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PYGOPUS NIGRICEPS (FISCHER): A LIZARD MIMICKING A VENOMOUS SNAKE

By

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(*Received 7/11/66*)

Hall (1905) drew attention to the close mimetic resemblance of *Delma fraseri* to young unbanded specimens of the brown snake (*Demansia textilus*). Since his paper has been overlooked by most subsequent workers his observations are quoted, "There were the same velvety black patches on the head and nape (in *D. fraseri*) with deep orange between the two bands and behind the last. The back had the exact tint of pale brown in both cases. True, there were no transverse black marks on the body, and the ventral surface was not mottled and was of a paler tint. But these markings I knew were variable, and the bands and spots were often absent. The only other noticeable colour difference was a light transverse line cutting the anterior black patch into two nearly equal parts."

Hall concluded, "We can readily see the advantage to be gained by a harmless lizard mimicking a poisonous snake, and it is of interest to find it imitating a growth stage of its own size, for as the brown snake grows it loses the distinctive black colouring of its head, and is quite unlike what it was in the young state."

Waite (1929) included a plate showing the remarkably close mimicry of *D. textilus* by *D. fraseri*. Kinghorn (1926) and Barrett (1954) both refer to the close resemblance of *D. fraseri* to juveniles of *D. textilus*.

Serventy (1951) wrote concerning *Pygopus lepidopodus*, "This snake-lizard was captured within 30 yards of the beach under a bush. The head was held some 3 or 4 inches off the ground, the sides of the neck being flattened, giving the creature a very snake-like appearance."

Cott (1940) noted that mimicry is not common among vertebrates. He stated "mimics do not merely look like their models. They behave like them."

Several harmless snakes are known to mimic venomous species (Dunn, 1954; Gans, 1961) but I am unaware of any lizards (other than *D. fraseri*) which are known to mimic venomous snakes, although this would presumably have selective advantage among any limbless or near limbless lizards which superficially resemble snakes in appearance.

The lizard family Pygopodidae is endemic to Australia and New Guinea and possesses only the merest rudiments of the hind limbs. Locomotion is by serpentine movements.

The specimen on which the following observations are based is referred to *nigriceps* on the basis of its locality (Coen, Cape York) and intermediate scalation. It is now in the collection of the Australian Museum, Sydney (AM. R 26579). According to Cogger (pers. comm.) the genus *Pygopus* is in need of revision and there seems little doubt that *nigriceps* and *bayleyi* are extremely close and might well be conspecific.

When alarmed *P. nigriceps* elevates its head and neck region like many snakes. At such times the neck is somewhat flattened laterally. If closely approached the pygopod actually strikes at the enemy. The strike, like that of the mimetic egg-eating snake, *Dasypeltis scabra*, is usually past the enemy and is always made with the mouth closed. Full strike behaviour has recently been repeatedly elicited in my laboratory by several stimuli including the close approach of a laboratory mouse.

An early stage of display (to a mouse) is shown in Figure 1. The flattening of the neck region, caused by inclining the head slightly downwards as well as by extension of the throat area, is apparent.

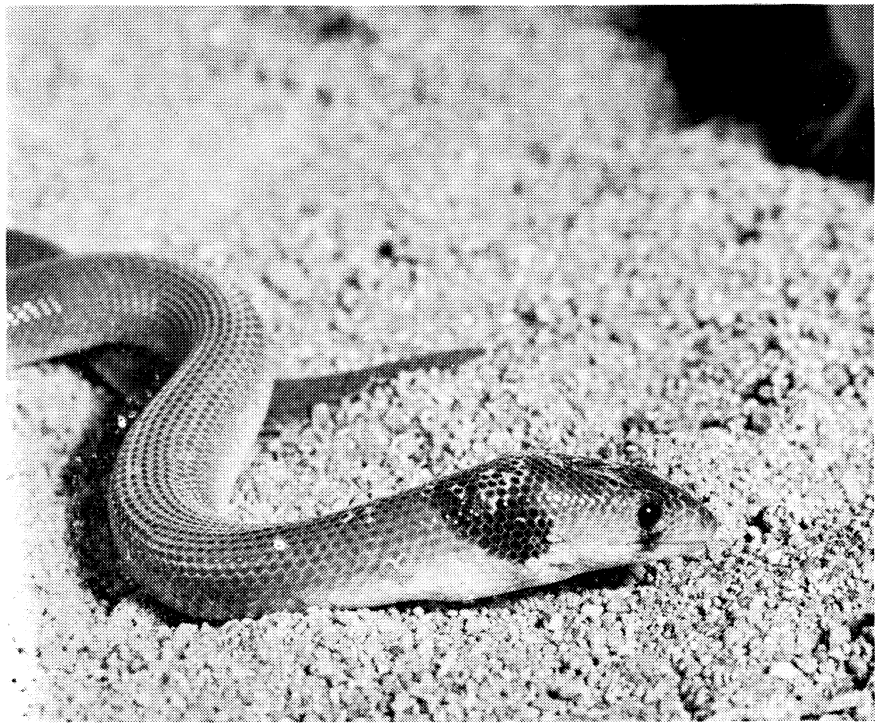

FIGURE 1

Commencement of defensive display behaviour of *Pygopus nigriceps* to a laboratory mouse. Note flattening of neck region.

P. nigriceps, which grows to about eighteen inches in total length, superficially resembles the small black-headed snake (*Denisonia gouldii*) and the little whip snake (*Denisonia flagellum*). The general red-brown to olive body coloration and black markings on the head and nape of the neck give the heads a similar appearance. Both of these elapids do not exceed about eighteen inches in total length.

It is suggested that resemblance to species of *Denisonia*, together with the generalized snake-like appearance and behaviour will have survival value, especially in a continent where the main snake radiation is of elapids.

DISCUSSION

P. nigriceps and the very closely related or conspecific *P. bayleyi* are widely distributed throughout the Australian continent. They exist at low population densities, that is to say they will be less abundant than the models which is in accord with the requirements of mimicry. In Panama, Dunn (1954) found that about one third of the conspicuous snakes with ringed markings were harmless and two thirds venomous.

Virtually nothing is known about the biology of the Pygopodidae but it is interesting to note the common names and sentiments ascribed to the genus *Pygopus*. Waite (1929) wrote concerning *P. lepidopodus*, "I have heard weird tales about a 'salt-bush snake,' which it is alleged is the most venomous of all 'snakes,' and which jumps at an intruder!"

Barrett (1954) writing of the "scaly-foot" (presumably *P. lepidopodus*) said, " 'Jumping snake' and 'saltbush snake' are popular names for scaly-foot, which timid people who have met with it declare is so aggressive that it jumps at anyone who disturbs it."

The mimetic defensive behaviour described above for *P. nigriceps* suggests that although grossly exaggerated, as is usual with popular accounts, these tales may have a foundation in fact. The observations extend snake mimetic behaviour to a second species of the genus *Pygopus*, and since the genus comprises only the species *lepidopodus*, *nigriceps* and *bayleyi*, suggest it is a generic characteristic.

ABSTRACT

Hall (1905) drew attention to the close mimetic resemblance of the pygopod *Delma fraseri* to young unbanded specimens of the brown snake (*Demansia textilus*) and Serventy (1951) recorded that a specimen of *Pygopus lepidopodus* elevated its head and flattened the sides of the neck giving it a very snake-like appearance. The present paper extends these observations by recording defensive behaviour in *Pygopus nigriceps* similar to many snakes. When provoked *P. nigriceps* will even strike at the aggressor like a snake. In addition, *P. nigriceps* shows a superficial resemblance in head coloration to several small venomous snakes found in the same areas.

