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(Photo Paola Mariani)

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FIELD GUIDE TO THE AMPHIBIANS AND REPTILES OF ARUSHA NATIONAL PARK (TANZANIA)



EDOARDO RAZZETTI & CHARLES ANDEKIA MSUYA

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Primary forest on the slopes of Ngurdoto crater.

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Front cover: *Hyperolius viridiflavus*

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FOREWORD

The breathtaking scenery of Mount Meru and Kilimanjaro is not the only reason for visiting Arusha National Park. Rather, the extraordinary quality of the park lies in the variety of its landscapes and habitats, ranging from open savannah to montane forests, lakes, marshes and rocky peaks, hosting a highly diverse wildlife community. Therefore visitors, during their walks through the park, besides enjoying the view of an elephant roaming in the forest, have the possibility to discover the enchanting world of the minor species: birds, butterflies, frogs, snakes. The Arusha National Parks herpetofauna seems to be particularly interesting and diverse.

In the last 50 years many species of amphibians throughout the world have declined markedly in numbers, also within apparently pristine habitats, such as national parks and nature reserves. Concern is so high that the Species Survival Commission of the International Union for the Conservation of Nature (IUCN) established the Declining Amphibian Populations Task Force to collect and monitor data on amphibian populations and to assess their geographic distribution, their decline and possible causes. In order to contribute to this international effort, TANAPA decided to gather updated information on the Arusha National Park herpetofauna and to keep monitoring its populations.

This booklet is the result of the joint effort of two naturalists: Charles Msuya from the University of Dar es Salaam and Edoardo Razzetti from the University of Pavia. They have been working within the framework of the Mount Meru Conservation Project (2000-2002), a joint effort of the University of Insubria, Varese branch, Tanzania National Parks (TANAPA) and Istituto Oikos, funded by the European Union and aimed at studying and preserving the Arusha National Park biodiversity. The authors' competence, commitment and enthusiasm, together with their ability to take beautiful photographs, resulted in this fine work, that is expected to gently guide visitors into the fascinating world of amphibians and reptiles, two groups of animals, which have been on earth so much longer than man.

LOTA MELAMARI
(Director General
Tanzania National Parks)

**FIELD GUIDE TO THE AMPHIBIANS
AND REPTILES
OF ARUSHA NATIONAL PARK
(TANZANIA)**

INTRODUCTION

Aim of the booklet

Tanzania is internationally recognised as a key country for the conservation of African biological diversity. Its herpetofauna numbers about 130 amphibians and over 275 reptiles, many of them strictly endemic and included in the "IUCN" Red lists of different countries. This unique resource is still relatively unknown even if amphibians and reptiles are ideal subjects for zoological inventories and biogeographical analysis as they are relatively easy to survey and often strictly related to a particular environment. Moreover, since 1989 the scientific community has started to realise that amphibians are declining in many areas of the world and that they are more sensitive than other species to diverse environmental modifications. This is probably due to the fact that their larval and adult stages occupy different habitats and have limited vagility (Stebbins & Cohen, 1995; Houlihan *et al.*, 2000).

Despite its importance, the Arusha National Park herpetofauna has never been completely studied up to now, even if some scientific papers showed already its peculiarity and importance.

The aim of this booklet is to fill the existing gap in the literature and to provide a stimulus that will strengthen ecological tourism in the park. Visitors will be encouraged to appreciate also this fascinating and a bit mysterious component of the ecosystems.

Arusha National Park

Arusha National Park is situated on the eastern slopes of Mt. Meru in Tanzania. The area lies on the eastern edge of the Great Rift Valley. The geology and soils dominating much of the park and Mt. Meru area are volcanic by origin, resulting from the activity of the mountain. The volcanic nature of Mt. Meru began during the Pleistocene, forming the Meru caldera and several minor craters including Ngurdoto Crater. About six thousand years ago the eastern part of Meru caldera collapsed forming an extensive lahar and the closed alkaline lakes. The only lake which has an outflow water system is the Small Momela, which empties into Big Momela Lake. Continued volcanic activity built an ash cone in Meru Crater, an attractive feature on Mt. Meru. A combination of climatic changes and river flows have influenced the concentration of alkali in the lakes and therefore the biological diversity and distribution of organisms. The highest biological diversity is found in Lake Longil, which has relatively low alkaline levels.

The vegetation of Arusha National Park follows an altitudinal zonation (Hedberg, 1951). The lower altitude (1440-1700 m) vegetation cover varies from shrubland, thicket and bushland to dry evergreen forest, where *Diospyros abyssinica* (Hiern) and *Olea hochstetteri* Baker are common.

The mid altitude (1700-1800 m) vegetation on Mt. Meru is dominated by an evergreen mist fed forest, with *Olea hochstetteri*, *Assearis*, *Croton*, *Ficus* and *Nuxia* sp. On the walls of Ngurdoto Crater *Cassipourea malossana* (Baker) dominates.

The higher altitude (1800-2100 m) forest is dominated by *Juniperus*, *Podocarpus*, *Ilex*, *Xymalos*, *Afrocrania* sp. and several epiphytes. Plant communities around Meru caldera are mainly pioneers.

Most of the lakes are very alkaline and open with *Cyperus leavigatus* dominating at the edge. Lake Longil has a less alkaline environment and littoral vegetation, with *Cyperus*, *Papyrus* and *Typha* sp. dominate. The lake is also covered with *Nymphaea caerulea*, *Ceratophyllum demersum* and *Pistia stratiotes*.

Pitfall traps at Lokie swamp; many species of amphibians can be found in this area including: Xenopus muelleri, Ptychadena mascareniensis, Phrynobatrachus keniensis, Kassina senegalensis, Hyperolius viridiflavus and Hemisus marmoratum.





Lokie swamp after heavy rainfalls, hundreds of Xenopus muelleri can be found in a single pit-fall trap.

Arusha National Park amphibians and reptiles

The Arusha National Park herpetofauna has never been completely studied although some specimens were collected in the Mt. Meru area during the Swedish scientific expedition in East Africa at the beginning of the last century (Andersson, 1911; Lönnberg, 1910, 1911). Later (1956-1957) some chameleons and a few other reptiles were collected by the hunters and snake experts C.J.P. Ionides and Lt. Col. J. Minnery (Loveridge, 1959; Rand, 1958; 1963). Finally, a paper about the most common snakes was posthumously published by the Scientific Officer of Tanzania National Parks, Desmond Foster Vesey-FitzGerald (1975).

The Arusha National Park is particularly interesting for amphibians and reptiles because (1) there are still large areas of montane forest, (2) the mountain systems of Meru, Kilimanjaro and Kenya are quite varied and host many endemic species, (3) there are many different habitats.

Last but not least, Arusha National Park is regularly visited by many tourists interested not only in large mammals, but also in smaller animals such as birds or butterflies. The opportunity to watch some brightly coloured endemic chameleons (such as *Chamaeleo jacksonii merumontanus*) or listen to the

melodic calls of beautiful frogs (like the endemic *Hyperolius viridiflavus ommatostictus* or the mountain frog *Strongylopus fasciatus merumontanus*) could add value to the Park and help people to appreciate a different aspect of this beautiful protected area.

Data collection

This guidebook includes the results of a field campaign carried out in April-May 2001. Some scattered data were also collected by one of the authors during the ichthyological and limnological survey of the park in October-November 2000.

The methods used to collect data on amphibians and reptiles agree with the standard ones proposed by Heyer *et al.* (1994), Blomberg & Shine (1996) and Halliday (1996). Two trained persons were active for at least 6 hours a day (day time and night time) for 17 days (April-May 2001) always assisted by three more biologists.

Photographs were taken of all *taxa* to document their natural coloration and pattern variation. As a further aid to taxonomic identification the acoustic repertoire of some amphibians was recorded with a Marantz professional tape recorder. Voucher specimens were deposited at the University of Dar es Salaam to confirm identification but this was, if possible, limited to specimens occasionally killed by ants or drowned in the traps.

Two main survey techniques were adopted: (1) Drift fences & pitfall traps and the (2) Systematic Sampling Surveys (time-constrained). Both techniques were applied in all the major natural habitats available in Arusha National Park.

Drift fences & pitfall traps. Drift fences intercept amphibians and reptiles moving on the ground and redirect them into pitfall traps. Four drift fences were located in different habitat types. Each fence was made from a 60 cm wide plastic sheeting placed in a 10 cm trench, backfilled with soil and fastened every three meters to a staple. The pitfall traps were made from large plastic buckets (diameter 30 cm, high 40 cm) buried in the ground, with the opening flush with the surface. Fifty meters of fencing with 10 traps were placed near to possible amphibian breeding sites (swamps, ponds, streams) and 75 meters of fencing with 10 traps in suitable reptile habitats. The traps were checked every day in the morning for seven days and then moved to another location.

Pitfall traps are extremely useful to obtain information about ground dwelling amphibians and reptiles, but some species are captured more easily than others: amphibians that are strong jumpers or climbers (like *Ptychadena* or *Hyperolius*) or large reptiles (large snakes) are more difficult to trap.

Systematic Sampling Surveys (time-constrained). This is an opportunistic search for amphibians and reptiles with the goal of finding as many species as possible. Before each search, the exact locality, latitude and longitude,



Lake Longil during the wet season with Kilimanjaro on the background.

date, number of observers, weather conditions, temperature, habitat type, vegetation, slope and starting time were recorded. When a habitat had been adequately sampled in the judgement of the investigator (i.e. when the whole area had been thoroughly investigated or when no new species had been located within a given period of time), the finishing time was recorded and the observers moved to another location. This technique is very useful, making it possible to obtain quantitative values as percentage composition of species and numbers seen per man-hour of searching.

Secretive species were sought in their refuges (e.g., under stones, tree barks or fallen logs, in leaf litter or among the branches of trees). Night searches were carried out with the aid of head-lamps and flashlights. The calls of amphibians at breeding sites were used to detect different species (sometimes they can be heard up to 2 km away) and traced to their source when a “different” call was heard. Specific searching techniques were applied to find some *taxa* (Caecilians, Chameleons). Different kinds of stake nets were used to catch adult amphibians and tadpoles; fishing rods with slip knots were used to noose lizards, agamas and skinks; thick leather gloves and boots, hooks, tongs and “T” shaped sticks helped to catch snakes.

Results

During the herpetological survey of the Arusha National Park 10 species of amphibians and 24 of reptiles were found. Analysis of the data collected shows that the survey allowed us to do a complete (or almost complete) check list of the amphibians, but the accumulation graphs for the reptiles indicate that a few species are still lacking and more research is needed to complete the list. This is due to the limited time of the survey and also because the rainy season is optimal for the amphibian census, but is also the worst period to look for reptiles due to cold weather and high grasses. In particular most of the large snakes were probably hibernating. We were unable to observe any large pythons, for example, during the survey, whereas in October and November many specimens had been found.

LIST OF SPECIES

The species accounts are based on the following references except where noted:

Common names for Reptiles are taken from Broadley & Howell (1991), Loveridge (1957) and Branch (1994); for Amphibians from Passmore & Carruthers (1995), Lambiris (1989b) and, for the species not listed, from Frank & Ramus (1996).

Systematics and Nomenclature are based on Frost, 1985, 2000, Duellman, 1993, Meirte, 1992 and Uetz, 2001 except where noted.

