & 1981).

CONCLUSIONS

During a survey of the herpetofauna of Abuko Nature Reserve during 1999 and 2000, 17 species of amphibian and 23 species of reptile were recorded. Of the amphibians, three species had not been previously recorded in The Gambia and 12 had not been recorded in Abuko before. Of the amphibian species that have been recorded in the past in Abuko only two were not located during the present survey. Of the 23 species of reptiles recorded in the present survey three had not been previously recorded in The Gambia and seven had not been recorded before in Abuko. 14 species of reptile that have been recorded previously in Abuko were not located during the present survey. The total number of species now recorded at Abuko Nature Reserve is 19 amphibians and 37 reptiles.

Abuko Nature Reserve remains the most comprehensively studied and recorded area in The Gambia for amphibians and reptiles. The variety of new species seen during the current survey reflects the lack of recording that has taken place in the past and the new methodologies employed (i.e. drift fences) in the recent survey. It is also an indication of what may be discovered in the rest of The Gambia, which remains largely unsurveyed for its herpetofauna.

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INVERTEBRATE PREDATION ON LARVAE OF THE CRESTED NEWT (*TRITURUS CRISTATUS*)

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ABSTRACT.- Several authors have recently suggested that lack of desiccation in a breeding site for Crested Newts (*Triturus cristatus*) may lead to populations of predatory, aquatic invertebrates that are high enough to reduce metamorphic success of the newts. This issue has been examined in three newt breeding ponds at two sites by recording annual variations in numbers of both newts and invertebrates. While there was some evidence for an increase in invertebrate numbers in the absence of desiccation, under the conditions of the study, changes in invertebrate numbers could not be linked with any detrimental effect on newt metamorphic success.

ONE of the current dilemmas for the conservation of Crested Newts (*Triturus cristatus*) concerns the optimal degree of permanence of breeding ponds. Desiccation during the spring or summer will result in lack of metamorphosis that year, but may help in the longer term by eliminating predatory fish or by reducing numbers of aquatic invertebrates that take newt larvae (Arntzen & Teunis, 1993; Cooke, 1997; Oldham et al., 2000; Griffiths & Williams, 2000; Kupfer & Kneitz, 2000; Cooke & Arnold 2001). There is some information on the impact of fish (e.g. Oldham et al., 2000), but a lack of quantitative data on the effects of invertebrates on newt larvae. Effects on larvae of the Natterjack Toad (*Bufo calamita*) have been studied in detail by Banks & Beebee (1988), who found that invertebrate populations were generally higher in permanent ponds and were important in controlling numbers of Natterjack larvae, both in the field and in aquarium experiments.

In 1996, in an attempt to inform the debate on Crested Newts, I began collecting information on predatory invertebrates at two sites monitored for newts since the 1980s (Cooke, 1995, 1997). At the time, both studies were intended to be long-term, but ill health led to one being terminated from 1999. In view of the current interest in this subject, some results are presented in this paper focusing on (1) whether invertebrates increased in the absence of site desiccation and (2) whether increases in invertebrate numbers were related to decreases in newt metamorphic success, and vice versa.

SITES AND METHODS

The sites are at Shillow Hill in Cambridgeshire and Stanground near Peterborough. Descriptions are given in Cooke (1995 and 1997 respectively). Both sites have ponds that frequently dry out in the summer or autumn, but at Stanground there is a tap that has been used in some years by the Wildlife Trust to ensure wet conditions persist through to time of newt metamorphosis.

Top Pond, Shillow Hill: digging a sump in the dry bed of the pond during the drought of the early 1990s.

Year	When pond dried	Adult newts	Netting sweeps	Larval newts	Water-boatmen	Dragon-flies	Beetles
1996	Autumn	71±12	15±6	65±13	13±1	0.3±0.3	4.0±1.0
1997	Summer	9±4	0	-	-	-	-
1998	Autumn	102±24	38±2	80±23	11±2	0.0	9.5±1.8
1999	Did not dry	62±21	26±3	36±11	9.0±2.5	1.0±0.4*	2.3±1.0*
2000	Did not dry	76±22	37±4	119±16**	30±3**	7.8±0.6***	18±6*

Table 1. Top Pond, Shillow Hill: site desiccation and mean data (+SE) on counts of adult Crested Newts (based on 5 visits per year), and number of netting sweeps and newt larvae and invertebrates caught (4 visits). *t* tests used to test for significance between pairs of years shown in Table 3: * significantly different from previous year, P<0.05; ** P<0.01; *** P<0.001.

At Shillow Hill, the principal water body (Top Pond) was studied, while East and West Ponds were examined at Stanground. No fish were seen in any of these ponds during the course of the study, although fish have occurred in East Pond in the past (Cooke, 1997).

Numbers of adult Crested Newts were counted at night with a powerful torch: five times per breeding season at Shillow Hill, and three at Stanground. Newt larvae and predatory invertebates were caught with a pond net, examined, counted and released. Providing there was water in the ponds, each was netted on four occasions each year during July and early August, corresponding to the period when newt larvae were metamorphosing and starting to leave the water. Two metre sweeps were made in towards the edge, through the body of the water and the aquatic vegetation. At Shillow Hill, the number of sweeps was adjusted down from a maximum of 48 depending on the size of the pond (Cooke, 1995). At Stanground, a maximum of 15 sweeps was made in each of the two deepest parts of both ponds (see Cooke, 1997). The yearly mean total of newt larvae should provide an indication of relative abundance in a pond. This work was done under licence from English Nature.

Because of the study of Banks & Beebee (1988) and advice from M. Drake (pers. comm.) of English Nature, the following taxa of predatory invertebrates were routinely recorded: larval and adult Water-boatmen (*Notonecta* spp), dragonfly larvae (Odonata), and adult beetles at least 5 mm in length and beetle larvae (Coleoptera). A size limit was set for adult beetles because very small individuals were occasionally abundant but had no relevance with regard to predation of newt larvae. Very small Water-boatmen or dragonfly larvae were much less commonly found. Notes were kept of any other predatory invertebrates, such as Water Scorpions (*Nepa cinerea*), but these were few in number and will not be mentioned again in this paper. The technique should provide a comparative measure of summer numbers of the three main taxa.