ACKNOWLEGEMENTS

I am grateful to Mr. I. Fox for preparing the plate and to Mr. H. G. Cogger for nomenclatorial advice. This work was carried out during the tenure of a Queen Elizabeth II Fellowship and I acknowledge the support given by the Commonwealth Government of Australia.

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AMPHIBIANS AND REPTILES OF THE SEYCHELLES

By

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(*Received* 30/1/67)

During the course of conservation work on the land birds and giant tortoises of the Seychelles and other island groups in the western Indian Ocean, the Bristol Seychelles Expedition 1964-65 was able to observe and collect a number of reptiles and amphibians. These form the basis for the species list below.

CAECILIANS (Apoda, limbless burrowing amphibia).

Six species of an endemic genus *Hypogeophis*. This is one of the few places in the world where this group is common and successful.

H. rostratus (Cuvier). (*Caecilia rostrata*, *H. guentheri*).

The commonest species, locally abundant from sea level to about 2,250 ft. on the granite islands of Mahé, Praslin, Silhouette, La Digue, Curieuse and Frigate. Subspecies based on differing numbers of vertebrae: *H. r. rostratus*, Mahé and Silhouette. *H. r. guentheri*, Frigate. *H. r. praslini*, Praslin and Curieuse. The La Digue population is not mentioned, and may be a fourth subspecies.

H. alternans Stejneger.—This species is rather similar to the first, and is usually found with it, but in much smaller numbers except at higher altitudes.

H. angusticeps Parker. (*H. alternans* Stejneger, in part)—Very similar to *H. alternans* but not found at sea level. In wet moss and soil on rocks at over 1,500 ft. and in deeper forest soil down to a few hundred ft.

H. sechellensis (Boulenger). (*Dermophis sechellensis*, *D. flaviventer*)—Similar to *H. alternans*, but smaller. Found in forest soil near water at over 1,000 ft. on Mahé, Praslin, Silouette. Rare.

H. cooperi (Boulenger). (*Praslinia cooperi*)—Extremely rare; only three specimens known, from Mahé and Praslin at over 1,000 ft.

H. brevis Boul.—Also extremely rare; only two specimens known, both from Mahé at over 1,000 ft.

We collected the first four species listed, all of which occur over large areas and are in no danger of extinction at present. The last two species may be extinct, but no intensive search has been carried out, and we were unable to look in the most likely areas.

If, as has been suggested, the genus *Hypogeophis* is split, it then contains only *H. rostratus*, the other species remaining together as *Praslinia**.

FROGS AND TOADS.

Five species are recorded, three of which form the Sooglossinae, a group unique to Seychelles. They are of pelobatid type, with ranid thigh musculature. All three are found only on Mahé and Silhouette.

Sooglossus sechellensis (Boettger) (*Arthroleptis sechellensis*)—Dark brown with darker and reddish markings; up to 25 mm. Lives mainly on the ground in remnants of the endemic moss forest.

S. gardineri (Boul.) (*Nectophryne gardineri*).—As above, but very small (up to 15 mm.) One of the smallest amphibia.

Nesomantis thomasseti Boul.—Should be included with *Sooglossus*. As above, but larger (45 mm.).

These species are generally thought to be very rare, but in fact they are still quite common, although restricted to the few remaining areas of high mountain forest.

Megalixalus seychellensis (Tschudi) (*M. infrarufus*).—An endemic representative of an Ethiopian genus. Despite recent reports, this large green tree frog is common in a few high areas on Mahé, and near sea level on Praslin.

* A new species is described by E. H. Taylor (1968), with a revision of the Seychelles caecilians, in *The Taxonomy of the Caecilians of the World*, University Press of Kansas, Lawrence, Kansas.

Rana mascareniensis.—This very widespread African species is regarded as being introduced in Seychelles, but this is far from certain. Common from sea level to the highest marshy areas on all of the larger granite islands.

This completes the list of Anura described for Seychelles, but we found two similar tree frogs of medium size, one green (on Silhouette) and one reddish brown (on Mahé and Praslin). These seem to be new species, despite their abundance. Both occur at high altitudes in remnant forest areas near water.

There are no urodeles in Seychelles.

REPTILES.

Geckos.

Aeluronyx sechellensis (Duméril and Bibron). An endemic species of a genus otherwise represented only by one species in Madagascar. A large brown gecko, active both in the day and at night. Occurs on Cousin, Cousine and other small islands, and less commonly in high forest on Mahé and possibly Praslin and Silhouette.

Phelsuma.—The taxonomy of this genus seems somewhat confused. It is essentially a Madagascar form which has speciated among the nearby island groups. In Seychelles there are several well marked forms, but the present division into 3 species with various subspecies seems excessive. *P. a. astriata* is described from Mahé and Frigate; *P. madagascariensis sundbergi* from Praslin and Curieuse; *P. abbotti pulchra* from Mahé; and *P. a. longinsulae* from Frigate. Silhouette, La Digue and other islands are not mentioned, and there are other anomalies.

Phelsuma is a large bright green diurnal gecko, varying in size and markings from island to island. It occurs in endemic and secondary vegetation and around houses and other buildings from sea level to valleys at over 1,000 ft.

The following species are widespread and often commensal with man:

Phyllodactylus inexpectatus (Stejneger)

Hemidactylus frenatus (Duméril and Bibron)

H. mabouia (Moreau de Jonnes)

Gehyra mutilata (Weigmann)

Lepidodactylus lugubris (Duméril and Bibron)

These are variously recorded from houses and cultivated areas, mainly on Mahé and the other larger islands which have been inhabited for many years.

Skinks.

Mabuya sechellensis (Duméril and Bibron).—A widespread genus with two endemic species in Seychelles. This is the smaller, and the most common, being found on all the granite islands of any size from sea level, where it is most abundant, to over 1,000 ft.

M. wrightii Boul.—This species is very similar to *M. sechellensis*, but is much larger and more heavily built. It occurs on these islands which have or have had sea bird colonies, and seems to be specialised for taking sea bird eggs and young.

The other endemic skinks belong to the genera *Scelotes* and *Amphiglossus*, now combined. *Scelotes* is probably correct, with three species described. *S. braueri* (Boettger), Mahé, Silhouette, Frigate. *S. vesey-fitzgeraldi* (Parker), Frigate and Silhouette. *S. gardineri* (Boul.), Mahé, Praslin, Silhouette, Frigate. The first two species are very similar; very small, glossy dark brown skinks with reduced limbs. The third is larger, and lighter in colour. All three species live in leaf litter, under logs etc. in areas of endemic vegetation at high altitudes, or in secondary forest at sea level.

The only other lizard described is an endemic chameleon *Chamaeleo tigris* (Kuhl), which is recorded from Mahé, Praslin and Silhouette. It is not common, but we collected several specimens, and these seemed to represent two types, one larger, and less heavily spotted.

Snakes.

Lycognathophis seychellensis (Schlegel) is the only species of an endemic genus. It is rather small (2-3 ft. maximum), slimly built and difficult to locate. Its colour is very variable, often yellow. Known from Mahé, Praslin, Frigate and probably Silhouette.

Boaedon geometricus (Schlegel)—is an endemic species of a widespread African genus. It is quite large (up to 4 ft. or more), dark brown, with a wide head. Widespread but uncommon over much of Mahé, Praslin and probably Silhouette and Frigate.

Typhlops braminus Daudin.—This widely distributed African burrowing 'snake' is probably introduced in Seychelles. It is found in soil and under logs etc. in lowland areas on Mahé, Frigate and probably elsewhere.