Relevant data about **identification, geographic range, ecology and reproduction** were taken from (**Amphibians**): Andersson, 1911; Bowker & Bowker, 1979; Channing & Griffin, 1993; Duellman & Trueb, 1994; Frost, 2000; Lambiris, 1989a, 1989b; Loveridge, 1925, 1953; Passmore & Carruthers, 1995; Passmore *et al.*, 1995; Poynton, 1964; Poynton & Broadley, 1985a, 1985b, 1987, 1988, 1991; Rödel, 2000; Schiøtz, 1999; Stewart, 1967. (**Amphibians and Reptiles**): Barbour & Loveridge, 1928b; Bauer *et al.*, 1993; Lambert, 1985, 1987; Laurent, 1964; Largen, 1997; Loveridge, 1935; 1957; Rose, 1962. (**Reptiles**): Broadley, 1990; Chippaux, 1999, FitzSimons, 1943; Lönnberg, 1911, Loveridge, 1936, 1959; MacKay & MacKay, 1985; Marais, 1992; Neças, 1999, Pitman, 1974; Schleich *et al.*, 1996; Uetz, 2001; Vesey-Fitzgerald, 1975.

Notes: Due to graphic necessities the order in which the species are presented have been slightly modified but a complete systematic check-list has been added at the end of specie accounts.

The synonymies are limited to those names that can be found in field guides on African amphibians and reptiles published in recent years.

Bufo gutturalis
Power, 1927

Common names

Guttural Toad, Greater Cross-marked Toad

Synonyms

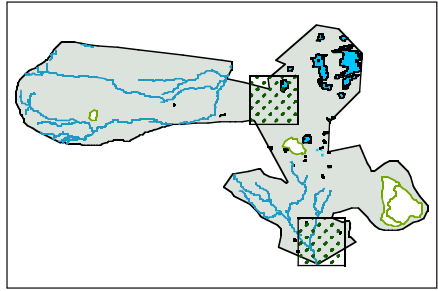
Bufo regularis gutturalis Power, 1927

Identification

Bufo gutturalis, as it is common in the species of the same genus, is stout with short strong limbs and reduced webbing on the feet. The skin is rough and warty, granular below; there are two large prominent paratoid glands just behind the eyes. The top of the snout is typically marked by four dark patches with a light cross between them. The ground colour is usually brown with symmetrically arranged irregular dark blotches and often a light vertebral stripe. Some individuals show a reddish tinge in the back of the legs. This species can grow up to 98 mm of length but the biggest animal we found in Arusha National Park was just 57.8 mm.

Geographic Range

Eastern and southern Africa: from Kenya southward to South Africa including Botswana, northern Namibia and eastern Angola.



Local distribution

The guttural toad is apparently confined to the lowlands and we found it up to the Park Rest House (less than 1700 m). It is quite common in the bushland between Momela Gate and the shore of the Ngare Nanyuki river but can be found also in the bushland Uwanja wa Momela and between Big and Small Momela lakes.

Ecology and general behaviour

This species lives in open country bushlands and grasslands often quite far from wet areas and it is not unusual to find it on roads, in gardens and near to human habitations. The diet is wide, they will eat almost any animal of a suitable size. The call is a deep vibrant croak.

Reproduction

Breeding usually takes place in permanent shallow waters; the eggs are characteristically united in paired strings and are laid among submerged vegetation. During our survey in April and May we heard the call of a few males only one night in the Serengeti Ndogo. We never observed toads in the water and we never caught any *Bufo gutturalis* in the pitfall traps that we put close to the water. All the guttural toads we found in the pitfall traps were caught in open bushlands and over 75% of them were juveniles (less than 50 mm of length).

Xenopus muelleri
(Peters, 1844)

Common names

Northern Platanna, Mueller's Clawed Frog

Synonyms

Dactylethra mülleri Peters, 1844

Taxonomy

While *Xenopus muelleri* has a wide range of distribution in Tanzania and Kenya, there is confusion in geographic distribution with *Xenopus laevis*. The species is monotypic.

Identification

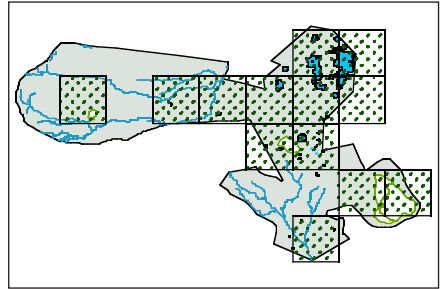
The head is small with upwardly directed eyes, the pupil is circular and there is a short tentacle under each eye; tympanum and tongue are lacking. The body is flattened and there are sensory lateral lines organs on the sides made by many tubercles; the skin is very slippery. Fingers lack webbing while toes are fully webbed and the inner three terminate in a black claw. The back is usually dark brown or grey with irregular dark patches, the belly is usually greyish white. Females can be distinguished by the larger skin folds around the vent and are usually larger than males. In Arusha National Park *Xenopus muelleri* can reach 82.5 mm of body length.

Geographic Range

All southern Africa: from Burkina Faso to Kenya and Uganda, southward to the Republic of South Africa.

Local distribution

Xenopus muelleri is one of the most common and widespread species in Arusha National Park. from the open grassland of Serengeti Ndogo up to the wetlands of Kilimanjaro view point and the big pond near Njeku Camp (2519 m). It can be found both in temporary and permanent waters even in some soda



lakes like Lekandiro and Small Momela. Using a beach seine we caught some platannas even in the muddy waters of El Kekhotoito pond, a place that is organically enriched by a large herd of buffalos and a few hippos. The highest density population is probably located in the Lokie swamp where, using a drift fence, on a few occasions we caught over 100 platannas in a single pitfall trap. Many authors reported the presence of *Xenopus muelleri* in streams and rivers, but we never found any in the watercourses of Arusha National Park.

Ecology and general behaviour

Platannas are usually restricted to aquatic habitats, they move on land during rainy nights. If the weather is wet enough they sometimes wander into the forest or bushland; we observed some of them over half a kilometre from the nearest wet zone. During the day they are usually difficult to spot, but in pools with poor oxygen it is possible to detect their presence by circles in the water when individuals come to the surface to take air. In the night with a lamp it is possible to observe them as they float motionless in the shallow water. *Xenopus* can feed both in the water and land; a wide range of arthropods are preyed on but also small fish and even small tadpoles. The call is a soft buzzing sound uttered under water by both sexes.

Reproduction

The mating begins immediately after the start of the rainy season and amplexus occurs under water. Several thousands of eggs are laid on the aquatic vegetation. The tadpoles are plankton feeders and swim with the head directed downward. The body is almost transparent with a long tail and two sensory tentacles in the mouth region. They somewhat resemble the glass catfish *Kryptopterus bicirrhis*, a common species of aquarium fish.



Ptychadena mascareniensis
(Duméril and Bibron, 1841)

Common names

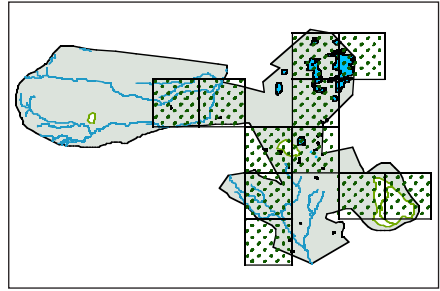
Mascarene Grass Frog

Taxonomy

Despite the fact that species of the genus *Ptychadena* are common and widespread in most of Africa they are often very difficult to identify.

Identification

A “green frog” with six longitudinal ridges on the back, and only the outer ones may be interrupted. This species is medium sized reaching a snout-vent length of 51 mm (average size of adults in Arusha National Park 25.5 - 30 mm). Fingers lack webbing and on the toes webbing is present between the outer metatarsals. The back is usually brown or green with rounded green or brown blotches usually smaller than the size of



the eye. There is a light creamy vertebral band and a longitudinal light coloured line on the upper surface of the tibia. Males have paired gular slits on the sides of the throat.

Geographic Range

Widespread in most of Africa: from Sierra Leone to Egypt through Eritrea and Ethiopia to South Africa; also Madagascar and Seychelles Islands. Introduced into Mascarene Island.

Male of Mascarene Grass Frog from Kilimanjaro View Point; the opening of the vocal sac fold can be spotted under the tympanum.





Female of Mascarene Grass Frog from Kilimanjaro View Point almost ready to lay the eggs.

Local distribution

Widespread and abundant in many areas of the park, the Mascarene grass frog is the most common amphibian around the brackish waters of the Momela lakes (Big and Small Momela, Lekandiro). Walking on the banks among the reeds it is possible to see a hundred frogs leaping away in the water in less than ten minutes. This species also inhabits most of the ephemeral ponds in the grasslands, for example, in Serengeti Ndogo and the small pond between Lekandiro and Tulusia lake. Some specimens were found on the shore of the fast flowing stream Ngare Nanyuki. In Arusha National Park *P. mascareniensis* can be found as high as Kilimanjaro view point and the Arched Fig tree (about 1900 m).

Ecology and general behaviour

Lives in grasslands, wooded grasslands and forest not too far from water. This

species is extremely common in most of the wet areas as long as it can find refuge among the vegetation. According to Inger and Marx (1961) the diet consists mainly of terrestrial prey: beetles, grasshoppers, dragonflies, ants, butterflies and small amphibians although aquatic invertebrates are preyed on as well. The voice of the male can be heard both during the day and the night, a short low pitched nasal “quack” often associated by a series of clucking sounds. The males call from a concealed position in grass or just floating on the surface with open legs.

Reproduction

During the rainy season, small pigmented eggs are laid in a series of small clumps among vegetation in shallow water. We were not able to observe any oviposition site but at the beginning of May we found a few females that looked almost ready to lay.

Rana angolensis
Bocage, 1866

Common names

Common River Frog, Angola River Frog

Synonyms

Rana fuscigula angolensis Bocage,
1866

Identification

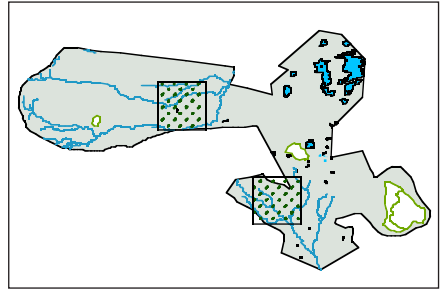
A large "green frog" that can attain in some areas (Malawi) 90 mm of snout-vent length but usually no more than 70 mm. Skin with incomplete longitudinal ridges variable in development (cf. *Ptychadena mascareniensis*), long legs (length of the tibia is 55-72% of the snout-vent length). Toes extensively webbed (cf. *Strongylpus fasciatus*), fingers not webbed. Ground colour on the back usually green or brown with blotches about the size of the eye, a light green or yellow vertebral line usually present.

Geographic Range

Upland areas from Ethiopia to Angola, eastward to Mozambique, including most of South Africa.

Local distribution

The common river frog in Arusha National Park can be found both in



brackish and fresh water, at low altitude (Maksoro river springs, about 1400 m) and medium altitude (Kilimanjaro View Point, arched fig tree wet area) up to the Maio falls (1926 m).

Ecology and general behaviour

The typical habitat of this species are slow flowing streams with permanent water. In Arusha National Park most of the frogs can be found in forested areas though many can also be observed among the aquatic vegetation of the Maksoro river. *Rana angolensis* has two distinct calls, a sharp rattle of about one second followed after a short pause by a short "croak" that resembles the call of the European green frogs *Rana synk. esculenta*.

Reproduction

Breeding may occur throughout the year; several thousands of small pigmented eggs are laid in shallow water with a very slow current. The tadpoles of *Rana angolensis* reach a length of 80 mm at Gosner's stage 40. We observed some of them close to metamorphosis at Kilimanjaro view point at the end of April.

*Adult River Frog from
Kilimanjaro View Point.*



The wet area at Kilimanjaro View Point; in the area it is easy to spot: Xenopus muelleri, Rana angolensis, Strongylopus fasciatus, Ptychadena mascareniensis, Phrynobatrachus kenienensis, Kassina senegalensis and Hyperolius viridiflavus.

Only few amphibians can survive in the soda waters of the Small Momela lake: Xenopus muelleri, Hemisus marmoratum and Ptychadena mascareniensis.