RESULTS

The two issues (build up of invertebrate populations in the absence of desiccation and whether they reduce metamorphic success) can be evaluated by examining results over two or more summers (Tables 1 and 2). However, site desiccation in summer complicates this approach for both sites. At Shillow Hill, Top Pond contracted to its sump in the summer of 1996, and dried out completely in summer 1997. Mean number of netting sweeps reflected the variation between years (Table 1). Also adult newt numbers were very low in the depleted pond in the spring of 1997 (Table 1). At Stanground,

Pond/Year	When pond dried	Adult newts	Netting sweeps	Larval newts	Water-boatmen	Dragon-flies	Beetles
East Pond							
1996	Did not dry	29±5	26±4	11±2	18±10	1.8±1.2	8.0±2.8
1997	Did not dry	12±1*	30±0	19±4	39±11	2.3±0.8	5.3±2.2
1998	Did not dry	27±4*	30±0	36±5*	22±5	3.8±2.4	8.5±5.6
West Pond							
1996	Summer	13±3	13±8	13±0	22±20	0	0
1997	Autumn	44±4	30±0	6.3±0.3	35±18	0.5±0.3	3.2±0.6
1998	Did not dry	8±6**	30±0	19±7	96±17*	3.0±1.9	2.3±0.6

Table 2. East and West Ponds, Stanground: site desiccation and mean data (+SE) on counts of adult Crested Newts (based on 3 visits per year), and number of netting sweeps and newt larvae and invertebrates caught (4 visits).t tests used to test significance between pairs of years shown in Table 3: * significantly different from previous year, $P<0.05$; ** $P<0.01$

conditions remained wet in the summers of 1997 and 1998 because of use of the tap, and 30 sweeps were made on every occasion in each pond. In 1996, however, use of the tap was less successful; East Pond was reduced to its sump, while West Pond desiccated totally during July and was only netted on the first two occasions. Statistical evaluation between pairs of years is therefore restricted to when water persisted in the summer of both years through to newt metamorphosis and there were no significant changes in netting effort: 1998-2000 at Shillow Hill, 1996-8 at Stanground's East Pond and 1997-8 at West Pond (Tables 1, 2 and 3).

At Shillow Hill, there was little overall change in invertebrate numbers in 1999, following desiccation in the previous three years (Tables 1 and 3). However, lack of desiccation in 1999 was followed by increases in all three invertebrate taxa in 2000. In East Pond, Stanground, no increases were seen in invertebrates in 1997 or 1998, despite water persisting throughout this period, at least in the sump (Tables 2 and 3). In West Pond, desiccation in autumn 1997 was followed by an increase in numbers of Water-boatmen in 1998, rather than a decrease.

Results in Table 3 have been examined for evidence that predatory invertebrates might have an inverse effect on numbers of larval newts. At Shillow Hill, no significant change occurred for newt larvae in 1999, although dragonfly numbers increased and beetle numbers decreased. Numbers of all three invertebrate taxa increased in 2000, but newt larvae also increased in abundance. An unusually high, but unquantified, incidence of tail damage was noted among metamorphs in 2000. It is not known whether such lesions were caused by the invertebrates, by other newt larvae or by a different agent. Many larvae with tail damage had previously been seen in 1996 when high densities of newt larvae and invertebrates were observed as the pond contracted to the sump. On the last two visits in 1996, Crested Newt larvae exceeded 10 per sweep and Water-boatmen reached 2 per sweep (compared with means in 2000 of 3.2 and 0.85 respectively).

At Stanground, interpretation was made more complicated by significant changes in counts of breeding newts (Tables 2 and 3). In East Pond, a decrease in adult numbers in 1997 was not translated into any significant change in larval numbers. In 1998, both adults and newt larvae increased. There were no changes in invertebrate numbers in either year. In West Pond in 1998, numbers of newt larvae were maintained despite reductions in adult numbers and increases in invertebrates.

Pond/years compared	Pond dried first year?	Adult newts	Netting sweeps	Larval newts	Water-boatmen	Dragon-flies	Beetles
Shillow Hill							
1998 vs 1999	Yes	NC	NC	NC	NC	I	D
1999 vs 2000	No	NC	NC	I	I	I	I
Stanground East							
1996 vs 1997	No	D	NC	NC	NC	NC	NC
1997 vs 1998	No	I	NC	I	NC	NC	NC
Stanground West							
1997 vs 1998	Yes	D	NC	NC	I	NC	NC

Table 3. Changes between pairs of years when water persisted through to newt metamorphosis. This table summarises the statistical tests shown in Tables 1 and 2: NC = no significant change, I = increase, D = decrease.

DISCUSSION AND CONCLUSIONS

While relationships between species richness of invertebrates and pond permanence have been well studied (e.g. Collinson et al., 1995), this seems to be generally less true for abundance in relation to desiccation or permanence (M. Drake, pers. comm.). I had previously assumed that the latter relationship was a well-established entomological fact, and I suspect some other herpetologists have made the same mistake. A few studies do, however, exist that describe this effect (eg Downie et al., 1998). Also, the herpetologists, Brian Banks and Trevor Beebee (1988), noted that abundance of Odonata larvae and *Notonecta* increased as a function of site permanence in Natterjack pools. Results at Shillow Hill were consistent with populations of predatory invertebrates increasing in the absence of pond desiccation, but observations at the two Stanground ponds did not support this relationship.

Under the conditions of these studies, no evidence was found to associate lower metamorphic success of Crested Newts with increased numbers of predatory invertebrates. The most notable inter-year comparison was at Shillow Hill in 1999/2000, when all three invertebrate taxa increased, but so too did catches of newts. Predatory invertebrates will kill and eat newt larvae (e.g. Griffiths, 1996), but at these sites did not do so to a sufficient extent to outweigh other factors controlling numbers of newt larvae. The relationship between counts of adult Crested Newts and catches of newt larvae was discussed for Top Pond by Cooke & Arnold (2001).