TORTOISES AND TURTLES

Testudo gigantea (Schweigger),—the giant tortoise of Seychelles and Aldabra, is (or was) the most notable land animal on many islands in the Seychelles, Amirantes and Aldabras, but is now much reduced in numbers or extinct over most of its former range. The Seychelles form is not at present separable from the Aldabra tortoises, which are still numerous. No wild tortoises survive on the Seychelles, and the few captive herds are of mixed origin, mainly from Aldabra. A few of these herds contain individuals which may be wholly or partly descended from the original Seychelles type.

Pelusios subniger (Lacépède) (*Sternothaerus nigricans seychellensis* Siebenrock). This terrapin is not now separated from the very widespread African species, but since it is probably not introduced there may be differences between this and the mainland forms. Although once common on La Digue, Mahé and Frigate, it is now rather rare because of the tourist trade in stuffed polished specimens. This trade is now illegal, and the animal protected.

This completes the present terrestrial herpetofauna. In the sea the green turtle *Chelonia mydas japonica* (Thunberg) still occurs in the Seychelles, but is no longer very common, and is outnumbered by the hawksbill *Eretmochelys i. imbricata*, which is still taken in small numbers for its shell.

Other turtles are rare, but *Caretta caretta gigas* and *Dermochelys coriacea* probably occur regularly. *Lepidochelys olivacea* has not been reported.

A crocodile (probably *Crocodylus niloticus*) was indigenous in Seychelles, but is now extinct.

Aldabra and other outlying coral islands are entirely without amphibians because of the lack of suitable fresh water and the geological youth of the terrain. Amphibia must only be transported across oceans as the result of extremely rare accidents, and have never reached many apparently suitable islands.

A few reptiles occur, the giant tortoises being the most important. There are several endemic geckos, and skinks, but no snakes.

Sea snakes are rare or absent throughout the Seychelles area, despite their abundance to the north and west.

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NOTES ON THE MOROCCAN REPTILES AND AMPHIBIANS

By

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(*Received* 1/5/67)

The herpetofauna of Morocco consists of about 115 species and subspecies. This large number can be attributed to the enormous physical and climatic diversity of the country and to the influence of many geo-herpetofaunal elements, besides maintaining several species which are confined to this small area of north-west Africa alone.

Physically speaking, Morocco is dominated by four great mountain ranges, the Littoral (Rif), the Middle, High and Anti-Atlas, which, running from east to west and more or less parallel to each other, are with the exception of the Middle Atlas, precipitous and relatively unknown to most Europeans. To the south of the Atlas mountains there is the Sahara desert which stretches southwards for some 2,000 miles (Fig. 1.).

The rainfall in the northern half of the country is appreciable in winter, resulting in flooding every January in the plains around Rabat, and the climate is typically Mediterranean with winter temperatures in the region of 50°F. and summer in the region of 85°F. The long Atlantic coast receives much rain from the west, but to the south the western end of the High Atlas range takes up most of the moisture from incoming depressions leaving the eastern end of the range to become steadily more arid and gaunt. Snow patches remain throughout the year in the High Atlas at heights above 10,000 ft., while in south-east Morocco the climate becomes Saharan, very dry with mean summer temperatures around 100°F.

During the Tertiary age, there was a land connection to Spain in the north and many primarily European species of reptiles and amphibians extended their range of distribution southwards as far as the Atlas mountains. Species from the east have migrated across North Africa from as far as Egypt, and from the south-east Saharan species have reached the north-western extent of their range on the southern slopes of the High Atlas. Moreover, species from West Africa have migrated northwards along the Atlantic coast which in itself provides unique climatic conditions in North Africa. Finally on account of glacial isolation certain species today are only able to survive at heights of up to 10,000 ft. in the High Atlas, above which height the climate becomes arctic-alpine in character and species are absent.

The French have carried out work in some detail on the reptiles and amphibians of Morocco at the l'Institute scientifique Chérifien in Rabat and several publications have been written: i.e. Bons (1959), Pasteur and Bons (1959, 1960), and Bons and Girot (1962). In addition Lanza (1957) has worked on certain genera.

The observations that follow were made during the course of a biological expedition from Trinity College, Dublin, to the High Atlas mountains and to the Sahara desert from June until August in 1966.

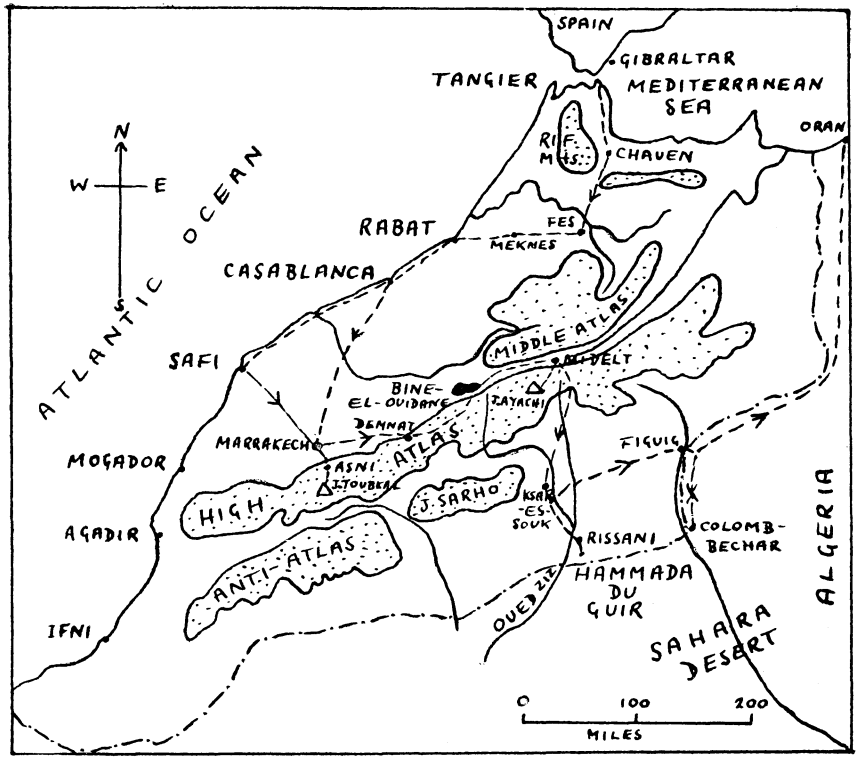

Figure 1

Morocco — above 4,000 ft. — Frontier — Expedition

OBSERVATIONS

In the dry, lowland areas of Morocco *Psammodromus algirus* is present in low scrub everywhere and in particular in the maquis of the Rif mountains. On the dry, dusty plain between the coast and Marrakesh *Lacerta hispanica vaucheri* was seen and the species is curious in that it emits a squeak when captured. Bibron's agamid *Agama bibroni* was also observed here. This agamid is present throughout Morocco. It was observed in the Rif mountains near Chauen, in the *hammada* (stony desert with low scrub) of S.E. Morocco near Erfoud and up to heights of 4,500 ft. near Asni in the High Atlas among boulders and even in dry stone walls near habitation. It grows to a foot in length and has a grey-brown background colour with a paler belly. The females have large red patches on the back and blue heads which presumably act as a releaser mechanism to the male in the

breeding season. The latter is quite different, with an intricate dark purple dimetric network on the back which disappears with ageing.

Another fine agamid found in the Hammada du Guir is the Spiny-tailed lizard —*Uromastix acanthinurus*, which makes burrows under rocks. The characteristic tail together with the body is grey while the head is yellow.

There are two abundant lizards in areas north of the High Atlas namely *Lacerta perspicillata* and *L. lepida pater*. The former has considerable variation in colour pattern which has been classified into three varieties: rayed, bronzen and spotted (Pasteur and Bons, 1960). They are up to seven inches long and the spotted variety, which was seen climbing on buildings in Imlil at 6,250 feet in the Toubkal range of the High Atlas, is black with small green spots. The latter is primarily a European species, green with blue, lateral eye spots and was caught near Asni at 4,500 feet.