Strongylopus fasciatus merumontanus
(Lönnerberg, 1910)

Common names

Striped Stream Frog, Striped Long-toed Frog

Synonyms

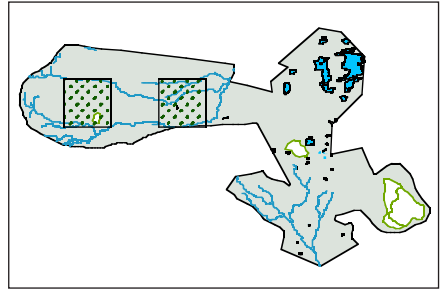
Strongylopus fasciatus (Smith, 1849)

Taxonomy

Three subspecies are actually considered valid (Poynton, 1964): the nominal form, *S.f. fuelleborni* and *S.f. merumontanus*. This latter subspecies was described by Einar Lönnerberg from a single specimen collected on Mt. Meru at 3000 meters during the first Swedish expedition in 1905 (Lönnerberg, 1910).

Identification

Snout-vent length up to 50 mm (46 mm in *S.f. merumontanus*), very similar to a river frog but with extremely long slender legs and toes. Webbing absent from fin-



gers and very reduced on the toes. There is a dark stripe on each leg from the knee to the ankle. The dorsal surface lacks the skin ridges of *Ptychadena*. The ground colour is usually buff or golden yellow with conspicuous dark longitudinal stripes. Some specimens of the Mt. Meru lack the dorsal stripes and have a brown-red back.

Geographic Range

Strongylopus fasciatus forms isolated

Strongylopus fasciatus from Kilimanjaro View Point, individual with striped pattern.





Strongylopus fasciatus from the same locality, individual with plain reddish back.

populations in the mountains from northern Tanzania to South Africa, westward up to Zambia and eastern Zimbabwe. This scattered distribution is a clear relict of the cooler periods during the Pleistocene when these populations were linked together. *Strongylopus fasciatus merumontanus* is endemic in the uplands of northern Tanzania including Mt. Meru, Uluguru and Usumbara Mts. *S.f. fuelleborni* occurs in southern Tanzania, eastern Zambia and Malawi. *S.f. fasciatus* is widespread in South Africa and Zimbabwe.

Local distribution

Limited to the upper meadows and open forested areas of Mt. Meru from Kilimanjaro view point upwards, and the wet areas near the arched Fig tree (about 1900 m) up to Njoku camp in the caldera (over 2500 m) and Kitoto forest. The species probably occurs also in higher zones since the type specimen of *S.f. merumontanus* has been collected at 3000 meters.

Ecology and general behaviour

Stream frogs are generally found near open grasslands within the forest, but during the wet season they move into the forest quite far from wet areas. We observed several young individuals *Strongylopus* along the road from Kilimanjaro view point to Kitoto forest view point. Taking photographs of this species is quite difficult as they are fast moving and can jump long distances. The call of *Strongylopus fasciatus* is a clear high-pitched "pip" uttered singly or in a short burst of three or four; it is quite difficult to distinguish from the call of *Hyperolius viridiflavus*.

Reproduction

The eggs are laid singly among vegetation in shallow waters. During April and May on Meru we found many juveniles of about 20 - 25 mm body length. The reproduction peak probably occurs during the small rains of October to December.

Phrynobatrachus keniensis
Barbour and Loveridge, 1928

Common names

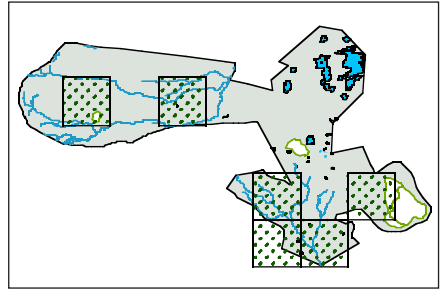
Puddle Frog, Cricket Frog

Taxonomy

This species has been described by Thomas Barbour and Arthur Loveridge in 1928(a) from a specimen collected in "a marsh on the northeast slope of Mt. Kenya, Kenya Colony". The systematics of puddle frogs is still quite confused especially in some African regions: "As long as we lack a thorough revision of this genus, these frogs cannot be determined for certain" (Rödel, 2000).

Identification

In Arusha National Park *Phrynobatrachus keniensis* is, along with *Hyperolius nasutus*, the smallest amphibian species; it may attain a body length that ranges



from 14.6 to 26 mm (29 individuals examined). The body is rather stocky with short limbs, the head is small and pointed. The pupil is horizontal and the tympanum quite small. The most important diagnostic feature of this genus is a tubercle in the middle of the tarsus. Colour and markings are very variable within the Arusha National Park with at least three different patterns. Ground

Adult Puddle Frog from Mbuga Za Raiden pond.





Phrynobatrachus keniensis from Kilimanjaro View Point.

colour is usually brown, grey or beige with a golden tinge. The back can be uniform, faintly mottled or marked with dark blotches; some individuals have a yellow vertebral line extending from snout to vent. Most of the frogs observed had a dark lateral band on both sides of the head and on the flanks.

Geographic Range

Phrynobatrachus keniensis is endemic of the upland meadows of Kenya (Kikuyu, Molo, Mt. Kinangop, Mt. Kenya) and Mt. Meru.

Local distribution

Common and widespread in all the wet areas of the Park especially in grasslands but also in some forested areas (Kitoto) from Serengeti Ndogo (1400 m) up to Njeku Camp (over 2500 m). This species can be observed especially in

the small temporary ponds of Serengeti Ndogo and near Lokie swamp. We never found any *Phrynobatrachus* near soda lakes and brackish streams.

Ecology and general behaviour

Puddle frogs usually live on the banks of swamp, pools and streams and they are ready to seek refuge in the water when disturbed. They usually move away from the wet areas only after rainfall, but in the meadows inside the caldera of Meru the average humidity is so high that it is common to find many individuals wandering around. The voice of the males is a quick series of ticks that resembles the sound of a coin falling on the ground.

Reproduction

Breeding occurs in shallow standing waters. The small eggs float in a single surface layer.

Hemismus marmoratum
(Peters, 1854)

Common names

Mottled Shovel-nosed Frog

Synonyms

Engystoma marmoratum Peters, 1854
Kakophrynus sudanensis Steindachner, 1863

Taxonomy

The systematic position of *Hemismus marmoratum* has been tentatively revised by Laurent (1972) that recognised a few subspecies: *H.m. marmoratum*, *H.m. ingeri*, *H.m. loveridgei* and *H.m. sudanese*.

Identification

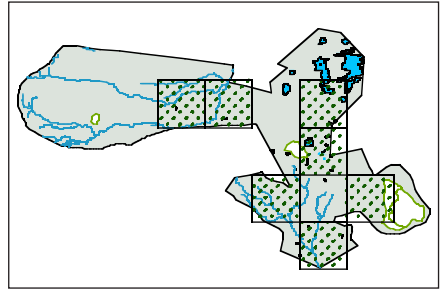
A small amphibian with short, fat body; the limbs are powerful and short, the head is small with transverse fold and has a pointed snout hardened for digging. The eyes are small with a vertical pupil. In Arusha National Park females reach a snout vent length of 35.5 mm and males 29.5 mm (30 individuals measured). The dorsal colour is usually brown with a pattern of darker reticulation and yellow patches. The throat of males is usually grey.

Geographic Range

Sub-Saharan Africa excluding rainforest from southern Somalia to northern South Africa.

Local distribution

The Mottled shovel-nosed frog is quite common in most grasslands and open wooded areas from 1400 to 1670 m (we found it up to the big fig tree near Leopard Hill View Point on Ngurdoto crater). Usually lives near watercourses (Maksoro, Ngare Nanyuki rivers) and most of the ponds, swamps and even brackish water lakes (like Big and Small Momela lakes).



Ecology and general behaviour

This species is rarely seen as it spends most of its time underground and can be found above the surface only during the night or in wet weather. Unlike most of the other burrowing amphibians *Hemismus* burrows headfirst using the forelimbs and pointed snout to penetrate the soil. The prehensile tongue of *Hemismus marmoratum* has a peculiar structure that allows it to be protracted slowly (increasing capture success) and also to be elongated hydrostatically to double its length during feeding (Nishikawa *et al.*, 1999). The diet consists mainly of ants and termites. Males call from the mouth of a small burrow near water, the voice is a repetitive high-pitched buzz that can be confused with the sound produced by crickets.

Reproduction

Eggs are laid in an underground chamber near water and the female remains with the brood (Van Dijk, 1997). The tadpoles develop inside the chamber and they react very quickly to the first rains going into temporary ponds before any other species of amphibians. In Arusha National Park during April and May we found some tadpoles that were on the edge of metamorphosis and we could hear very few males calling, so the breeding season probably occurs during the small rains period.



Hemisus marmoratum from Momela gate.

Shovel-nosed Frogs call from concealed positions on the banks of Lokie swamp.



Kassina senegalensis
(Duméril and Bibron, 1841)

Common names

Bubbling Kassina, Senegal Running Frog

Synonyms

Cystignathus senegalensis Duméril and Bibron, 1841

Taxonomy

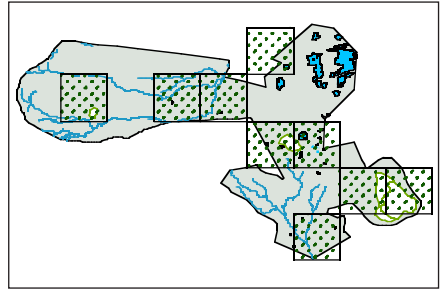
Possibly composed of various cryptic species or at least a number subspecies; Schiøtz (1975) discussed the differences in eastern African material and observed four different “forms” based mainly on dorsal pattern, but rejected the recognition of subspecies. Poynton & Broadley (1987) concluded that: “...the material appears to provide no clear grounds for the separation of *taxa* within the *senegalensis* complex”. Examination of *K. senegalensis* in the Arusha National Park shows both specimens with Schiøtz’s “Form 1” (*pattern senegalensis*) and “Form 3” (*pattern argyreivittis*).

Identification

Bubbling kassinans are medium sized frogs reaching a length of 44 mm in Arusha National Park (34 individuals examined) with short hind legs. Fingers lack webbing and do not bear terminal discs. The pupil is vertical. The back is usually bright yellow, khaki or dark brown (darker individuals are more common at Njeku camp) with a disruptive pattern of longitudinal dark bands that can be continuous or broken into streaks and oblong spots. Males have a gular disc and a large dark subgular sac divided into paired lateral pouches.

Geographic Range

African savannas south of the Sahara, from Senegal and southern Mali to Eritrea, Ethiopia and Somalia, southward to Namibia and South Africa (excluding the western Cape province).



Local distribution

In the Arusha National Park bubbling kassinans avoid the brackish waters of soda lakes but are quite common both in grasslands and forested areas from the lowland temporary ponds in Serengeti Ndogo (1414 m) up to the Njeku camp pond (2519 m). Kassinans are good walkers and sometimes single individuals can be found quite far from wet areas. We found a few specimen on the Ngurdoto crater rim and a subadult in stony bushland about one kilometre from the nearest pond. Lokie swamp, the wet areas near Kilimanjaro View Point and the rest house ponds are the best places to observe this species in the Park.

Ecology and general behaviour

Even though *Kassina senegalensis* belongs to the Hyperoliidae family (the same as the reed frogs) it is a slow moving ground dwelling species that prefers to walk rather than jump. During the dry season the species seeks refuge under logs and stones. The voice is an unmistakable “quoip!” that resembles the popping sound of bubbles coming to the surface. Males usually call from submerged vegetation in shallow water during late afternoon and night. Large choruses can be heard over great distances; during the wet season for example the large aggregations of Kassinans calling from swamps and ponds inside Ngurdoto crater can be distinctively heard from the rim.