The study ponds regularly desiccate, either totally or partially. For instance, Top Pond dried out in five years out of ten, 1991-2000, despite a sump being dug by hand in the early 1990s (Cooke & Arnold, 2001). West Pond dried out in six years out of ten up to 1998; East Pond did not dry totally during this period, but contracted to its machine-dug sump in five of these years (Cooke, 1997 and unpublished). Such a level of desiccation may mean that predatory invertebrates were unable to realise their full potential in terms of population size. The simple nature of this investigation should also be stressed. For instance, it remains possible that examination of mortality of younger, more vulnerable newt larvae might demonstrate effects.

Although work continues at Shillow Hill, the subject might be more profitably investigated in sites that desiccate less regularly or with captive animals under controlled conditions.

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ADVERTISEMENT CALL AND BREEDING ACTIVITY OF *PHYSALAEMUS CUQUI* (LOBO, 1993)

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IN America, most of the research on anuran breeding behaviour has dealt with north temperate or Neotropical species, and very little attention has been paid to the reproductive behaviour of southern South American species. *Physalaemus cuqui*, a leptodactylid frog found throughout much of northwestern Argentina, was originally considered a northern population of *P. albonotatus* (Barrio, 1965; Laurent, 1969) until Lobo (1993) described it as a separate species based on osteological and morphometric differences. Although systematic relationships of the species have been investigated (Lobo, 1993), with the exception of the description of its tadpole (Perotti, 1997) and some additional distributional records (Lobo, 1994), no new information concerned with the breeding behaviour of this species has been published since its original description. The purpose of this paper is to: 1) describe the advertisement call of the species, and 2) present data on some aspects of breeding behaviour and clutch characteristics. The data were obtained between October 1996 and April 1997 in Parque Nacional Calilegua, located about 100 km north of San Salvador de Jujuy, Argentina (23°35' S 64°50' W). The area is a typical subtropical humid montane forest (Brown & Grau, 1993). The rainfall (about 1200 mm per year) is strongly seasonal, the wet season starting around November and lasting until March. Recordings and observations were made mainly in flat open areas at an altitude of 600 m. Night observations of reproductive activity were obtained for at least 10 days each month by one of us (MV). When amplexus occurred observations were made to the end of the oviposition. After mating pairs separated spontaneously, body sizes (SVL) were measured with dial calipers to the nearest 0.1 mm.

Parameter	Mean ± SD	Range
Note duration (msec)	1580.1 ± 224.8	(1291.3 - 1948.1)
Calls/minute	8.6 ± 1.6	(6 - 11)
Pulses/call	26.7 ± 5.7	(17.0 - 37.4)
Pulses/second	22.9 ± 2.2	(19.5 - 25.6)
Fundamental frequency (Hz)		
Beginning	512.2 ± 25.9	(475.5 - 576.5)
End	422.7 ± 20.6	(446.8 - 381.9)
Dominant frequency (Hz)	1877.6 ± 132.3 [4°]	(1784.0 - 1971.2)
[Harmonic dominant]	2284.3 ± 75.6 [5°]	(2183.0 - 2428.6)
	2591.9 ± 143.9 [6°]	(2261.8 - 2713.0)

Table 1. Summary of numerical parameters of advertisment calls of 10 *Physalaemus cuqui* males recorded at Parque Nacional Calilegua, Argentina.

Location and dimensions of foam nests were recorded and then preserved in 10% formalin. All descriptive statistics are given as x ± 1 SD. Recordings of 10 individual advertisement calls were made on 14 February 1997 from 18:00 to 22:00 h, 24° C air temperature and 96% air relative humidity. Voucher specimens have the number FML 06263 (Instituto de Herpetología, Fundación Miguel Lillo, Tucumán, Argentina). A Marantz PMD 430 tape recorder and a Sennheiser ME-66 microphone were used for recordings from a distance of 0.5 to 1.5 m, which were digitized and analyzed at the Smithsonian Tropical Research Institute (Panamá) using Signal/RTS PC-based signal analysis software. Frequency information was obtained through fast Fourier transformation (FFT) (width 256 points). The terminology used for the description of the calls follows Heyer et al. (1990).

Physalaemus cuqui emits a long trilled whine at a rate of 6 to 11 calls per minute. Call duration ranges from 1.2 to 2.1 seconds. Calls are strongly partially pulsed; the pulse rate is 19.5-25.6 per second, with 13 to 36 pulses per call. The fundamental frequency (slightly modulated) is at about 512 Hz at the beginning and falling to about 422 Hz by the end of the call. Seven or eight harmonics are clearly evident in the audiospectrogram of the call (Fig. 1). The fourth, fifth and sixth harmonic are the dominant broadcast frequencies ranging from 1784 to 2713 Hz, with intensity peaks at 1877.6, 2284.7, and 2636.6 Hz respectively. Detailed spectral data are summarized in Table 1.

Males call mainly during the rainy season (November-February). Daily chorus activity extends from 19:30 h to 01:50 h. On three occasions, isolated males were calling at dusk (17:00 h). Males call in small temporary rain-filled or larger more permanent ponds from stationary positions floating close to the muddy shoreline (19.8 ± 18.2 cm). They inflate their lungs fully and then force some of that air through the larynx and then into the vocal sac producing the call and then return the air to the lungs for the next call. Most frogs vocalize in shallow water (4.0 ± 2.3 cm deep). Some however called in an artificial pool filled with 50 cm of rain water indicating that males can float and call from deeper waters. Female SVL (32.8 ± 0.8 mm, N = 9) is greater than that of males (31.1 ± 1.6 mm, N = 26) ($t_{33} = 3.03$, $P < 0.01$). Size of unmated males (SVL= 30.9 ± 1.68 mm) did not differ from the size of mated