Small boys in Asni were organized to catch reptiles for us and besides many Bibron's agamids they brought specimens of the Common Chameleon—*Chameleo c. chameleon* for which they held the respect of the fear of death and on whose mode of locomotion is based the Berber proverb "to walk like a chameleon"; the equivalent to the English "look before you leap". More small boys caught reptiles for us while we were based in the Ksar Jedid oasis near Rissani in S.E. Morocco, and apart from the inevitable Bibron's agamid which inhabited the dry walls, they brought a skink which according to Lanza (1966, pers. comm. after 1957) is the subspecies *Chalcides ocellatus subtypicus* of the Sahara. It is abundant in palm bases and differs from the subspecies *montanus*, which was seen near Demnat at 5,000 feet among clumps of the cactoid spurge—*Euphorbia resinifera*, in that it possesses spots in contrast to dark lateral lines. Present among ruined dwellings was the sand-coloured gecko *Tarentola mauritanica ?deserti*. This animal differs significantly from the common *T. mauritanica mauritanica*, which is abundant near the Mediterranean coast and was observed among rocks in the High Atlas at 6,500 feet near Imlil and also near the dam of Bine-el-Ouidane.

Near the coast at Cap Cantin, 36 kms. north of Safi, several interesting species were seen. The active lizard *Eremias o. olivieri* is common among dunes and generally is rare on the Atlantic coast together with the skink *Chalcides m. mionecton*, which burrows in the sand between rocks and is confined in Morocco to a narrow strip along this coast.

By water in the lowlands the Spanish terrapin—*Clemmys* (*caspica*) *leprosa* is abundant but it is also present in rivers and ponds at heights of 4,500 feet. This species together with the water snake—*Natrix maura*—were recorded near Asni and near Demnat in the High Atlas, the latter species reaching a height of 6,500 feet. Two species of toad were also recorded in the High Atlas at 6,250 feet near Imlil. Both *Bufo b. spinosus* and *B. mauritanicus* are abundant throughout Morocco where it is damp, while the latter is only to be found in N.W. Africa. In the Ksar Jedid oasis many green toads—*Bufo v. viridis*—were seen at night in a small pool by a well. They were of many different sizes and the species was not observed elsewhere in Morocco although it is primarily European. The edible frog—*Rana esculenta ridibunda*—was seen or heard in every lowland river or pond.

In upland, dry regions of the High Atlas mountains there are several unusual species. A small gecko *Quedenfeldtia trachyblepharus* is more or less confined to the Toubkal range in Morocco at heights of from 6,000 to 10,000 feet. It is unusual in that it is diurnal seeking refuge beneath boulders when disturbed. At 6,000 feet its body is light grey in colour, becoming much darker at higher altitudes. It is probably a relict species, only able to survive in these conditions and formerly having a greater range of distribution during the glacial period. In the Jebel Ayachi region at 6,300 feet, the dry, barren, rocky hillside yielded the small smooth snake—*Coronella girondica* which is primarily a European species.

In streams at high altitudes, the Painted frog—*Discoglossus pictus pictus*—is abundant and several specimens were caught near Imlil in the Toubkal range of the High Atlas at 6,250 feet.

Below is a systematic list of the amphibians and reptiles recorded in Morocco.

AMPHIBIA

Discoglossidae

**Discoglossus pictus pictus*. Imlil, 6,250 feet Toubkal range, High Atlas.

Bufonidae

**Bufo bufo spinosus*. Imlil, 6,250 feet Toubkal range, High Atlas.

Bufo v. viridis. Ksar Jedid oasis, 6 kms. S.E. of Rissani (Hammada du Guir).

**Bufo mauritanicus*. Rabat; Imlil, 6,250 feet Toubkal range, High Atlas; Oued Ziz, S. of Ksar-es-Souk. Confined to N.W. Africa.

Ranidae

Rana esculenta ridibunda. Abundant in pools and rivers at low altitudes.

REPTILIA

Chelonia.

Emydidae

†**Clemmys* (*caspica*) *leprosa*. Fes; Asni and Demnat, 5,000 feet, High Atlas.

Sauria

Gekkonidae

†**Quedenfeldtia trachyblepharus*. Toubkal range from 6,000 to 9,500 feet. Confined to Morocco.

†**Tarentola m. mauritanica*. Imlil, 6,500 feet Toubkal range; near the dam of Bine-el-Ouidane, 3,000 feet, High Atlas.

†*T. mauritanica ?deserti*. Ksar Jedid oasis, 6 kms. S.E. of Rissani (Hammada du Guir).

Agamidae

†**Agama bibroni*. Throughout Morocco, not recorded above 4,500 feet in the High Atlas.

Uromastix acanthinurus. Hammada du Guir.

Chameleonidae

†**Chameleo c. chameleon*. Throughout Morocco, not recorded above 4,700 feet in the High Atlas.

Scincidae

†**Chalcides m. mionecton*. Cap Cantin, 36 kms. N. of Safi. Confined to Morocco.

Chalcides ocellatus montanus. Near Demnat at 5,000 feet, High Atlas. Endemic subspecies.

C. o. subtypicus. Ksar Jedid oasis, 6 kms. S.E. of Rissani (Hammada du Guir). Saharan subspecies.

Lacertidae

†**Eremias o. olivieri*. Cap Cantin, 36 kms. N. of Safi. Endemic sub-species.

Lacerta lepida pater. Asni, 4,500 feet, High Atlas.

L. hispanica vaucheri. Near Chemaia, between Safi and Marrakesh. Endemic subspecies.

†**L. perspicillata*. Imlil, 6,250 feet Toubkal range; near Demnat at 5,000 feet, High Atlas. Confined to Morocco.

Psammodromus a. algirus. Throughout Morocco.

Serpentes.

Colubridae

†**Coronella girondica*. Cirque de Jaffar, 6,000 feet Ayachi range, High Atlas. Confined to mountains in Morocco.

†*Natrix maura*. Throughout Morocco near water.

†*Specimens returned to the British Isles.* **Species recorded photographically.*

CONCLUSION

Morocco is a land of enormous variety and in order to observe a large number of species of reptiles and amphibians one would have to travel very extensively. In the hot summer months particularly in southern Morocco several species undergo a period of aestivation while in winter, particularly at higher altitudes, a number of species experience a short period of hibernation. To discover the reptiles and amphibians in any particular area it is necessary to visit that area at different times of the year.

On account of these factors together with the many geo-herpetofaunal elements to which Morocco is subjected the indigenous species are of great interest and worthy of more detailed behavioural studies.

I am indebted to Mr. J. W. Steward who received and maintained the living reptiles which were air freighted from Marrakesh and who gave me great assistance in the identification of the living and preserved material.

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AN OUTLINE CLASSIFICATION OF THE SQUAMATES

By

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(*Received* 22/5/67)

While preparing the documentation of the geological ranges of the major groups of the subclass Lepidosauria for the Geological Society Symposium Volume, The Fossil Record (Tarlo 1967a), I found that the classifications of the Squamata in current use were unsatisfactory. This was especially so with the Triassic squamates and their relationship to the living forms. Hoffstetter (1962) avoided this problem by simply referring the former to "Triassic squamates", whereas Romer (1956) in contrast found no difficulty as he did not accept these animals as lizards. Although primarily concerned with geological ranges, I listed the various groups in the framework of a classification which differs from previous versions. The purpose of this note is to outline the reasons for yet another rearrangement of the Squamata.

PREVIOUS CLASSIFICATIONS

The evolution of the classification of the squamates is best illustrated by

listing in chronological order those most recently proposed, with the Triassic genera, as well as appropriate comments, interpolated.