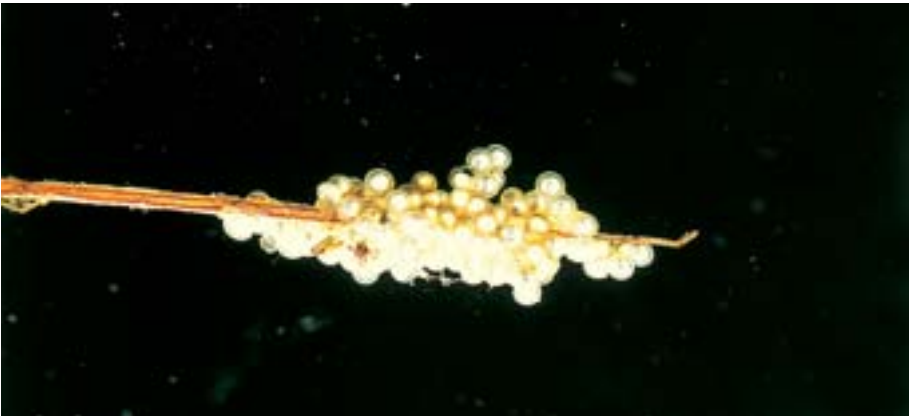
Bubbling Kassina from Kilimanjaro View Point.

Reproduction

In Arusha National Park we observed small clumps of eggs on submerged grass during April and May. The tadpoles

are often brightly coloured and grow quite big (usually about 50 mm); they have broad fins and a pointed tail.

Cluster of eggs laid by a single kassina at Lokie swamp.



Hyperolius viridiflavus ommatostictus
Laurent, 1951

Common names

Painted Reed Frog

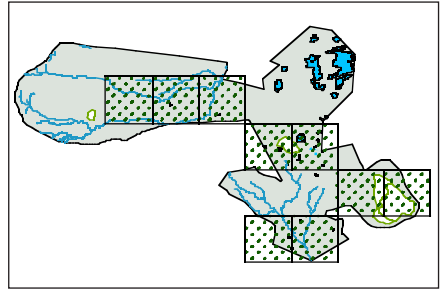
Taxonomy

The taxonomy of the *Hyperolius viridiflavus* group is extremely complex with 28 subspecies recognized by Schiøtz, (1999). Wieczorek *et al.* (2001) split *H. viridiflavus* into 10 species and according to this paper the subspecies of Arusha National Park should be included, along with seven more taxa in *Hyperolius glandicolor* (Peters, 1878). Most of the books published before Schiøtz (1999) considered the *ommatostictus* subspecies as members of the large group of *Hyperolius marmoratus*. Christina M. Richards (1981) discussed the pattern variation of different subspecies of *Hyperolius viridiflavus* including *H.v. ommatostictus*.

Identification

A medium sized treefrog with a snout-vent length up to 30 mm, the shape resembles somewhat the European treefrog *Hyla arborea* or the American barking treefrog *Hyla gratiosa*. Fingers and toes bear terminal adhesive discs and are webbed. The snout is truncate.

Spotted individual from the rest house pond.



As in all the species of the genus *Hyperolius*, the pupil is horizontal and the tympanum concealed. The colour pattern of *H.v. ommatostictus* is extremely variable usually the dorsum is dark brown with small white rings or white spots that can be completely absent in some individuals. During the day frogs seen resting on the vegetation can be almost white. A few adult males and most juveniles are beige or brown with undulating dorsolateral stripes. The limbs are often red especially on the underside. Males present a large vocal sac on the throat protected by a gular disc.

Geographic Range

The distribution range of *Hyperolius viridiflavus* complex includes most of the tropical Africa, while the subspecies of Arusha National Park *Hyperolius viridiflavus ommatostictus* is an endemic of the Kilimanjaro and Meru areas.

Local distribution

The painted reed frog is widespread near the freshwater ponds of Arusha National Park; it is quite easy to see because it reaches high population densities. In Arusha National Park it can be found in all wet areas from 1400 to 2400 m (the highest point we found the species is the Giraffe pond between the Kitoto view point and Miriakamba huts). It is not present near the Momela lakes as it usually avoids brackish waters.

Ecology and general behaviour

This species can be found near swamps, ponds, or slow flowing streams in different habitats both in savannas (like Serengeti Ndogo) or in small open areas in the forest (Kilimanjaro view point). The males call from reeds and sedges at the edge of ponds but also from bush and trees that they are able to climb up easily. The males spend a lot of energy during reproduction (Grafe, 1996) and despite small body size are able produce very loud calls: a short “weep!”, resembling that of *Strongylopus*. Loud choruses can be heard during the night throughout the year, but single frogs call often during the day especially in the dry season.



Calling male from rest house pond.

Reproduction

This species lays small clusters of eggs (up to 12 per season according to Grafe) on submerged water plants.

Tadpoles have a long tail with a pointed tip. Grafe and Linsenmair (1989) report

that some females of *H.v. ommatostictus* are able to change into males. This is the only known case of sex change occurring among amphibians.

Brown individual from Mbuga Za Raiden pond.



Hyperolius nasutus
Günther, 1864

Common names
Long Reed Frog

Taxonomy

The systematics of the *Hyperolis nasutus* group is still not clear and many subspecies of uncertain systematic value have been described. Poynton and Broadley (1987) proposed the name *Hyperolius benguellensis* for the southern Mozambique and Natal populations. Channing (in press) states that the South African populations should be separated in a different species: *Hyperolius poweri*.

Identification

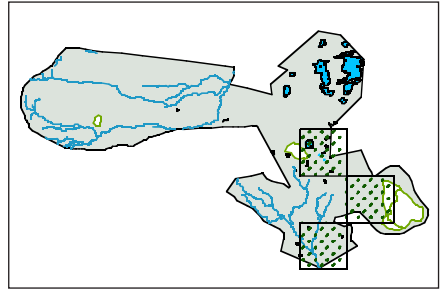
A very small sharp-nosed reed frog with green translucent elongated body and white belly; the dorsum could be completely uniform or finely stippled with dark spots occasionally forming a mid-dorsal stripe. A bright white dorsolateral often black bordered band is frequently present in males and sometimes also in females. The size of breeding males is usually 19-22 mm, the maximum snout-vent length is 24 mm. Males have a yellow or white gular disc.

Geographic Range

This species is common in most of the savanna areas south of the Sahara both in west Africa (from Ivory Coast to Cameroon) and in east Africa (from Ethiopia to South Africa).

Local distribution

In Arusha National Park *Hyperolius nasutus* is localized at lower altitudes (1400-1600 m) and not common; it can be found around the ponds and swamps in the open areas of the south eastern part of the Park like the pond Mbuga Za Raiden, the edges of the Lokie swamp (near lake Longil) and in a few shallow pans inside Ngurdoto crater.



Ecology and general behaviour

The long reed frog lives in grasslands and open wooded grasslands. Usually it can be found, in the wet season only, well concealed on grass stems in the dense vegetation bordering ponds and wetlands. During the afternoon and the evening the males call from sedges and reeds above the water, a harsh high pitched chirp about 0.3 seconds long.

Reproduction

The small egg masses of about 20 eggs are laid on submerged vegetation just below the surface, usually the clutch size ranges from 60 to 292. Tadpoles hatch in five days, are light brown with dark spots and resemble those of *Phrynobatrachus*. Larger tadpoles usually have a dark-tipped tail.



Geochelone pardalis babcocki
(Loveridge, 1935)

Common names

Tropical Leopard Tortoise

Synonyms

Testudo pardalis babcocki Loveridge, 1935

Taxonomy

The species is probably monotypic.

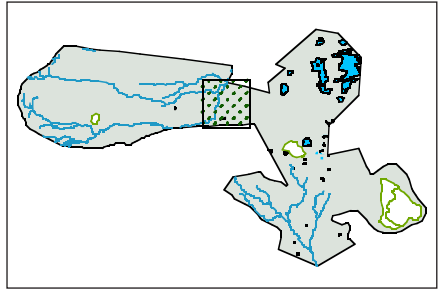
Identification

A large tortoise that can grow up to 35-40 cm and exceptionally 70 cm of total length. Neck hidden when the head is withdrawn into the shell. Carapace without hinge, convex and humped (not flattened). Shell colour yellow or light brown, speckled with black. Leopard tortoises from the Arusha area are usually sparsely coloured while the ones from Serengeti are buff with radiating spots; this could be related to the drier habitat in the Arusha area (Kabigumila, 2000).

Geographic Range

Geochelone pardalis is distributed throughout the savannas of Africa

Individual from Tarangire National Park.



from southern Sudan, Kenya, Uganda, Tanzania, Rwanda, Burundi to Swaziland, including Zaire and Angola.

Local distribution

During our survey this species was never observed inside the Park but large tortoises have been found in different areas by park rangers and by some biologists of Oikos Institute (usually between Momela gate and Serengeti Ndogo). The leopard tortoise is probably the most endangered reptile in Arusha National Park since it is a conspicuous, slow moving, long living species very vulnerable to collecting. Two specimens have been collected in Arusha N. P. by Yngve Sjöstedt in 1905 (Lönnberg, 1910).

Ecology and Reproduction

The growth rate is higher in immature animals (6.9 mm per month) than in adults (2.9 mm per month) in northern Tanzania (Kabigumila, 2000). Sexual maturity is usually reached at 15 years. The females are usually much bigger than the males (usually 1.7 times) but are also less numerous; this could be because annual mortality is higher in females (Hailey & Coulson 1999). During the breeding season males engage in combat. Females lay clutches of 6-15 eggs in a small hole in the ground. Food consists of a variety of plants and grasses.

Protection

Included in CITES appendix II.

Hemidactylus mabouia
(Moreau de Jonnés, 1818)

Common names

Tropical House Gecko

Taxonomy

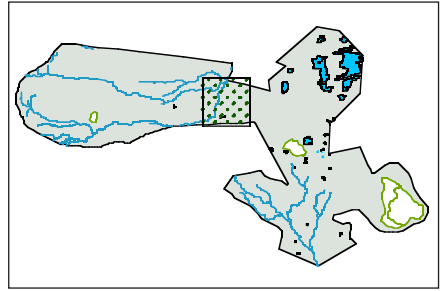
Loveridge, 1947

Identification

A medium sized gecko with a flattened head which is longer than it is broad and a little broader than the neck. Toes dilated with paired adhesive lamellae below with a free distal digital joint rising from the end of digital expansion (cf. *Pachydactylus*). Thumb clawed; enlarged tubercles on tail and body (12-18 rows). Distance from anterior border of the eye to the tip of the snout longer than the distance from posterior border of the ear opening to posterior border of the eye, 7-10 transverse dorsal scale rows in a caudal vertical. 22-40 pre-anofemoral pores in males. Pupil vertical. Colour very variable as in most of the geckos, usually brown or grey (sometimes almost white) with scattered dark spot, often four to five dark transverse bands on the body and 10-12 bars on the tail.

Geographic Range

This is a widely distributed reptile: most of sub-Saharan Africa from Senegal



to Ethiopia down to South Africa. Elsewhere also on Madagascar, Seychelles, Antilles, Comoro and other islands, Mexico, Panama, Trinidad, Puerto Rico, Colombia, Bolivia, Brazil, Guyana, French Guyana, Suriname and Argentina. The species has been introduced into Florida and Honduras and is still expanding its distribution (Meshaka, 2000).

Local distribution

This species has been found exclusively on the wall of the rest house where we lived and on the building nearby but few attempts has been made to check its presence on other buildings inside the Park. Medium search time 0.084 geckos per hour.

Ecology and Reproduction

This species is usually found on the walls and roofs of buildings but can be found also on cracked rocks, in the hollows of trees, on baobabs and the crown of palms. As with most geckos, this species is able to emit sounds while communicating with conspecifics: a soft "tik-tik-tik" repeated 7 or 8 times. The breeding period has its peak from September to January (Moodley & Biseswar, 1997); sometimes the females lay their eggs in a communal depository of 50-60 eggs. Loveridge reports *H. mabouia* seizing a small white-headed dwarf gecko (*Lygodactylus picturatus*).