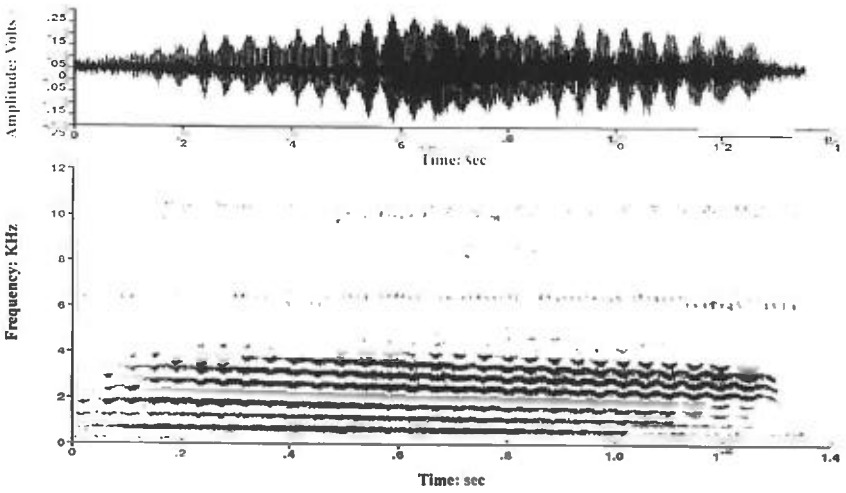

Figure 1. Oscillogram and audiospectrogram of the advertisement call of *Physalaemus cuqui* recorded at Parque Nacional Calilegua, Argentina. FML 06263, Collector number LF 16 (air temperature 24° C).

males (SVL= 31.9 ± 0.94 mm; t_{25} = 1.62, P> 0.10). The mean body size ratio (female SVL/male SVL) for eight recorded couples was 1.04 ± 0.03 (range: 1.00 - 1.07). A regression of paired male size on female size was not significant ($F_{1,6}$ = 0.49, P> 0.50). Clutches were deposited every month during the rainy season. However, there was significant variation compared to an expected distribution of equal monthly deposition (X^2_3= 7.71, P< 0.05), with more than twice as many clutches deposited in November, December and January (18.6 clutches/month) as in February (7 clutches/month). Mated pairs made foam nests at the water surface by means of a rapid succession of kicks by the male, in a similar way to that reported by Heyer & Rand (1977) for *Physalaemus pustulosus*. Nests are placed short distances from the shoreline (4.0 ± 6.3 cm) in 5.2 ± 3.0 cm of water; some were attached to the surrounding vegetation and some were not. Foam nests are hemispheric (diameter: 71.0 ± 17.4 mm; height 35.1 ± 8.4 mm). Nine nests contained an average of 975 unpigmented eggs (range: 705-1316 eggs) with a diameter of 1.28 ± 0.04 mm each (obtained by random measures of 10 eggs/nest).

Physalaemus cuqui clearly represents a prolonged breeding species (in the sense of Wells, 1977) although shows marked seasonality. Reproductive activity occurs during every month of the rainy season but decreasing clutch frequency through November to February indicates that reproductive activity increases at the early phase of rainy season. The species shows slight sexual dimorphism, with females being larger and heavier than males. Although the sample size was small, we found no evidence of large male advantage or size-assortative mating related to male mating success.

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APPARENT LEARNING OF A COMPLICATED TASK BY AN ADULT HERMANN'S TORTOISE (*TESTUDO HERMANNI BOETTGERI*)

ROBERT BUSTARD

ON 4 July 2001 an adult female Hermann's Tortoise was noticed in the *Geochelone sulcata* pen, which abuts on the Hermann's Tortoise pen. This had never happened previously. The tortoise was returned to its original pen and a check was made to try and find out how it had escaped.

Since the tortoises are microchipped, this individual was identifiable. Individual identification was also possible from its carapace colour pattern. Later on the same day it was discovered how the tortoise had escaped. When constructing tortoise pens only a low barrier is necessary but posts should be sited *outside* the pen so they cannot be utilised in escape attempts. As a result of a novel escape method used by one of my *sulcata* females, to be described elsewhere, the number of boards around their pen had been raised, and a new post to secure these placed in the Hermann's pen, which comprises three boards 8.5 cm high.

The method of escape used by the female Hermann's requires several separate actions to be taken sequentially by the tortoise. Having raised itself into a vertical position in this corner, the tortoise uses the slight ledge offered by the top of the first board as a right hind foot rest. There is no corresponding ledge for the left hind foot to use, nor are there ledges on the higher boards. From this position it can place its right front foot on the top board. However, in this position there is no possibility for it to gain enough purchase with its hind limbs to pull itself up and over. Furthermore, in order to do this it has to relinquish its foot support on the protruding edge of the first board. It manages by climbing the space between the right hand boards (green in photo) and the new unpainted post on the left, as a climber would tackle a rock chimney. It uses its limbs to brace its carapace against the post to prevent it falling back as it attempts to climb upwards by pushing with its rear legs. This is a much more complicated task for a tortoise than it might appear due to its inflexible carapace. A mammal, for instance, would bend its back. In a tortoise, all the movement has to be undertaken by the legs. This situation is illustrated in Plate 1.

However, because of the extra board to the rear (unpainted in the photograph), having reached the position illustrated in Plate 1, it has to change position by rotating to the right to face the lower green boards. As it does this it loses the chimney bracing effect, as it is no longer able to wedge itself in (Plate 2). Nor at this stage does it always have a limb over the top of the green rail, although it does in Plate 2. In the position illustrated, it is still vulnerable to falling backwards as it has no secure hold with any limb. It has to gradually work itself upwards and forwards and only when it reaches the position in Plate 3 is it fairly certain of being able to propel itself forward so that it falls into the adjacent pen (tortoises are not put off by this fall of 26.5 cm).