Romer (1956) placed only one genus, *Askeptosaurus*, in the lepidosaurs, the rest he relegated to the Euryapsids.

Subclass Euryapsida (Synaptosauria): Order Protorosauria:
Suborder Araeoscelida: Family Protorosauridae:
Genera *Macrocnemus* Nopcsa 1931, *Trachelosaurus* Broili & Fischer 1921
Family Tanystropheidae:
Genus *Tanystropheus* von Meyer 1852
Subclass Lepidosauria: Order Eosuchia:
Suborder Thalattosauria: Family Thalattosauridae:
Genus *Askeptosaurus* Nopcsa 1925
Order Squamata: Suborders Lacertilia, Ophidia.

von Huene (1956) united all the Triassic true lizards in a single family in the suborder Prolacertilia within the Squamata.

Order Squamata: Suborder Prolacertilia: Family Askeptosauridae:
Genera *Askeptosaurus*, *Macrocnemus*, *Tanystropheus*, *Trachelosaurus*
Suborders Lacertilia, Ophidia.

Kuhn (1961) dispensed with the term Squamata and, with the exception of *Askeptosaurus*, placed the Triassic genera in separate suborders of the order Sauria (Lacertilia), from which, incidentally, he excluded the Prolacertilia.

Superorder Lepidosauria: Order Thalattosauria:
Family Askeptosauridae: Genus *Askeptosaurus*.
Order Prolacertilia.
Order Sauria: Suborder Trachelosauria:.
Family Trachelosauridae: Genus *Trachelosaurus*.
Suborder Tanysitrachelia:
Family Tanystropheidae: Genus *Tanystropheus*.
Suborder Macrocnemoidea:
Family Macrocnemoidea: Genus *Macrocnemus*.
Orders Serpentes, Amphisbaenia.

Tatarinov & Maleev (1964) placed all the forms in the order Lacertilia, within which they included both the Thalattosauria and the Prolacertilia.

Order Lacertilia: Suborder Prolacertilia:
Family Protorosauridae: Genera *Macrocnemus*, *?Trachelosaurus*.
Family Prolacertilidea:
Family incertae sedis: Genus *Plesiodraco* Tarlo 1962 (nomen nudum).
Suborder Thalattosauria:
Family Askeptosauridae: Genus *Askeptosaurus*.
Suborder Tanysitrachelia:
Family Tanystropheidae: Genus *Tanystropheus*.

Kuhn (1966) has now changed his previous scheme and removed all the Triassic lizards from the Sauria (Lacertilia), at the same time he has reintroduced the taxon Squamata which he restricts to the living suborders. However, still with the exception of *Askeptosaurus*, the Triassic genera are kept within a single order, the Prolacertilia.

Order Thalattosauria: Family Askeptosauridae: Genus *Askeptosaurus*.
Order Prolacertilia: Suborder Prolacertoidea:
Family Macrocnemidae: Genus *Macrocnemus*.
Suborder Trachelosauria:
Family Trachelosauridae: Genus *Trachelosaurus*.
Suborder Tanysitrachelia:
Family Tanystropheidae: Genus *Tanystropheus*.
Suborder indet.:
Family Kuehneosauridae: Genus *Kuehneosaurus* Robinson 1962.
Order Squamata: Suborders Sauria, Serpentes, Amphisbaenia.

Romer (1966) has recently moved from his former extreme position, but still retains one genus, *Tanystropheus*, in the subclass Euryapsida. The rest are included in the Lepidosauria but only the Kuehneosauridae are placed in the Squamata.

Subclass Euryapsida: Order Araeoscelida (Protorosauria):
Family ?Tanystropheidae: Genus *Tanystropheus*.
Subclass Lepidosauria: Order Eosuchia: Suborder Thalattosauria:
Family Thalattosauridae: Genus *Askeptosaurus*.
Suborder Prolacertiliformes:
Family Prolacertidae: Genus *Macrocnemus*.
Order Squamata: Suborder Lacertilia: Infraorder Eolacertilia.
Family Kuehneosauridae: Genera *Kuehneosaurus*, *Icarosaurus* Colbert 1965.
Suborder Ophidia.

PROPOSED CLASSIFICATION

There is little doubt that the Triassic lizards were true squamates and hence should be retained within this order. It is hard to justify the inclusion of the Prolacertilia in the Squamata as Huene (1956), Kuhn (1961) and Tatarinov & Maleev (1964) proposed, but the procedure recently followed by Kuhn (1966) in which the Prolacertilia and Squamata are treated as two independent orders is acceptable. However, the Triassic genera should be classified as the latter, and not, as suggested by Kuhn (1966), the former.

In view of the important adaptive radiation of the lizards during the Trias, the so-called "lizard inter-regnum" (Tarlo 1967b), it would appear appropriate to exclude the Triassic forms from any of the living suborders, while still retaining them within the Squamata. It seems logical, therefore, to assign each major line of the Triassic radiation to an independent suborder, even where such as yet only includes a single genus.

Within the subclass Lepidosauria, the Prolacertilia and Squamata are taken as two independent orders, the latter being classified as follows:

Order Squamata Oppel 1811
Suborder Macrocnemia Kuhn 1946
Family Macrocnemidae Kuhn 1946
Genus *Macrocnemus*

Suborder Tanysitrachelia Peyer 1931
Family Tanystropheidae Romer 1947
Genus *Tanystropheus*

Suborder Askeptosauria Tarlo 1967a
Family Askeptosauridae Kuhn-Schnyder 1952
Genus *Askeptosaurus*

Suborder Eolacertilia Romer 1966, emend. Tarlo 1967a
Family Kuehneosauridae Kuhn 1964
Genera *Kuehneosaurus*, *Icarosaurus*, *Kuehneosuchus* (=*Plesiodraco*) Robinson 1967

Suborder Trachelosauria Broili 1917
Family Trachelosauridae Broili 1917
Genus *Trachelosaurus*

Suborder Sauria MacCartney 1802
Infraorder Gekkota Cuvier 1817
Infraorder Iguania Cuvier 1817
Infraorder Rhiptoglossa Wiegmann 1834
Infraorder Scincomorpha Camp 1923
Infraorder Anguimorpha Fürbringer 1900
Suborder Amphisbaenia Gray 1844
Family Amphisbaenidae Gray 1825
Suborder Serpentes Linné 1758
Infraorder Simoliophidia Tarlo 1967a
Infraorder Scolecophidia Duméril & Bribron 1844
Infraorder Aniliida Amaral 1929
Infraorder Alethinophidia Nopcsa 1923
Superfamily Booidea Hoffstetter 1955
Superfamily Colubroidea Hoffstetter 1955
Suborder Sampodermatomorpha Bogert & del Campo 1956

[published as a joke to accommodate *Sampoderma allergorhaihorhai* Bogert & del Campo 1956 based on the fictitious reptile investigated by Sherlock Holmes in "The Case of the Speckled Band."]

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SPRING HERPETOFAUNA OF THE ROVINJ AREA (ISTRIA, YUGOSLAVIA)

By

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(*Received* 30/3/67)

Now that Yugoslavia is rapidly becoming a European tourist centre, many herpetologists may be interested in the variety and abundance of forms which can be seen and collected there. This is a short account of the species seen during the last two weeks of March 1964 in an area so far little visited by British herpetologists. Rainfall was high during this period, in contrast apparently to the dry summer. It was understood from the local population that the visit was too early to see the larger lacertids and snakes.

AMPHIBIA

Bufo bufo spinosus (Common Toad)

This comparatively large toad was found in a pond surrounded by vegetation. The pond was deep in parts but water plants were common in the shallows and it was amongst these that the males were seen sitting and calling with a soft, deep croak. Catching these was fairly simple if they were stalked and then 'grabbed' or netted. No females were seen.