Pachydactylus turneri
(Gray, 1864)

Common names

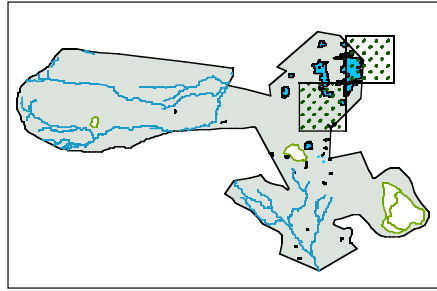
Bibron's Thick-toed Gecko

Taxonomy

The origin and nomenclatural position of geckos of the *Pachydactylus* group (especially the endemic forms) is actually under study (Bauer *et al.*, 1997, Bauer, 1999). Gerald Benyr (1995) separated *P. laevigatus* from *P. bibronii* and placed *turneri* and *pultzeriae* as subspecies of it. However, the name *turneri* Gray 1864 has priority over *laevigatus* Fischer 1888, so *Pachydactylus turneri* is the correct name for the species.

Identification

A stocky gecko with large keeled tubercles on the neck, back and limbs. Toes dilated throughout with a single row of adhesive lamellae, distal joint not compressed (cf. *Hemidactylus*) and thumb clawless or with tiny claws. Pupil vertical; lower eyelids vestigial or absent. The back has minute granules and large tubercles. Rostral not bordering nostril, preanal pores in males absent. The back is usually grey or brown with 4-5 curved dark bands on the back and 8-10 on the tail.



Geographic Range

From South Africa to Rwanda, Botswana and Tanzania including Angola, Mozambique and Swaziland.

Local distribution

Usually found in rocky areas especially on lake shores (Big Momela and Tulusia) but also under stones in the grasslands near Kusare post. Number of animals per hour of search: 0.320.

Ecology and Reproduction

This species is gregarious and many individuals can be found under the same stone. *P. bibronii* usually feeds in the evening and early morning, eating mainly ants, termites, grasshoppers, beetles and flies. The female usually lays two eggs (16 x 14 mm) hidden in a rock crack.



**Keys for the identification of the chameleons
of Arusha National Park
(Simplified from Broadley & Howell, 1991)**

- 1a. A single series of enlarged granules forms a gular crest on the median line of the throat, often extending along the belly as a ventral crest; a white line from chin to vent 2
- 1b. Gular crest absent 3
- 2a. Body scalation homogeneous 4
- 2b. Body scalation heterogeneous, scattered large tubercles present *Chamaeleo rudis*
- 3a. Body scales homogeneous, or at most a few slightly enlarged tubercular scales *Bradypodion tavetanum*
- 3b. Body scales heterogeneous, granular scales interspersed with large tubercles *Chamaeleo jacksonii*
- 4a. Occipital lobes merely indicated, not moveable *Chamaeleo gracilis*
- 4b. Occipital lobes small to large, mobile, in contact on the median line or narrowly separated *Chamaeleo dilepis*

Bradypodion tavetanum from Seneto Post.



Bradypodion tavetanum
(Steindachner, 1891)

Common names

Kilimanjaro Two-horned Chameleon

Synonyms

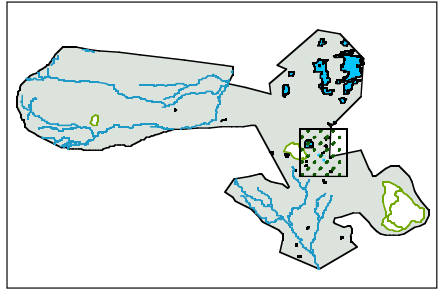
Chamaeleo tavetanus Steindachner, 1891

Taxonomy

The genus *Bradypodion* is endemic to South Africa and the East African species should be returned to *Chamaeleo* for the moment. Several people are trying to sort out the problematic chameleon phylogeny (Broadley, *pers. comm.*).

Identification

Casque raised on the median line of the head, males (and some females) have paired rigid scaled horns extending forward from preorbital region. Canthal crest which is not shovel shaped on the snout. Body scalation heterogeneous, small granules with scattered large tubercles, gular crest absent.



Geographic Range

Kenya (Teita Hills), Tanzania (Arusha area, Kilimanjaro, south to North Pare Mountains).

Local distribution

Observed during our survey on the trees around Seneto Post. Loveridge (1959) reports about a series of specimen collected on the Meru for C.J.P. Ionides by Col. J. Minnery.

Protection

Included in CITES appendix II.

Individual from Seneto Post.



Chamaeleo dilepis
Leach, 1819

Common names

Common Flap-necked Chameleon

Synonyms

Chamaeleo petersii var. *kirkii* Gray, 1865

Taxonomy

The subspecific status of *Chamaeleo dilepis* is controversial with five doubtful subspecies that urgently need a revision: *dilepis*, *idjwiensis*, *isabellinus*, *martensi* and *petersii*.

Identification

A large species (20-24 cm) with occipital lobes small to large, mobile, in contact on the median line or narrowly separated, body scalation homogeneous. A single series of enlarged granules forms a

gular crest on the median line of the throat and on the belly.

Geographic Range

Most of the savannas of tropical Africa.

Local distribution

This species has never been observed in the park but it is listed here as it is common in different areas in north Tanzania and could be present as well.

Ecology and Reproduction

Found in savannah and bushland, usually feeds on grasshoppers and beetles. Breeding time is usually in the early rains. Egg development takes 3-4 months and finally in the dry season the female lays 25-50 small eggs that will hatch in approximately 150 days.

Protection

Included in CITES appendix II.

Individual from Micumi (Tanzania).



Chamaeleo gracilis
Hallowell, 1842

Common names
Gracile Chameleon

Synonyms
Chamaeleo granulatus Hallowell, 1856
Chamaeleo burchelli Hallowell, 1856
Chamaeleo simoni Boettger, 1885

Taxonomy
This species is monotypic since *Chamaeleo gracilis etiennei* has been elevated to species rank.

Identification
A large chameleon (up to 40 cm) that greatly resembles *Chamaeleo dilepis* but can be distinguished by the occipital lobes that are merely indicated and not moveable. Body scalation is homoge-

neous, a single series of enlarged granules forms a gular crest on the median line of the throat.

Geographic Range
Found in most of equatorial Africa.

Local distribution
Reported for Mt. Meru by Loveridge (1957).

Ecology and Reproduction
This widespread species can be found in different habitats including wet and dry forest, forest borders and bushlands but humid areas are usually avoided. After mating, the female digs a small hole in the ground and lays 20-30 eggs that will hatch after 240-300 days.

Protection
Included in CITES appendix II.



Chamaeleo rudis
Boulenger, 1906

Common names

Ruwenzori Side-striped Chameleon

Synonyms

Chamaeleo rudis sternfeldi Rand, 1963

Taxonomy

Klaver and Böhme (1997) list only one subspecies *Chamaeleo rudis sternfeldi*, but they mention also that this taxa could be considered a full species.

Identification

A small chameleon with snout-vent length 62-85 mm. Body stocky, head short and broad. No cranial horns, no sail-like dorsal crest, nostril laterally directed, body squat with scalation heterogeneous: large scattered tubercles on the flanks.

Geographic Range

Mountain areas in south western Uganda, eastern Zaire, Rwanda and Burundi. The relict populations on Mt. Kilimanjaro and Meru belong to the *Chamaeleo rudis sternfeldi* subspecies.

Local distribution

Recorded on Mt. Meru at "Laikinae" (7500 ft. alt.) by C.J.P. Ionides on August 1957 and by B. Cooper on the eastern slope at 9000 ft. (Rand, 1963).

Ecology and Reproduction

A mountain species usually found over 2500 m.

Protection

Included in CITES appendix II.





Chameleons can be observed mainly on the trees at the edge of the forest.

Chamaeleo jacksonii merumontanus
Rand, 1958

Common names

Meru Three-horned Chameleon

Synonyms

Chamaeleo jacksonii merumontana
Rand, 1958

Taxonomy

Chamaeleo jacksonii has three subspecies: *C.j. merumontanus* small sized and limited to Mount Meru, *C.j. xantholophus* the largest subspecies (up to 35 cm) from the eastern slopes of Mount Kenya and the nominal species *C.j. jacksonii* (medium sized: up to 25 cm) in the rest of the geographic range. Klaver & Böhme (1986) placed *C. jacksoni* in

the subgenus *Trioceros*. Finally it must be stressed that the genus *Chamaeleo* is masculine, thus the correct spelling of Rand's subspecies is *merumontanus*.

Identification

A small chameleon (up to 16 cm snout vent length), with a low casque and a dorsal crest formed by 17-20 large conical twin scales. The males have three forward oriented horns, the central one starts from above the mouth, the other two from the orbital crest; the females usually lack horns and if they are present they are smaller than in the males. According to Howell & Broadley these characteristics allow the identification of the species: no gular crest, body, tail and limbs without soft spines, no occipital flaps, body scales heterogeneous, granular scales and scattered large tubercles.

Adult male from unknown area on Mount Meru.





Adult individual from Nairobi.

Geographic Range

High mountain areas of Kenya, Uganda and Northern Tanzania. The *merumontanus* subspecies is strictly endemic to Mount Meru. There are naturalized populations on Hawaii islands.

Local distribution

The type locality indicated by Rand (1958) of *merumontanus* is the farm Laikinoi on Mt. Meru, 7500 ft. alt. (misspelled Laikinae in Rand, 1963) but nobody in Arusha National Park has any knowledge of this location. C.J.P. Ionides in a letter dated 5th December 1957 wrote about the specimen collected by Lt. Col. J. Minnery "they are found on bushes and in low small trees. Laikinoi is a farm on the very edge of the rain forest". As far as we know, there have never been any buildings at 7500 ft. alt. except Miriakamba Huts on the

eastern slopes, and other specimens of *C. jacksoni* have been collected on the eastern slope at 9000 ft. alt. It seems likely therefore that Miriakamba is a new name for the old Laikonoi. No Meru Three-horned Chameleon was found during the limited time of our research (little time was spent searching at altitudes above 2500 m).

Ecology and Reproduction

C. jacksoni is a mountain species that is particularly common up to 2800 m. It can be found in humid mountain forests but also in coffee plantations, gardens and in the bushes around paths. Ovoviviparous gestation lasts for 6-7 months and finally the female gives birth to 7-51 young.

Protection

Included in CITES appendix II.

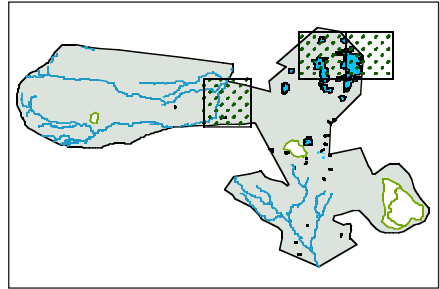
Agama agama
(Linnæus, 1758)

Common names
Rock Agama

Synonyms
Lacerta agama Linnæus, 1758

Taxonomy

The genus *Agama* includes about 60 species of the 317 species of Agamids of the world; the biogeographical affinities, dispersal models and biochemical phylogenetics have been studied by Moody (1980 *vide* Jacobsen, 1997) and Joger (1991). *Agama agama* includes nine subspecies, four of which are present in Tanzania: *A.a. usambare*, *A.a. elgonis*, *A.a. dodomae*, *A.a. ufipae*. The subspecies of Arusha National Park is probably the Elgon rock agama (*Agama agama elgonis* Loveridge, 1923) that is



distributed from Mt. Elgon (Kenya) south to Usandawi in central Tanzania.

Identification

Top of the head covered with small irregularly arranged scales and with the interparietal larger than the adjacent scales. Eyelids completely moveable (the eyes can be closed). Dorsal scales uniform, keeled and imbricate except for a small

Adult male from Momela gate with regenerated tail.