In Plate 3 it has just managed to secure a toehold with the right rear limb on the top of the pen. It is able to push itself forward with the left rear limb and to some extent with the left forelimb which is now against the edge of the top unpainted board. These are a series of complicated steps all of which have to be carried out sequentially to effect escape. Having successfully escaped via this route and methodology this same female tortoise regularly returns to this spot and is found in various positions of the climb. It usually fails when it comes to the point where it loses the chimney effect and has to swing to the right, but this in no way deters it from further attempts. The large pen has three corners but it is never seen at the other two. It apparently remembers the location from which it made its escape. Due to the intricacy of the climb, it appears that it also remembers what it has to do in order to position itself for a successful escape attempt.

Plate 1.

Plate 2.

Plate 3.

Further back-up for this interpretation comes from the failure of other tortoises of a similar size which share the pen to escape. This is despite tortoises being great escapers, and naturally drawn to corners. Other tortoises are frequently seen erect against areas of the pen. Hence it is not merely a question of coming to a corner and trying to climb out, or arriving at this corner by chance and using purely trial and error techniques to escape. Yet further corroborative evidence comes from the fact that this female tortoise, as of the time of writing (19 June), has now escaped on two further occasions over the past fortnight, the latest successful escape being yesterday.

While it is not possible to prove conclusively that the complicated climbing manoeuvres have been learned, the evidence strongly inclines one to this view. An alternative explanation is that the tortoise remembers that it has escaped from this corner before, so devotes all its escape activity to this corner and from time to time successfully makes the correct manoeuvres purely by trial and error. The writer does not, however, consider this latter possibility to be likely on the basis of the evidence - particularly the fact that no other tortoise has managed this escape by trial and error.

Tortoises have a well-developed ability to learn and remember the local topography quickly. European Tortoises placed in a large new pen (14 x 11 m) which has a 30 cm wide access to warm, dry sleeping quarters, the entrance being hidden from most of the pen by an intervening 4 m long solid board fence, invariably learn their way home on day one. Such topographical memory clearly has survival value for tortoises which go out to forage in the wild but need to be able to find their way back to a regular secure sleeping place.

Reptiles are able to learn rapidly by experience. More than 30 years ago the writer described single instance learning in a group of juvenile wild Saltwater Crocodiles (*Crocodylus porosus*) (Bustard, 1968).

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REPTILE OBSERVATIONS ON THE MARIA ISLANDS: TWO SATELLITE ISLANDS OF ST. LUCIA (WEST INDIES)

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THE following report details observations on three of eight species of reptile found on Maria Island Major during a vacation to St. Lucia in December 1998. The visit was led by a registered guide from the St. Lucia National Trust.

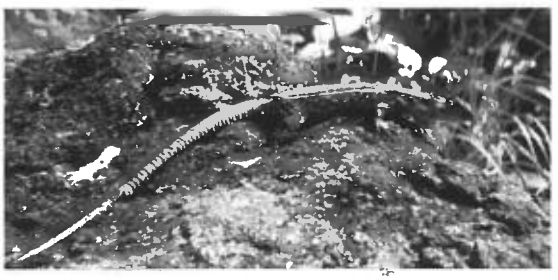
The Lesser Antilles island of St. Lucia is one of more than a dozen that form an arc of islands stretching northward from South America. Trinidad and Tobago are to the South and the Virgin Islands to the North, separated by the Anegada passage. The uninhabited Maria Islands (Maria Major and Maria Minor) are located on the southeastern tip of St. Lucia. They lie approximately 1 km from the mainland separated by shallow waters with coral reefs and beds of seagrass. Combined, they are less than 12 ha and despite such size are home to a diversity of habitats and herpetofauna. The islands are a herpetological jewel as they are home to the world's rarest serpent (McFarlan, 1990), the endangered *Liophis ornatus* (IUCN, 2000), and one of the rarest lizards *Cnemidophorus vanzoi*.

The islands were made a nature reserve by the St. Lucia National Trust in 1982. They are afforded much protection from the trust by the provision and restriction of guided access for the general public. The St. Lucia National Trust and St. Lucia Forestry Department manage the reserve and it is highly respected for its herpetofauna. The size of the islands and their tiny population of reptile inhabitants renders the land susceptible to stochastic events (e.g. natural environmental change, disasters, and introduction of predatory or competitive species). Several conservation measures are already in place. Captive breeding studies at the Durrell Wildlife Conservation Trust have lead to translocation of *C. vanzoi* to another suitable habitat, Praslin Island (K. Buley, pers. comm.). The island was made safe by eradication of Common Rats (*Rattus rattus*), a natural predator of the whiptails (Johnston et al., 1994).

The disappearance of *L. ornatus* and *C. vanzoi* from mainland St. Lucia is discussed in detail by Corke (1987). Mongoose are likely to be the leading cause of mainland decline for *L. ornatus*, although it is possible that the snake also suffered from human culling during a bounty scheme to remove venomous snakes that started in 1869. The same system was responsible for the demise of *Clelia errabunda*, the natural predator of the venomous *Bothrops caribbaeus* (Underwood, 1995). It is believed that *C. vanzoi* was exterminated from the mainland by Mongoose introductions, also designed for the reduction of venomous species.

The West Indies are well known for their tropical wet and dry seasons that are often interrupted by unpredictable rainstorms. The Maria Islands receive less than 40 inches of rain per year (Geoghegan & Renard, 1985), although the amount of rainfall received depends mostly on the elevation of the island (Crother, 1999). The higher, more volcanic islands receive more than lower limestone islands. This difference in elevation and humidity is accompanied by changes in habitat. Higher volcanic rain forest in the Lesser Antilles can vary from Tropical Dry to Tropical Moist rain forest, whereas all the lowland islands (including both Marias) are classified as Tropical Dry Forest (Holdridge, 1967). The weather was clear for the trip and the morning temperature was 28° C. A change in weather occurred during the afternoon and a heavy tropical downpour of rain lasted for an hour after leaving the island. There were no pools found during the visit. The heavy downpour that occurred after leaving the island is

The Maria Islands. Photograph by author.