Bufo viridis viridis (Green Toad)

A single specimen was found in a hole in the surrounding soil of a Roman amphitheatre at Pula, south of Rovinj.

Hyla arborea arborea (European Green Tree-frog)

This species was found in hedges and small trees surrounding ponds in which *B. b. spinosus* was found. The males were calling in chorus approximately every fifteen minutes but at dusk the chorus was louder and more prolonged. The individuals in the immediate vicinity of intruders became silent and so catching in the trees was found to be impossible, not only for this reason but also as the chorus masked the sound of individuals. They were caught hopping towards the water mainly at dusk but sometimes during the daytime. Some were netted in the water or on rocks a few inches away. These latter individuals had changed colour from bright green to a dark, drab khaki. Few females had arrived at this stage but one was found which subsequently mated and produced spawn in a large polythene bag containing an inch of water.

Triturus vulgaris meridionalis (Common Newt)

This species was found in deep ponds (of at least eight feet) at the edges of agricultural land.

REPTILIA

Algyroides nigro-punctatus (Keeled Lizard)

This lizard was found on large boulders amongst low herbage and shrubs. Smaller individuals were found on the rocky areas of grassy banks alongside *Lacerta sicula campestris*

Lacerta muralis maculiventris (Wall Lizard)

A lizard which occurred very widely on stone walls found only in the town of Rovinj.

Lacerta sicula campestris (Ruin Lizard)

This small green lizard was common on grassy banks facing the sun and in other areas covered with low herbage.

Lacerta melissellensis fiumana

Some confusion arose with the identification of this lizard which was only tentatively identified in the field from Hellmich (1962). Colouration seemed to grade into that of *L. s. campestris* and it was thought that perhaps only one species had been collected. Dr. J. V. Tranter then kindly examined the whole live series and compared each form with the descriptions given by Mertens and Wermuth (1960) and by Boulenger (1885-1887). It was found that both species were represented but that *L. m. fiumana* occurred in at least three colour forms. These forms are described as:—

I. Uniform green, males with a red belly, females with a trace of a pale dorso-lateral streak. This is the type usually imported alive into England but they were not included in this collection.

II. Back green, with a dorsal row of spots and a whitish dorso-lateral line. Darkish sides. Males with a reddish belly (most caught were of this type).

III. Back green or brownish with dark brown vertebral and lateral bands spotted with black and with six whitish lines—on either side of the vertebral band, dorso-laterally and one laterally (collected and very similar to *L. s. campestris*).

Ophisaurus apodus (Glass "Snake" or Scheltopusik)

One live specimen was seen on the ground below brambles surrounding the ruins of a monastery. A specimen (110 cm. long) was found nearby which had apparently been killed by a blow on the head.

Each lacertid was found typically in one type of habitat. *L. muralis* was found only on buildings in Rovinj or outlying hamlets. *L. sicula* was found along roadside verges outside the town. Only for a small area was there a mixed *muralis-sicula* population. *L. melissellensis* was common only in land covered by low shrubs—clearings in woods, overgrown fields, etc. It is interesting to speculate on the relative abundance of these species with increasing building development, for it may be that *muralis* was an uncommon form found only around certain rocky places, but with stone buildings this species is now extremely common and apparently successful.

This area was found to be very rich in herpetofauna in terms of numbers of individuals at the time of the visit. According to the local population, it is apparently richer still with regard to numbers of species in later spring and early summer.

ACKNOWLEDGEMENTS

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EATING OF GREEN ALGAE BY THE GECKO
(*Phelsuma laticauda*)

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(*Received* 30/3/67)

A Madagascan flat-tailed day-gecko (*Phelsuma laticauda*) was kept in a densely-planted vivarium (24 in. × 18 in. × 24 in.), the temperature of which was maintained by incandescent lamps at between 75° and 85°F (24°-30°C). The plants in the vivarium were sprayed with tepid water each day so that the relative humidity was extremely high. This specimen was fed with blue-bottles (*Calliphora*), other insects and spiders together with mashed banana (G. F. Boyce, personal communication) to which was added small amounts of 'Abidec' drops (Boot's Ltd.) twice weekly.

An earthenware dish filled with water was available. Algae appeared rapidly in the water and if the level fell, fresh, green deposits formed on the sides. On several occasions, this animal was seen licking these green algal deposits and transferring them to the mouth. Swallowing was then seen to take place. Under the regimen outlined the lizard survived for just over a year until on a very cold night the heaters failed.

It has been noted by Vogel that caymans kept in green water thrive rather better than those kept in always 'clean' tanks. He suggested that algae accidentally ingested with food may be a valuable source of vitamins. In the case of *P. laticauda* the algae were not ingested accidentally. The eating of these plants is not inconsistent with the omnivorous feeding habits and the rain forest habitat of this species.

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DEATH OF A SNAKE WHILE SWALLOWING PREY

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On December 26th, 1966, the body of a snake (*Ptyas mucosus*) was seen alongside Conduit Path on Hong Kong island. Its head was hidden in a hole in the hillside. The body was pulled out and after a considerable pressure had been applied the head came out of the hole. The snake had been in process of swallowing a toad *Bufo melanostictus* when it died. As the swollen neck had been tightly jammed in the entrance to the hole, it appears likely that the snake suffocated—the swollen pharynx cutting off the air supply from outside, whilst swallowing its prey.

It is interesting to note that the snake was found on a date when most reptiles and amphibians in Hong Kong are undergoing annual winter torpidity and that *Bufo melanostictus* is obviously not free from predation by snakes. It is possible that the snake died from the toxic effect of the toad but this seems unlikely as the snake was actually swallowing it (i.e. had not avoided it) and the pharyngeo-cervical region was held tightly in the mouth of the hole.

SNAKE KILLED BY PLANT BURR

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(*Received* 17/4/67)

In a previous volume of this journal a correspondence on the herbivorous habits of snakes was begun by the late Dr. Irvine (1953,1954), who quoted from his experiences in the then Gold Coast. The present writer was reminded of this by the following incident concerning a plant and a snake.

On the evening of the 25th of January 1967 a house snake (*Boaedon lineatus*) was found on the road near Achimota, a village on the outskirts of Accra. It weighed 58 g. and was later, after death, found to be a male measuring 579 plus 116 mm. body and tail lengths. Upon capture a bulge was noticed in its throat and this was still present four days later when offered a gecko (*Hemidactylus brooki*). The gecko was seized, constricted, and swallowed whilst still alive, but entered no further than the bulge in the snake's throat and had to be rescued after some minutes. A glass tube was passed down the throat, past the bulge, and a rinse with water produced some bits of fur: an abscess following damage to the oesophagus was assumed to be the trouble.

Two weeks later the snake was no better and was twice given beaten chicken's egg, administered through a plastic funnel. Thereafter the bulge grew larger, the animal more pathetic as it endeavoured to moult, and on the 15th of March it was killed.

At postmortem the bulge proved to be a mass of debris, not more than 20 mm. in expanse, in the midst of which was a burr of *Pupalia lappacea*, a common weed of cultivated plots on the Accra Plains. The hooks of the burr were securely fixed into the oesophagus which had become septic. Presumably the burr had been attached to the coat of a rodent caught and swallowed by the snake, perhaps the rodent whose fur was flushed from the living snake, and this burr was lodged in the throat.

The inability of the snake to swallow a gecko shows that, left alone in the wild, it would have starved to death. Thus not only is this a case of inadvertent vegetarianism but surely the first possible case of a snake being killed by a plant!

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SOME OBSERVATIONS ON THE HATCHING AND GROWTH OF THE AFRICAN TORTOISE *KINIXYS HOMEANA*

The following observations were made whilst the writer worked in the Department of Zoology of the University of Ife, Ibadan, Nigeria.