Female or young individual from Ngare Nanyuki river.

vertebral crest limited to the neck. *Agama agama elgonis* can be distinguished from the other subspecies by the colour of the throat of the males: brick red with a black transverse mark at the base.

Geographic Range

From Senegal to Ethiopia and southward to Angola, Democratic Republic of the Congo and Tanzania.

Local distribution

In the Park *Agama agama* is usually found in open areas: at the sides of roads, on concrete buildings (like the weather station on Ngurdoto crater) or near to the water (Ngare Nanyuki river, Lekandiro and Tulusia lakes). The individuals on Momela gate live together with *Mabuya striata* and are quite tame; by slowly moving towards them, it is pos-

sible to get very close. Medium search time 0.708 agamas per hour.

Ecology and Reproduction

This species is usually much more common in habitats that have been modified by man: piles of brush, bridges, buildings, but also on solitary trees. The agamas like the sunlight and they can be found in exposed situations during the hottest hours of the day. Males show a brighter colouration especially on the head and the neck while females are much duller. The breeding season is not confined to a single period. Growth is fast especially during the first year, juveniles can double their length in 12 month. Sexual maturity is usually reached during the second year when the snout-vent length is about 80 mm (Daniel, 1961). Diet consists mainly of ants, termites, beetles and grasshoppers.

Mabuya striata
(Peters, 1844)

Common names

Common Striped Skink, Eastern Striped Skink

Synonyms

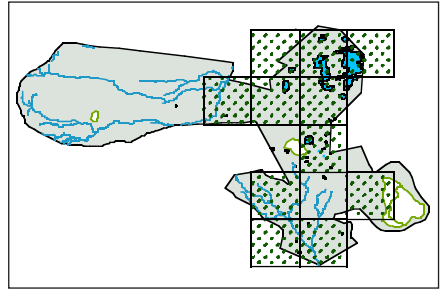
Tropidolepisma striatum Peters, 1844
Euprepes punctatissimus Peters, 1854

Taxonomy

Donald G. Broadley (2000) has recently reviewed the taxonomy of the genus *Mabuya* in south-eastern Africa. He has given specific status to all the previously recognised subspecies: *Mabuya striata punctatissima*, *M.s. wahlbergii*, *M.s. sparsa* and has revived *Mabuya mlanjensis* from synonymy. According to this paper the species should be considered monotypical and the geographic range restricted.

Identification

A medium sized skink with body length up to 107 mm (males) and 113 mm (females). Eyelids movable, the lower one has a large transparent disc. Dorsal scales with 3-7 keels, midbody scales row 32-43; limbs well developed (cf. *Panaspis* and *Lygosoma*). No white lateral stripe (cf. *Mabuya varia*). The back is usually red-brown with yellow dorso-lateral stripes; the belly is white.



Geographic Range

Most of eastern Africa, from Ethiopia to Congo, south to central and north eastern South Africa. The species is also present on the Comoro Islands.

Local distribution

The common skink is a savanna species even if its anthropophilous habits make it easy to observe in Arusha National Park basking on stone walls, every kind of concrete building and on the sides of roads. We found it as high as the Park Rest house (1686 m). One of the best place to observe this species is Momela gate, but it is quite common also on the shores of Big Momela and Tulusia lakes. Systematic sampling surveys: 0.792 skinks per hour.

Ecology and Reproduction

Although this species is considered arboreal, it is also quite common on rocks. *M. striata* is viviparous and the reproduction can occur throughout the year (Patterson, 1990). In Arusha National Park many new-borns were found at the end of April. The growth is fast and sexual maturity is reached in 15-18 months. The diet consists of different invertebrates including insects (termites, beetles) and snails. Lambert & Dewhurst (1998) observed a *M. striata* hunt down and eat a dwarf gecko (*Lygodactylus luteopicturatus*).

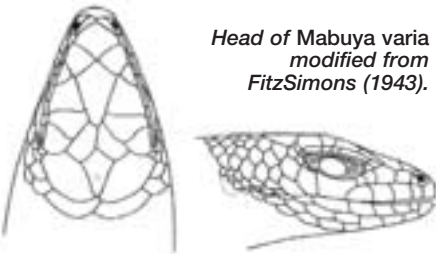
Mabuya varia
(Peters, 1867)

Common names
Variable Skink

Synonyms
Euprepes varius Peters, 1867
Euprepes damaranus Peters, 1870

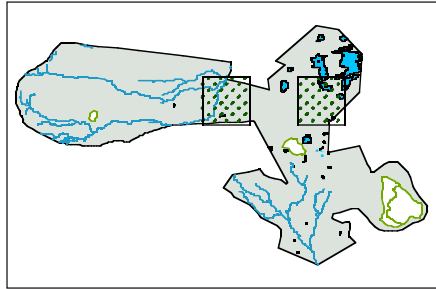
Taxonomy
No subspecies is actually considered valid. A recent taxonomical review (Broadley, 2000) has confirmed that *Mabuya varia nykae* do not represent a valid taxon.

Identification
A medium sized skink with body length usually up to 70 mm and exceptionally 117 mm (but individuals found Arusha National Park usually around 50 mm). Eyelids movable, the lower one has a large transparent disc. Dorsal scales with three keels, midbody scales row 30-36; limbs well developed (cf. *Panaspis* and *Lygosoma*). White lateral stripe always present (cf. *Mabuya striata*). The colouration can be very variable, the back is usually olive red-brown with or without vertebral and dorsolateral stripes and black blotches; the belly is white.



Head of *Mabuya varia*
modified from
FitzSimons (1943).

Geographic Range
South eastern Africa, from Eastern Cape Province in South Africa north to Sudan, Ethiopia and Somalia. Westward up to Congo, Angola and Namibia.



Local distribution
The distribution data collected are scarce; most of the individuals have been observed in the bushland on the banks of Ngare Nanyuki river (about two kilometres up from Momela gate) and in the grasslands around Kusare post. The distribution and maximum altitude (1650 m) here presented are probably very underestimated. Number of animals observed per hour 0.388.

Ecology and Reproduction
Mabuya varia is a terrestrial species that can be found around rocks, bushes and at the base of the trees in savannahs and montane grasslands. It preys mainly on insects: beetles, crickets, caterpillars, termites and a few other invertebrates. Reproduction usually occur during the winter, females give birth to 2-4 up to 10 young.

Adult from Ngare Nanyuki river.



Lygosoma afrum
(Peters, 1854)

Common names

Peters' Writhing-skink, Mozambique
Writhing Skink

Synonyms

Eumeces afer Peters, 1854
Mochlus afer Bocage, 1867

Taxonomy

The genus *Lygosoma* has been reviewed by Donald G. Broadley in 1966a and 1994; *L. afrum* has been distinguished from *Lygosoma (Riopa) sundevalli* by the different pattern of the back (speckled) and larger size. In East Africa four species has been distinguished.

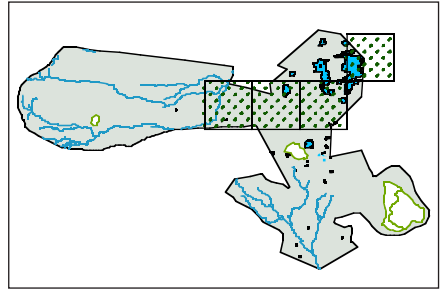
Identification

Movable eyelids, the lower one scaly (cf. *Panaspis*). Dorsal scales smooth in 26-28 rows at midbody (cf. *Mabuya*), limbs short. Dorsum light to dark brown, speckled with dark and white spots, ventrum white. Total length 80-140 mm.

Geographic Range

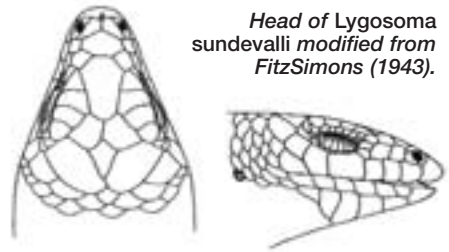
From Somalia, Sudan and Ethiopia south to Mozambique (north of latitude 24° S), west to northern Zambia and Congo. This species is also present on Zanzibar.

Adult from Uwanja wa Momela.



Local distribution

Found under stones only in open areas at low altitude (1400-1650 m); in grasslands (around Kusare post), bushland (Uwanja wa Momela) and around lakes (Longil, Big Momela) and streams (Ngare Nanyuki). Search time: 0.118 skinks per hour.



Head of Lygosoma sundevalli modified from FitzSimons (1943).

Ecology and Reproduction

Oviparous, lays 4-7 eggs in an underground chamber. The young measure 24 mm (snout-vent length). Preyed items include caterpillars, grasshoppers, beetles, sandhoppers and tiny snails. *Atractaspis bibroni* and *Lycophidion capense* have been reported to feed on *L. afrum*.

Panaspis wahlbergii
(A. Smith, 1849)

Common names

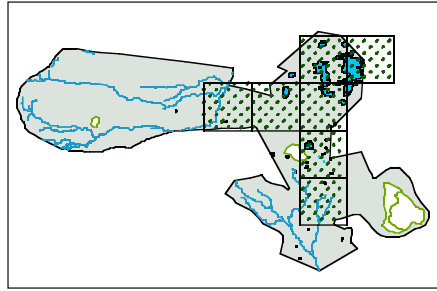
Wahlberg's Snake-eyed Skink, Savanna Snake-eyed Skink

Taxonomy

The first complete review of this group has been done by the Rumanian herpetologist Iohan Fuhn (1969, 1970) who assigned the European species to the genus *Ablepharus* (with the exception of one cosmopolitan species) and the African species to the genus *Panaspis*. Subsequently Greer (1974), Perret (1975) and Broadley (1989) modified the nomenclature status of many African "ablepharine" skink, erecting new genera and assigning *P. wahlbergii* to the genus *Afroablepharus*. Finally Jacobsen & Broadley (2000) recognized a new species: *Panaspis maculicollis* formerly included in *P. wahlbergii*.

Identification

A small dark skink with elongated cylindrical body and limbs reduced but with five digits. Eyelids fused and immovable, the lower one with a large transparent disc which covers the eye (cf. *Lygosoma* and *Mabuya*). Interparietal distinct and frontoparietal fused. Dorsal scales smooth, row 22-28 at midbody. Ground colour usually olive to dark brown; the back can be uniform or may



present six longitudinal continuous or broken dark lines. A white lateral line is present at least on the anterior part of the body. Breeding males are usually pink to vermilion on the ventral parts of the body.

Geographic Range

From Democratic Republic of Congo to Somalia and Ethiopia; southward to Zambia and Zimbabwe.

Local distribution

In Arusha National Park *Panaspis wahlbergii* is very common in all the lowland open areas and can be easily observed basking on stones especially along the Ngare Nanyuki river, around Longil, Tulusia and big Momela lakes but also at Asili post, Kinandia and the old "picnic" area. During our survey the medium search time for this species was 0.742 skinks per hour.

Ecology and Reproduction

These skinks are diurnal and can be found in a variety of habitats including grassland and bushlands. They frequently take refuge under stones or inside grass tussocks. The diet consists mainly of spiders, termites, homopteran and hemipteran bugs, beetles and ants. The females lay 2-6 small eggs under stones or logs during November-January.

Adolfus jacksoni
(Boulenger, 1899)

Common names

Jackson's Forest Lizard

Synonyms

Lacerta jacksoni Boulenger, 1899

Taxonomy

Adolfus jacksoni kibonotensis, the subspecies of Kilimanjaro and Mt. Meru, is not considered valid anymore.

Identification

A brown-greenish lizard that resembles the European wall lizard *Podarcis muralis*. Frontoparietal present, dorsal scales small and granular, ventrals smooth, subdigital lamellae not keeled. Snout to vent length of five individuals measured in Arusha National Park up to 51.5 mm.