Cnemidophorus vanzoi. Photograph by author.

known to stimulate activity in *L. ornatus* (Corke, 1987; Sherriff et al., 1995). Perhaps the presence of temporary pools or changes in temperature and humidity may contribute to diurnal activity patterns in *L. ornatus*.

The Maria Islands' vegetation type varies according to the levels of exposure to wind and salt spray. On M. Major a mix of woodland, scrub, grassland, rock, and cacti can be found. The exposed areas of M. Major (notably the crown and western side) are covered by low growing grasses and Prickly Pear cacti. Other cacti locally named Syèj are also common and can grow as tall as 10 ft. The southern part of the island has a mix of cacti and woodland. The woodlands are dry forest containing White Cedar (locally called Pòyé), Turpentine Trees (Gonmyé) and twisted fig trees (Mapou). Close to 120 species of plant are present on the islands combined (Geoghegan & Renard, 1985). The northwestern side has a stretch of beach around 100 m long that forms the major docking point for the island. The northeastern section has a mixed grassland that blends into scrub with increasing gradient. The northeast and eastern edges appear virtually inaccessible due to steep cliff faces. The south of the island has a sheer face. Maria Minor has mainly grass, a tiny west coast beach and rocky shoreline faces.

The islands have eight species of reptile. *Cnemidophorus vanzoi* and *Liophis ornatus* are endemic and found nowhere else naturally (Sheriff et al., 1995). *Anolis luciae* and *Sphaerodactylus microlepis* are endemic to St. Lucia and are present with *Gymnophthalmus pleei leutkeni*, *Hemidactylus palaichthis*, *Leptotyphlops bilineata*, and *Thecadactylus rapicauda* on M. Major. Maria Minor is home to just three of the eight species; *C. vanzoi*, *H. palaichthis* and *G. p. leutkeni* (*G. p. leutkeni* recorded only recently for the first time on M. Minor by Buley et al., 1997).

Reptile literature for the islands is sparse but continually expanding and short reports or surveys could provide a simple aid for the long term monitoring of the islands' herpetofauna. A current useful checklist for West Indian herpetofauna is Schwartz & Henderson (1991; also 1988). More recent work by Sherriff et al. (1995) and Buley et al. (1997) provide updated and more detailed species lists, history, and morphometric data on the islands' reptile fauna. For the most extensive review of West Indian herpetology the reader is referred to Crother (1999). Historical systematics of the islands' herpetofauna is best investigated using a variety of different publications as not all papers contain full factual details on classification. Crother (1999) provides the most historical references but Corke (1987) and comments within Sherriff et al. (1995) and Buley et al. (1997) confirm, with additional detail, the ecological and geographical features differentiating the St. Lucia and Maria Island populations.

In the interests of conserving the well being of the reptile occupants, none were captured for any

close visual or morphological inspection. The standard techniques of VES (Crump & Scott, 1994) were used and only the designated, lightly trodden paths walked to respect the sensitivity of the islands' flora and fauna.

SPECIES OBSERVED

Anolis luciae, St. Lucia Anole (Creole name: Zandoli) (Garman, 1888).
St. Lucia Anoles were observed in the central wooded areas of M. Major. All specimens seen were adult and most approximately 12 - 15 cm full length. Males have a generally dull green to olive-brown colour and females are brown with a vertebral zigzag pattern. Both sexes also have a narrow white streak that runs from under the top of the front leg to halfway along the body (Sheriff et al., 1995). Males were observed performing territorial behaviour on perches and presented a yellowish dewlap.

Cnemidophorus vanzoi, St. Lucia Whiptail (Zandoli tè) (Baskin & Williams, 1966). On arrival at M. Major we were greeted by two basking females on a rock just a few metres back from the shoreline (Corke, 1987) previously encountered *C. vanzoi* frequenting the beach area). The lizards were actively foraging and took refuge upon disturbance. Refuge was only for a short time before the same individuals reappeared for more activity. Active foraging is a feature common to most teiids as they are opportunistic feeders (Corke, 1987; Pough et al., 1998). Most of the adults encountered were seen basking on the edges of existing paths on the island. If disturbed they too would retreat into grassy vegetation but would reappear after a few minutes. However, this timid display was not apparent in all the lizards. Some individuals showed almost no fear of human presence and were even curious to venture closer if the viewer were to remain static.

Adult males have a dark back with bright turquoise blue tails and yellow bellies. Some had white spots along the body flanks. Adult females are similar to young specimens and have brown backs with a light and dark longitudinal stripe running from behind the neck to the base of the tail. The majority of the lizards and all juveniles were seen close to the crown of the island. Young males are not easily distinguishable from young females (Corke, 1987) so juveniles were not sexed.

Hemidactylus palaichthis, (Mabouya) (Kluge, 1969).
This rock gecko was encountered on the northeastern side of M. Major. Two specimens were found in small crevices of rock aptly suiting the camouflage of their lichen colour and pattern. The first individual was spotted at eye level. The species is generally a light grey colour with small dark flecks and a heavily tuberculate body (Sherriff et al., 1995). The specimens sandwiched in the crevice were darker in appearance but still had the characteristic size, appearance and features of the species. One specimen was unusually encountered at the very base of the shoreline docking point. It lay uncamouflaged on dark rock close to the washing surf. This species is endemic to St. Lucia. However, Corke (1992) discusses the ease of misidentification as *Hemidactylus mabouia*, a species common on mainland St. Lucia and other 'Lesser Antilles Islands'. A comparison of the two showed a difference in skin texture (more warty appearance on *H. palaichthis*) and differences in the arrangement of lamellae. It may be possible that *H. palaichthis* is present on other islands and remains undetected and presumed to be *H. mabouia*. This statement is also agreed by Sherriff et al. (1997).