On April 13th, 1966 a newly emerged tortoise of the species *K. homeana* was observed in an enclosure from which the adults of a mixed group of *Kinixys* species had been removed some five months earlier. This indicated that the minimum period of incubation is five months and probably longer. A pair of the closely related species *K. erosa* was observed mating in April of the previous year (Blackwell 1966) and young hatched in the enclosure some three weeks later. The improbability of this young being related to this particular mating indicates that the incubation period is probably twelve months.

When the writer entered the enclosure to examine the young animal he was able to observe a second young emerging from the ground, being covered with damp soil and debris on its journey from the egg capsule to the surface. The soil was excavated and the empty egg capsules recovered. These were buried at a depth of between four and five inches and placed some six inches apart. The egg capsules were reconstructed and found to measure 35 mm. in length and appeared almost spherical.

The weights and measurements of the tortoises soon after hatching are given in Table 1, and rate of growth in Fig. 1. It will be seen that a total of four animals hatched; numbers three and four hatching on April 29th and probably May 5th respectively. The latter animal is thought to have been overlooked on hatching and is estimated to have been about four days old on discovery. It will also be seen that number two died after being bitten by the African Multimammate rat, *Rattus natalensis*, at 52 days.

	Date	Weight	Length	Width
No. 1	13.4.66	14.6 grms.	47 mm.	43 mm.
No. 2	13.4.66	13.3 grms.	42 mm.	38 mm.
No. 3	29.4.66	14.3 grms.	46 mm.	40 mm.
No. 4	10.5.66	18 grms.	51 mm.	44.5 mm.

Table 1. Weights (grms.) and measurements (mm.) of newly hatched specimens of *K. homeana*.

The animals were removed from the enclosure, upon discovery, and placed in individual containers which were furnished with damp soil, and each had a watch glass of water pressed into the soil. Another watch glass for food, which consisted of finely minced beef and crushed banana, was also included. The young animals ate the meat readily and always before the banana. It has been indicated that the genus *Kinixys* is not exclusively vegetarian (Blackwell, 1966).

In appearance the young are dark brown in colour with a heavily serrated edge to the carapace, and the general appearance closely resembles that of a dead leaf, suggesting a cryptic coloration.

It is impossible to distinguish between *K. homeana* and *K. erosa* when they are very young, as the precentral scale, present in the carapace of the adult *K. homeana*, is absent and does not develop for some weeks.

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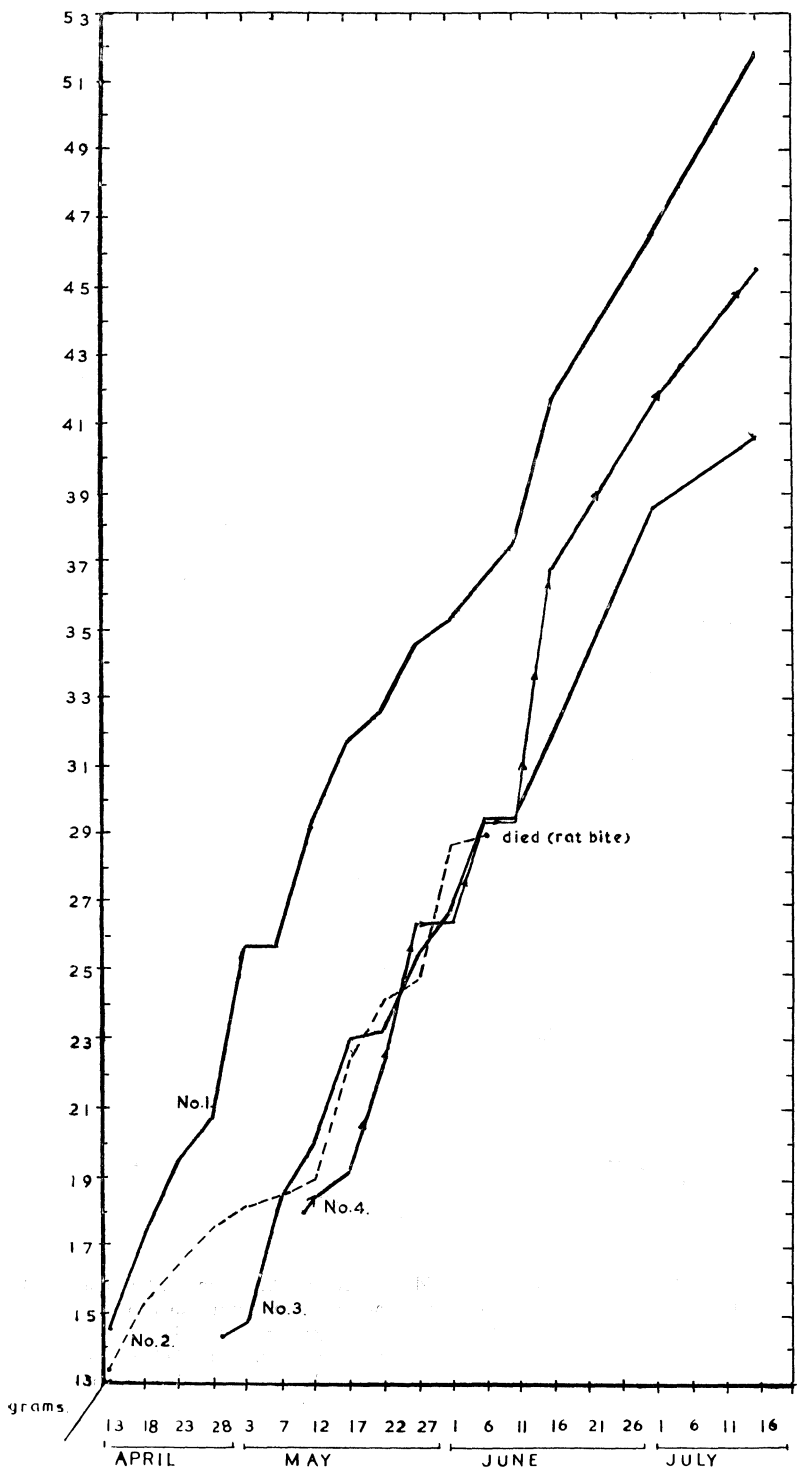

Figure 1 Growth rate of 4 specimens of *K. homeana*.

KINIXYS SPECIES EATING GIANT LAND SNAIL

On 28th March, 1966 a tortoise of the species *Kinixys belliana*, the savanna representative of this genus, was observed feeding upon the body of a half grown snail *Achatina sp.* A great deal of mucous was produced by the snail in its efforts to escape but this did not discourage the tortoise from eating it. The *Achatina* snail normally grows to some six inches in length.

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THE "TAILED" FROG, *ASCAPHUS TRUEI*

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This small frog, a representative of the most primitive of all the batrachian families, lives in the ice-cold streams along the Pacific coast of N. America from N. California to British Columbia. It is not easy to see why it is popularly known as the "American Bell Toad" since it has no vocal sac and never utters a sound. Its real fame lies in quite different directions. Firstly, it has no near relative on the American continent. Its nearest and only relation lives in similarly inaccessible regions in New Zealand; and secondly, anyone seeing the male of the species for the first time, would exclaim: "But this frog has a tail!" Upon which the well-read herpetologist would answer: "No sir, what to you looks like a tail is only a cloacal appendage not deserving the designation of 'tail' because it has no skeletal elements." It is only present in the male and is a kind of copulatory organ. Yet no other Batrachian has anything like this. It may be that the value of this "tail" lies in the fact that *Ascaphus* lives in fast-flowing mountain streams where copulation without a special safeguard would never have the desired result.