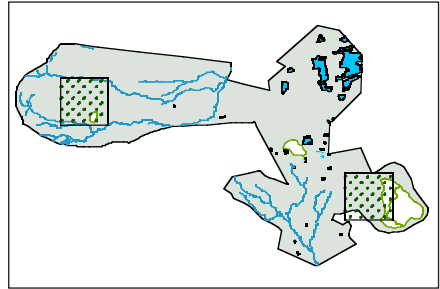
Geographic Range

Tanzania, Kenya, Uganda, Rwanda, Burundi and Democratic Republic of Congo.

Local distribution

Many Jackson's forest lizards have been found under stones near a tree at Njuku camp (about 2500 m) and a single specimen in a pitfall trap on the slopes of

Head of the same individual.



Ngurdoto crater near to Leopard hill (1670 m). Einar Lönnberg in 1911 observed on Mt. Meru some *Adolfus* at the "escarpment station" on the trunks of big cedar trees (this locality is probably Miriakamba huts as the other station, Saddle huts, is well above the tree line).

Adult male from the forest on southern side of Ngurdoto crater.



Ecology and Reproduction

This species usually lives in trees at the edge of the forest where it feeds mainly on beetles, moths and spiders. It is an arboreal species but can be found also under stones and debris. Loveridge reports of a female laying four eggs measuring 14 x 7 and 15 x 7 mm respectively.

Nucras boulengeri

Neumann, 1900

Common names

Boulenger's Scrub-lizard

Synonyms

Nucras kilosae Loveridge, 1922

Taxonomy

Broadley and Howell (1991) examined specimens from the same locality of description of Loveridge's *Nucras kilosae* and could not find any diagnostic feature, so they placed this species in synonymy with *Nucras boulengeri*.

Identification

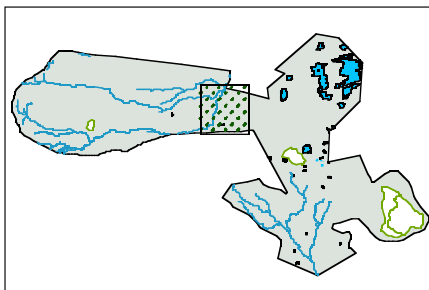
A lizard with rounded head and very long red tail; frontoparietal present, dorsal scales small and granular, ventrals smooth, subdigital lamellae not keeled, nostril bordered by 2 or 3 nasals and well separated from the first labial (cf. *Adolfus*). Collar well marked, head shields smooth.

Geographic Range

Uganda, Kenya and Tanzania, south to north-western Zambia.

Local distribution

We found a single juvenile specimen (SVL 26.5 mm) at the beginning of May in the open bushland sandy area along



the Ngare Nanyuki river (about 600 meters west of Momela gate).

Ecology and Reproduction

The beautiful lizards of the genus *Nucras* are usually found in open areas with sandy soils; they are quite secretive as they forage mainly in the early morning and evening. If threatened by a predator they are able to run away with notable speed and agility. The main breeding period of this species is probably during the rainy season.



Young specimen from bushland around Ngare Nanyuki river.

Leptotyphlops scutifrons merkeri
(Werner, 1909)

Common names

Merker's Worm-snake

Synonyms

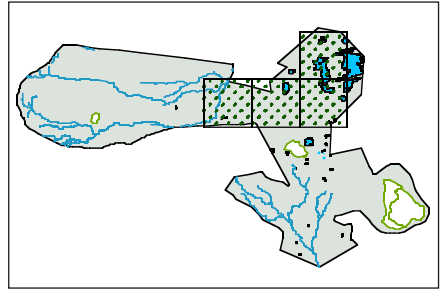
Stenostoma scutifrons Peters, 1854
Glauconia merkeri Werner, 1909

Taxonomy

The worm snakes of south eastern Africa have been reviewed by Broadley & Watson (1976). Two subspecies were recognised, the nominal form *L.s. scutifrons* (southern form, from South Africa up to central Tanzania) and *L.s. merkeri* (Kenya and Tanzania). Broadley (1990) and Webb *et al.* (2000) report that *Leptotyphlos conjunctus* can be considered a subspecies of *L. scutifrons*.

Identification

Size and body shape resembling an earthworm except for the colour that is dark reddish brown to dark brown and the shiny appearance. Blunt head with snout prominent, no teeth on the upper jaw, the eyes are vestigial and covered by scales. Ventral scalation similar to the dorsal one. Maximum size in Arusha National Park 253 mm (body + tail).



Geographic Range

From South Africa northward up to Kenya, Tanzania and Angola.

Local distribution

Usually found by turning up stones in grassland and bushland areas; five individuals were observed along the banks of Ngare Nanyuki river. Other worm snakes were found on the shores of small and big Momela lakes and near Kusare post. Medium search time 0.152 snakes per hour.

Ecology

Worm snakes live underground and can be observed only after heavy rains when they are flushed out or during the night. The females lay two or three eggs that look like a rice grain and the new-born are just 55 mm long. Merker's worm snake feeds almost exclusively on ant larvae and pupae; they produce pheromones that prevent them from being attacked by the ants (Webb *et al.* 2000).

Individual from Lenganassa river.



The shore of the Big Momela lake is very poor in amphibian species but rich in reptiles: Lygosoma afrum, Mabuya striata, Pachydactylus turneri, Psammophis phillipsi.

Ngare Nanyuki river is a good habitat for amphibians like Hemisus marmoratum and Bufo gutturalis but especially for reptiles: Panaspis wahlbergii, Mabuya varia, Agama agama, Psammophis phillipsi, Leptotyphlops scutifrons and Python natalensis.



Python natalensis
A. Smith, 1840

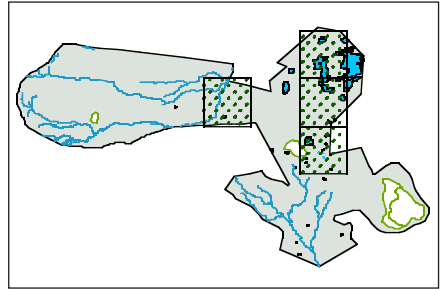
Common names
Southern African Python

Synonyms
Python sebae natalensis A. Smith, 1840

Taxonomy
Python sebae natalensis has been elevated to full species status by Broadley (1999).

Identification
This is, along with *Python sebae*, the largest African snake with adults averaging 3-4 meters and exceptionally attaining 6 meters. The back is light brown with black edged dark patches irregularly connected to form sinuous crossbars. On the sides there are irregular dark blotches, the underside is light grey speckled with black spots and small dark patches. Typical of the Boidae family are the ventral scales narrower than body,

Pythons can be easily observed along the Ngare Nanyuki river as they are very fond of water.



anterior supralabials scales with deep pits and vestiges of hind-limbs present and visible externally. *Python natalensis* can be distinguished from *Python sebae* by the frontals broken up in 2-7 scales, no dark preocular patch and subocular patch reduced to a dark oblique streak.

Geographic Range
From north eastern parts of South Africa to central Kenya, in the west up to southern Angola including eastern Congo, Zambia and Burundi.

Local distribution
The Southern African python is fairly common in Arusha National Park and large snakes can be observed in many wet areas. The best places to meet pythons are the shores of the Small Momela lake (they are usually hidden among the reeds or swimming in shallow waters) but also walking on the banks of the Ngare Nanyuki river (starting from the Momela gate area) could be an excellent way to observe them (for example, the 3.70 meters long individual shown in the picture). The largest python we saw was basking on the floating vegetation of lake Longil at the beginning of November. The best periods to observe large snakes are during hot weather; during the rainy season, the weather is probably too cold for this species and we observed just a single juvenile along the Small Momela lake.

Ecology

Pythons are non venomous snakes but due to their large size and long recurved teeth their bite can inflict deep wounds. The rock pythons are the only African snakes large enough to be potentially able to eat a man and even if attacks on man are probably mostly legend, a few records in the past have been reported (Branch & Haacke, 1980).

Pythons are very fond of water and usually they do not live too far from it. They often lay submerged with just the head on the surface waiting for prey like small antelopes, wild pigs, monkeys, hares, cane-rats or sometimes fish. The female lays 30-50 large eggs that she protects by coiling around them. The newborn are 60 cm long and in the wild probably need 10-15 years to reach full maturity. The African python is protected in some Countries and has been included in CITES Appendix II.



Lower jaw of Python sebae: the long recurved teeth of this snake can inflict nasty wounds.

The head of a Southern African Python from Small Momela lake.



Bitis arietans
(Merrem, 1820)

Common names
Puff Adder

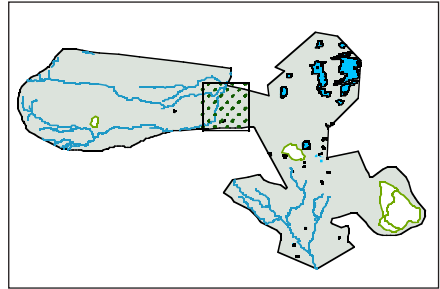
Synonyms
Echidna arietans Wagler, 1828

Taxonomy

Two subspecies are actually considered valid: *Bitis arietans arietans* (Merrem, 1820) is distributed in most of Africa including Tanzania and *Bitis arietans somalica* Parker, 1949 in Somalia and Northern Kenya.

Identification

An extremely stout, heavily built snake with a broad flattened hornless triangular head covered by small scales, snout rounded, tail short. Eyes of moderate size with vertical pupil. The scales are strongly keeled. Colour yellow or brown



(pale, dark, orange or reddish) sometimes greyish with a pattern of regular chevron-shaped bars on back and tail, venter yellowish or white. Total length usually up to 90 cm, exceptionally 150 cm with a weight of 6 kg.

Geographic Range

One of the most widespread African snake distributed from Southern Morocco to Arabia and south to the

A Puff Adder perfectly camouflaged among the low grass of a garden.





Mobbing of few superb starlings against a large Puff Adder (same individual of the picture on right).



Large Puff Adder found during the night along a road in Tarangire N.P.

Cape excluding the Sahara and the rain forest areas.

Local distribution

This species has been found in Arusha National Park by Vesey-Fitzgerald (1975) and often seen by biologists of Oikos institute and Park rangers. During our survey, in the cold rainy season, we never observed this species inside the park. The best way to observe puff adders is to look for them on the roads during the night where they often rest while hunting for prey or bask on the warm soil. Puff adders are sluggish and can be safely approached and photographed from a few meters distance, but are also able to strike suddenly

extremely fast and they must be treated with extreme care and respect.

Ecology

Bitis arietans has long recurved fangs (12-18 mm in large individuals) at the front of the upper jaw that are capable of injecting a large quantity of haematotoxin venom deep into the victim. Symptoms of bites include large swelling, pain and necrosis. This species is responsible for most of the severe snake bites in Africa, even if only 5% of them prove fatal to man.

The puff adder is a terrestrial snake and only seldom climbs low bushes. The typical movement is rectilinear and caterpillar like but if annoyed it can move faster sideways. It usually relies on its cryptic colour pattern to escape notice and catch its prey. Diet consists mainly of small terrestrial ground living mammals including rats and mice, but also lizards, frogs and toads are often preyed upon. The species is ovoviparous with one litter per year. Litters of 20-40 are common but extremely large litters of 147-156 neonates have been recorded. During cold periods the puff adder usually hibernates or emerges for a few hours to bask in the midday sun.



The same individual of the opposite page; found about 20 km west of Mount Meru.

Elapsoidea loveridgei loveridgei
Parker, 1949

Common names

Loveridge's Garter Snake

Synonyms

Elapsoidea sundevalli loveridgei Parker, 1949

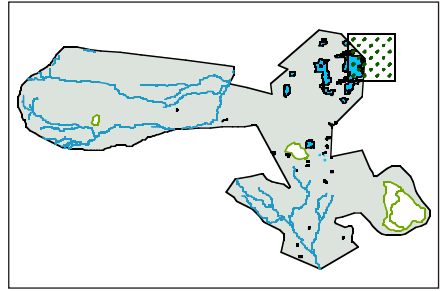
Taxonomy

Elapsoidea loveridgei was originally included in the *Elapsoidea sundevalli* and elevated to specie rank by Broadley (1971). Recently a revision has been published by Jakobsen (1997). Four subspecies are actually recognized: *E.l. colleti*, *E.l. multicincta*, *E.l. scalaris* and the nominal form *E.l. loveridgei*, this latter is the subspecies of Arusha National Park and is limited to central Kenya and northern Tanzania.