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AN IGUANID LIZARD SHAMMING A HOUSE GECKO

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THIS is a report of a free-living diurnal iguanid lizard, *Tropidurus plica* (Linnaeus), basking in artificial light at night, indoors. This Neotropical species was widely known as *Plica plica* until Frost (1992), following an extensive study of the group, included the species of *Plica* in the genus *Tropidurus*. Frank & Ramus (1995) list the vernacular name 'tree runner', which sounds strange for a lizard known for its 'sit and wait' foraging strategy (Hoogmoed, 1973; Vitt, 1991;

see Werner, 1996, for comments on vernacular names). Murphy (1997) quotes the local names 'tok-tok' and 'old man' with reservation.

During 21 May - 3 June and 6 -13 June 2000 we stayed on Trinidad (Republic of Trinidad and Tobago, West Indies), in the Pax Guest House on Mt. St. Benedict, Tunapuna (10° 39' 38.6" N, 61° 23' 49.8" W, 160 m a.s.l.). We lodged in a small cottage annexed to the main building, which had a corridor bounded towards the outside by a wall of natural stones. This wall was only 2 m high, not reaching the ceiling, so that above it the corridor communicated with the outside. In the corridor stood a chest of drawers carrying a large mirror. A couple of incandescent lamps lit the corridor at night.

Every night, an adult *Tropidurus plica* would emerge from behind the mirror and hang spread-eagled on the wall beside it, usually vertically with the head down but tilted up, away from the wall (Hoogmoed, 1973). The lizard was missing part of the tail, and its coloration lacked the usual green component; its dominant colours were grey and black. The identification of the species was confirmed by Dr. Victor Quesnel, an experienced and renowned local naturalist and herpetologist, when he came to visit on 29 May 2000.

The lizard was out almost every night throughout the whole night, but was extremely wary and on the appearance of people a few meters away would quickly dodge behind the mirror. It would stay under cover for a variable duration, and then sometimes emerge with only the front half of the body exposed. Although our room had a window, with semi-transparent curtains, towards the corridor, it was very difficult to photograph the lizard because it tended to escape even from the camera's approach behind the window.

Times when we actually recorded the lizard's presence included two attempts at photography, on 31 May at 05:00 h and on 9 June at 00:30 h, and a series of inspections in the night 12/13 June at 22:30, 00:30, 01:30, 05:00 and 06:40 h. At 00:30 and 05:00 h air temperature and wall temperature ranged from 25 to 25.6° C (Miller-Weber small animal thermometer). Light intensity on the wall section frequented by the lizard at night approximated 3000 lux (Gossen Lunasix-F photographic exposure meter graded in lux). We did not actually verify the lizard's whereabouts during the day but believe that it stayed behind the piece of furniture.

Tropidurus plica ranges widely in northern, especially Amazonian, South America and on Trinidad, living in forests, mainly on the trunks of large trees but also on rocks (Avila-Pires, 1995; Murphy, 1997). We saw an individual on a rock in the forest on Mt. St. Benedict, appearing awake at about 14:00 h. Hoogmoed (1973) described the species as diurnal with 'sit and wait' foraging habits. Vitt (1991), based on eight months of observations (wet and dry seasons) in Brazil, details the diel cycle of *T. plica as* diurnal. At night he observed four individuals sleeping, two hanging on tree trunks and two in rock crevices. He recorded the average body temperature of three day-active individuals as 30.7° C, while the accompanying air and substrate temperatures averaged 27.4 and 27.7° C respectively.

This case of reversed diel cycle in a *Tropidurus plica* is certainly unusual and one must wonder whether we have encountered a single freak animal, or a rare example of an existing pattern. Only after this latter alternative is validated will it be warranted to expound the assorted implications.

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A SHORT NOTE ON THE HERPETOFAUNA OF THE PALINURO PENINSULA, CLIENTO, SOUTHERN CAMPANIA, ITALY

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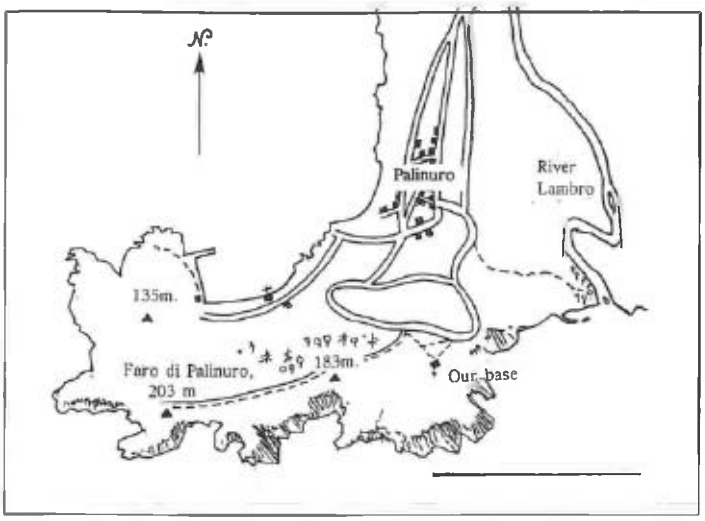
THE Palinuro peninsula was visited between 11 and 25 May, 2001. As Campania had been visited by myself and my family before, it was assumed that there would be nothing particular of individual interest. However, despite the fact there were no species observed that had not been seen previously, there were unusual characteristics of the local herpetofauna that were worthy of note.

LOCALITY DESCRIPTION

The Palinuro peninsula is just over two kilometres long and has an average width of about one kilometre. It juts westwards into the Tyrennian Sea, out of the mountainous, southwest-facing coast of the Cilento National Park, of which it is also a part, separated from it by the southern reaches of the River Lambro which enters the sea on its south coast. The north coast swings round in a gentle sandy bay, around which the little resort and fishing town of Palinuro sits. The south coast rises from the valley of the Lambro to form limestone cliffs of about 170 metres, the highest point being above the southwest extremity, where the lighthouse called Faro di Palinuro stands at 203 m. The north-facing slope is in great part covered by mixed woodland, the sun-facing south is clad in typical Mediterranian scrub, and there is some intense cultivation along some of the banks of the Lambro.