The chance of being able to examine one of these froglets which rarely reaches our shores, led to the production of the sketch of Fig. 1. which may also be of help to beginning herpetological anatomists trying to identify structures in sagittal sections through frogs. The section represents as nearly as possible the mid-line plane. Paired organs like the kidneys, the ovaries or the eyes are therefore not visible. Attention may be drawn to the fact that the Urostyle—the pelvic extension of the vertebral column—does not enter the "tail". The arrangement of all the other organs is fairly typical of that in most other frogs or toads.

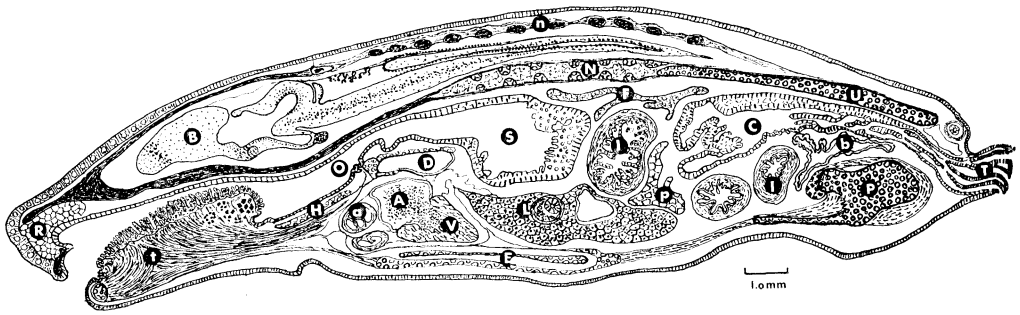

Fig 1. Ascaphus truei, juvenile ♀. Sagittal mid-line section. A, Atrium; a, Aortic trunc; B, Brain with ventricles, infundibulum, pituitary gland, spinal cord and central canal; b, Urinary bladder; C, Colon; D, Larynx & Lung; E, Epicoracoid cartilages; F, Fat body; H, Hyoid cartilage; I, Intestine; L, Liver, infected with Bunoderella metteri, and Gall bladder; N, Notochord; n, Neural arches; O, Oesophagus; P, Pelvis; p, Pancreas; R, Rostral gland; S, Stomach; T, "Tail" with cloacal aperture; t, Tongue; U, Urostyle; V, Ventricle.

CRESTED NEWT, *TRITURUS CRISTATUS LAURENTUS*, DOUBLE-BROODED IN AN INDOOR VIVARIUM

Three adult Crested Newts were collected from a pond near Guisborough, North Riding of Yorkshire on 20th April, 1965; a female and two males in breeding condition. Pairing took place, after the usual preliminaries between one of the males and the female, on 29th April. Subsequent ova were fertile; they were removed for rearing. A further Crested Newt was added to the original three in September, 1965; this had been collected as a sub-adult in Gundale, North Riding of Yorkshire, on 4th July, 1965. This specimen subsequently proved to be another male; it developed secondary sexual characters in February, 1966.

In mid-April of 1966 the female paired with one of the original males and began to lay eggs. At this point the second original male was removed to another tank and not put back, and the water was replaced with freshly-collected soft pondwater with a rich microscopic nekton and plankton. Again the Crested Newt eggs were removed for rearing. On November 28th and 30th, 1966, typical courtship was observed between the pair which mated in April, the spermatophore was received in the usual way and the first eggs were noticed within five days. These were again fertile but I failed to rear the larvae. The male partner died within a fortnight of the second mating, and the younger specimen about a month later. The former has been preserved in the spirit collection at this museum (Accession number 1966 z 153).

The vivarium used consists of a 30 in. × 15 in. tank with island, it is housed in a centrally heated room and has tungsten top lighting with further illumination from a skylight above. Summer air and water temperatures have lower minima than winter, because the central heating is off; water used since April, 1966, is soft or acid, diet is based on earth worms (*Lumbricidae*) and whiteworms (*Enchytrae*). Newts are active throughout the year in these conditions. I have found male Crested Newts in breeding dress in October and November, and once in December, in a few deep ponds in North Yorkshire.

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(*Received* 16/3/67)

LONG-LIVING BOMBINA SPECIMENS

During a day in September 1955, about 6 mid-wife toads (*Alytes obstetricans*), 6 yellow-bellied toads (*Bombina salsa*) and several edible frogs (*Rana esculenta*) were collected from beneath some stones in a pond in central France. On return to England they were introduced into my open vivarium, which consists of a brick enclosure, with a cement moat and small pond. All the amphibians were observed frequently, especially in the evenings, and were fed occasionally with worms. The last of the *Alytes* specimens failed to emerge from hibernation in 1959 and the last of the *Rana* survived until 1961. However *Bombina* continued to thrive and three remaining ones are in excellent condition after the winter. This seems to me to be remarkable, especially taking into account the local climate, which is damp and variable. The only disappointment has been the absence of any signs of breeding.

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(*Received* 20/4/67)

BOOK REVIEWS

AMPHIBIEN UND REPTILIEN. KATALOG DER SUBFAMILIEN UND HÖHEREN TAXA MIT NACHWEIS DES ERSTEN AUFTRETENS. By Prof. Dr. O. Kuhn, (1967). (Amphibians and Reptiles. Catalogue of the Sub-Families and the higher Taxa with references of their first appearance.) *G. Fischer publ. Stuttgart.* D.M.44. £4.11.10.

The sub-title of this little volume may give rise to misinterpretation. The "first appearance" refers to appearance in print, not to evolution.

It is not often that an author finds the time and the enormous patience required to edit a catalogue of this nature and the herpetological fraternity must sincerely congratulate Professor Kuhn for having undertaken this herculean labour and the firm of G. Fischer for publishing it. On 124 pages the book gives us early classifications from 1758-1831, a recent classification by Mertens and Wermuth (Griffiths 1963 is not mentioned) and alphabetical lists of the higher taxa of the fossil and of the recent amphibia and reptilia. As usual with works of this kind, the abundance of invalid names is depressing to behold. The book ends with a page of Rules of Nomenclature by H. Wermuth. The list of relevant literature on p.10 is deplorably short. It includes a book by Terentiev titled comprehensively "Herpetology" although it only deals with Russian species but fails to mention the 1954 reprint of Noble's Biology of the Amphibia which might rightly be called the Herpetologist's bible. Considering its small size the price of the book is prohibitively high and in spite of its undeniable value it will hardly find a place anywhere outside the shelves of the specialists of herpetological taxonomy whose task it will be to develop eventually a system of amphibian and reptilian taxonomy that pleases everybody.

REFERENCE

Griffiths, I. (1963). The Phylogeny of the Salienta. *Biol. Rev.* **38,** No. 2. 241-292. Cambr. Univ. Press.

E. Elkan.

LIVING TURTLES OF THE WORLD. By P. C. H. Pritchard. T.F.H. Publications Inc., T.F.H. Building, 245 Cornelison Avenue, Jersey City, N.J., 07302. Distributed in the British Empire by T.F.H. Publications (London) Ltd., 13 Nutley Lane, Reigate, Surrey. 1967. 288 pp. price $9.95.

A most useful account of chelonians, attractively illustrated with black and white, and colour photographs. Deals with classification, evolution, reproduction and vivarium keeping, as well as giving a systematic description of each family. Much of the information is based on the author's wide personal experience of chelonian habits.

A. d'A.B.

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Contributions should be addressed to the Editor, Dr. Harold Fox, Department of Zoology, University College, Gower Street, London, W.C.1. Articles should be typed in double spacing on *one side* of the paper only. Figures should be drawn in Indian ink on plain white paper, or preferably Bristol Board and suitably lettered for publication.