During our visit the weather was very variable with several overcast days and a little rain. Midday temperatures averaged between 21 and 25° C. We had accommodation above the southern cliffs in one of several chalet-type buildings belonging to a hotel. These had gardens around them whose hedges and dry-stone walls provided habitat for four of the six reptile species observed on the peninsula. The banks of the Lambro demonstrated one of the other two reptile species and three amphibians. The remaining reptile was found on rough-cast house walls.



Palinuro Peninsula, Cliento. Scale bar = 1 km.

SPECIES LIST

AMPHIBIA

Bufonidae

Bufo bufo, Common Toad. Several tadpoles of this toad observed at many locations along the banks of the Lambro. Four newly metamorphosed animals seen struggling through vegetation on 22 May.

Bufo viridis, Green Toad. A large number of small, recently hatched toad tadpoles, very similar to those of *Bufo calamita*, seen crowding into shallow waters at the mouth of the Lambro. As the Natterjack is not found in Italy, we assumed they were the larvae of the Green Toad.

Ranidae

Rana lessonae/Rana esculenta, Pool and Edible Frogs. Several green frogs were seen. Some observed in an irrigation ditch bordering allotments were bright green in colour. Others inhabiting the mouth of the Lambro were mostly brown with green vertebral stripes. No specimens were caught and it was therefore impossible to identify the animals with any certainty.

REPTILIA

Gekkonidae

Tarentola mauritanica, Moorish Gecko. This fairly common lizard was seen on dry stone walls in a variety of locations ranging from stone dykes and out-houses high up on the peninsula to heaps of stones at the top of the sandy beach lying to the west of the River Lambro. They were often observed during the day in the shade of the eaves or any other type of shadow. The greatest number seen together were three on the gable end of a derelict outhouse. They were much more timid than *Podarcis sicula*, the ubiquitous Italian Wall Lizard, though one morning one was seen chasing off a male Wall Lizard who had invaded his territory. He rushed forward with great speed nearly causing the latter to fall off the wall with fright.

Hemidactylus turcicus, The Turkish Gecko. Only two of these slender, narrow-headed animals seen, the first, a juvenile, on 18 May, the second, an adult, on 23 May. Both were seen after ten o'clock at night, hunting insects on rough-cast walls illuminated by street lights.

Lacertidae

Podarcis sicula, the Italian Wall Lizard. We had seen this lizard before, near Sorrento, where it was unremarkable in appearance, distribution and habits. In Palinuro we found a very different animal which exhibited a vast range of individual liveries. Whilst more than half of the specimens seen resembled the southern variety illustrated in Arnold et. al. (1978), a large minority, both male and female, were a brilliant turquoise blue, like island specimens, particularly in the higher parts of the peninsula. The males were very big (up to 9 cm snout to vent) and very bold. The population was of very high density. There were lizards in huge numbers everywhere from the remote upland scrub down to driftwood at the sea's edge. They were mating and their rough courting ritual was in evidence all around. Two aggressive suitors were rescued from a bucket of water into which they had fallen fighting. Whilst held by hand they struggled with great vigour and surprising

Podarcis sicula. Photograph by author.

strength. The males seemed fearless of humans, jumping onto terrace café tables from adjacent stone walls to eat bits of bread, jam out of plastic containers and even scraps of chocolate. We had a very 'friendly' one on our hotel balcony whom I fed like a pet. His mate, however, kept her distance.

Colubridae

Coluber viridiflavus carbonarius. Western Whip Snake, the black subspecies. Whilst the second specimen, an adult about 135 cm in length, was seen basking on a south-facing slope to the north of the hotel car-park, at around 09:30 h, 18 May in a typical scrub environment, the first was observed swimming across the mouth of the Lambro, from an island to the west bank around 11:00 h on 16 May. This caused us some confusion as I was watching water snakes and a 140 cm long black snake swimming carefully with its head held about 10 cm above the surface of the water was initially identified as a melanistic Grass Snake (*Natrix natrix*). However the shape of the head and the smooth shiny scales made me dismiss the idea. Later in the day a whip snake was seen basking among dry thorn bushes in the vicinity of the river. A third whipsnake was seen fleeing a bank of a path descending a south-facing slope two days later.

Elaphe quatuorlineata, Four-Lined Snake. Literature about the national park showed a photograph of this animal, but we did not expect to see it on the peninsula. However we were to be pleasantly surprised, firstly on 23 May, when our daughter, hearing what she thought was water trickling down a ditch beside a woodland path, investigated to find a huge 2 m long light brown snake with four longitudinal dark stripes down its back, slithering slowly through the undergrowth. It looked at least 7 cm thick and had a large long head. Another specimen, an immature example about 120 cm long and still possessing the juvenile markings of large charcoal grey blotches on an ash grey ground, was seen underneath a hedge growing at eye-level above a path in the hotel grounds at approximately 10:00 h on 24 May.

Natrix tessellata, The Dice Snake. A female about 95 cm long seen basking on a floating tree-trunk in the mouth of the river Lambro about 10:30 h on 16 May. Unlike Dice Snakes that I had seen on the banks of Lake Garda which had been a uniform grey in colour, this animal was greenish-brown with rows of round spots going down its flanks. Another snake was seen further up the Lambro, basking on the east bank in a clump of vegetation. We were wading across the river at the time and it, much alarmed, lunged into the water with considerable speed.

DISCUSSION

Most other areas of Italy that we had visited demonstrated unremarkable populations of *Podarcis* species, the occasional *Lacerta viridis*, and one or two of the commoner snakes. Whilst Palinuro revealed no examples of *Lacerta*, the abundance, behaviour and colouring of the Italian Wall Lizards and the strange aquatic behaviour of Western Whipsnakes, taken together with the abundance of two other snakes, two geckos and three amphibians makes this little Campanian peninsula very interesting to the herpetologist. Also the countryside is magnificent; wild as our Hebrides, and demonstrating Wolves, Wild Boar, several species of raptor, Ravens, Blue Rock Thrushes and many butterflies.

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