Identification

A stout, medium sized dark snake (total length usually not exceeding 60 cm) with 16-20 white or pink transverse lines (or narrow bands); the body has a smooth "oily" appearance. As in all the members of the *Elapidae* family this species has one pair of enlarged, fixed, tubular poison fangs not enclosed in a membranous sheath, but this is not a useful characteristic unless you are handling the animal. Internasal not bordering nostrils, dorsal scales in 13 rows at midbody.

Garter Snake from lake Tulusia.



Geographic Range

North eastern Congo, Burundi, Rwanda, Tanzania, Uganda and Kenya, Sudan, Ethiopia and Somalia.

Local distribution

Only one garter snake was caught during the survey; it was resting under a large boulder on the shores of lake Tulusia.

Closer view of the same individual, the opaque eye is typical of the early shedding process.



Ecology

A nocturnal and secretive species that feeds on geckos, skinks, lizards and sometimes amphibians. The area where the snake was found sheltered a large population of *Pachydactylus bibronii* as well as skinks and agamas, but no amphibians. The strange colour of the animal is due to the fact that it was almost ready to shed. The venom is neurotoxic but the species is not aggressive and very few human bites have been recorded.

Naja haje
(Linnæus, 1758)

Common names
Egyptian Cobra

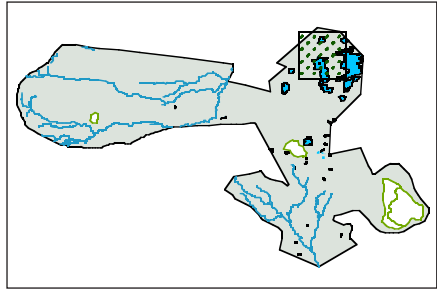
Synonyms
Coluber haje Linnæus, 1758

Taxonomy
There are five races *N.h. arabica*, *N.h. legionis* and the nominal form *N.h. haje*. *Naja haje annulifera* has been elevated to species rank and *Naja haje anchietae* is now considered a subspecies of this *taxon* (Broadley, 1995).

Identification
A large snake (150-200 cm) with thick body and stout head. Large dilatable hood on the neck. Young specimens are yellow-grey or brown to black larger ones usually darker. Fangs as in all the elapid snakes, one preocular in contact with nasal and separating prefrontals from labial scales; supralabials not in contact with the orbit of the eye.

Geographic Range
Saudi Arabia, Oman and throughout Africa north of Angola, Zambia, and

The Egyptian Cobra shedded skin found near lake Lekandiro.



southern Tanzania. The range of *N.haje haje* is from Morocco to Egypt, south to central Tanzania and west to Senegal.

Local distribution
The presence of the species has been confirmed on the basis of a large (183 cm) complete *exuvia* (shedded skin) found on the shores of Lekandiro lake. Local snake catchers affirm that along the rivers, near the eastern borders of the park, *Naja nigricollis* (another cobra species) is quite common but we personally never found one in the park nor did Vesey-FitzGerald in the past.

Ecology
A terrestrial species that often remains in the same area for a long time. They are normally not aggressive even if the poison is neurotoxic and extremely dangerous. Despite the wide distribution of this species the number of fatal bites is very low. The Egyptian cobra feeds mainly on amphibians and other snakes. The Egyptian cobra is not able to spit venom but the close species *Naja nigricollis* is. If annoyed they are able to stand up and display a large hood. As defensive behaviour *Naja haje* often shams death.

Dendroaspis angusticeps
(A. Smith, 1849)

Common names
Green Mamba

Synonyms

Naja angusticeps Smith, 1849
Dendroaspis sjöstedti Lönnberg, 1910

Taxonomy

Einar Lönnberg described *Dendroaspis sjöstedti* from a specimen with aberrant scalation collected at Kibonoto; the species is not considered valid anymore.

Identification

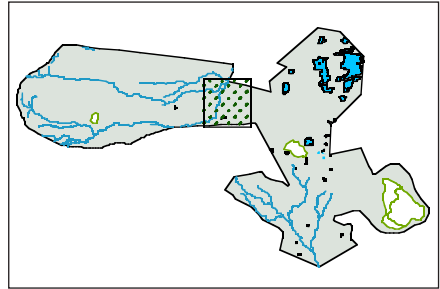
A large slender green snake (adults average 180 cm, exceptionally up to 250 cm), with coffin shaped head and smooth scales. Fangs as all the elapids, 3 preocular scales. Dorsal scales in 17-19 rows at midbody, inside of mouth white to bluish-white. This species is not easily distinguishable in the wild from *Philothamnus hoplogaster*.

Geographic Range

Kenya, Tanzania, Mozambique, Malawi, East Zimbabwe, Natal in South Africa.

Local distribution

This species was reported in Arusha



National Park by Vesey-FitzGerald, we observed a green mamba among the acacia trees along the Ngare Nanyuki river.

Ecology

This is an arboreal snake rarely seen outside forests or dense bushlands; it feeds on birds and eggs. Along with the black mamba (that has never been reported in the area) this is the most feared African snake due to its extreme agility, aggressiveness and the power of its poison. Compared to the black mamba the green mamba is less aggressive and the venom is less toxic, but still capable of inflicting fatal envenoming. Medical treatment is always needed for this species (Hodgson & Davidson, 1996).

Green Mamba from Arusha N.P.



Lamprophis fuliginosus
(Boie, 1827)

Common names
Brown House-snake

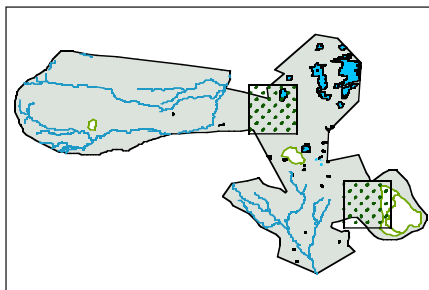
Synonyms
Lycodon fuliginosus Boie, 1827
Boaedon fuliginosus Schmidt, 1923

Taxonomy
FitzSimons (1962) recognized only one subspecies *L.f. mentalis* (but considered it questionable), but Broadley (1990) in the revision of the same book concluded that: "there is no justification for retaining *mentalis* as a subspecies of *Lamprophis fuliginosus*".

Identification
Head relatively flat with round snout, head slightly distinct from the neck, eyes rather small with vertical pupil. The back colour in Arusha National Park is usually blackish grey (but in some areas this snake can be brown). Typical of this species are two light stripes on the sides of the head and the high number (27-33) of midbody scales row. Total length between 60 and 120 cm.

Geographic Range
Throughout Africa but restricted to south western Morocco in North Africa.

All the Lamprophis that we found in Arusha N.P. were almost black.



Local distribution
The brown house-snake is considered common in Arusha National Park by Vesey-FitzGerald; we observed young individuals of this snake at Leopard hill (Ngurdoto Crater) and Uwanja wa Momela (about 1 Km north of Momela Lodge).

Closer view the same individual from Uwanja wa Momela.



Ecology
This harmless species, as the common name suggests, is often found near villages; in traditional communities it is much appreciated because it eats rodents. Rodents are hunted inside their burrows and killed by constriction. Diet includes also lizards (incl. *Heliobolus neumanni* and *Hemidactylus mabouia*) and occasionally birds and bats.

Lycophidion capense jacksoni
Boulenger, 1893

Common names

Jackson's Wolf-snake, Jackson's Tiger Snake

Synonyms

Lycophidion jacksoni Boulenger, 1893
Lycophidion irroratum Schmidt, 1923

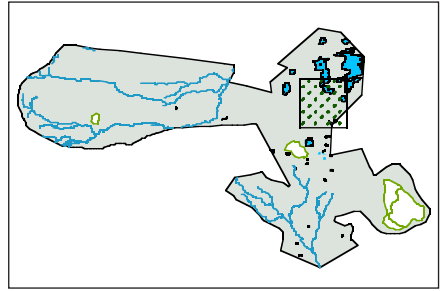
Taxonomy

Lycophidion capense (A. Smith, 1831) is a polytypical species and the different subspecies show great variability in the colouration patterns. The genus has been reviewed by Laurent (1968) and later by Broadley (1996) and three subspecies are considered valid: *L.c. capense*, *L.c. jacksoni*, *L.c. loveridgei*; all these *taxa*, except the nominal form, occur in Tanzania.

Identification

A small species measuring 35-40 cm with short tail, head flattened and not very distinct from the neck. *L.c. jacksoni* is usually dark grey or brownish, the dorsal scales are usually bordered with white at the apex and there is a pale band around the snout. No enlarged poison fang in the upper jaw, dorsal scales

Aggressive posture of Wolf-snake from Small Momela lake.



smooth, nostril pierced in an entire nasal shield followed by a small postnasal, pupil vertically elliptic in strong light, dorsal scales row reduced to 15 before the vent. In males 170-211 ventrals and 31-58 subcaudals; in females 178-221 ventrals and 21-55 subcaudals.

Geographic Range

Lycophidion capense is widely distributed throughout Africa. The range of *L.c. jacksoni* includes southern Sudan, Ethiopia, north eastern Congo, Uganda, Western Kenya, Rwanda, Burundi and Western Tanzania extending south-east to Morogoro and the Uzungwa mountains.

Local distribution

Considered common in Arusha National Park by Vesey-FitzGerald. The specimen in the picture was found on the western shores of Small Momela lake.

Ecology

The tiger snake is a nocturnal species that feeds mainly on skinks: *Panaspis* and *Mabuya*. The prey is seized on the back of the neck and constricted. *Lycophidion capense* is a harmless snake, but in the field caution is needed as it can be confused with the stiletto snake *Atractaspis bibronii*.

Psammophis phillipsii
(Hallowell, 1844)

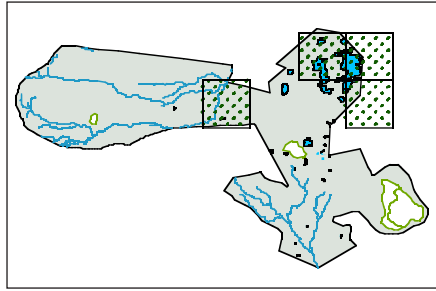
Common names
Olive Grass Snake

Taxonomy

The species included in the *Psammophis sibilans* complex (*P. sibilans*, *P. phillipsii*, *P. subtaeniatus*, *P. brevirostris*, *P. leightoni* and *P. rukwae*) do not have a clear systematic position. The group has been reviewed by Loveridge (1940), Broadley (1966c, 1977, 1990) and later by Brandstätter (1994, 1995 *vide* Hughes) critically reviewed by Hughes (1999). According to Brandstätter the plain (unpatterned) specimen from Arusha should be ascribed to *Psammophis sibilans irregularis* while Hughes does not justify the existence of the subspecies. The same unpatterned Tanzanian *Psammophis* were regarded as *P. phillipsii* by Broadley & Howell (1991). Broadley (*pers. comm.*) probably will assign the specimen from Arusha to *Psammophis mossambicus*. Since the situation is still confused and a complete revision is urgently needed we decided to follow Broadley & Howell (1991).

Identification

A large robust brown long tailed snake (up to 190 cm) that can be not patterned



or with black edged scales forming thin black longitudinal lines. 17 rows of scales at midbody, 151-183 ventrals, 1 preocular, 82-110 subcaudals, 8 upper labials of which the fourth and fifth or fourth, fifth and sixth are in contact with the eye, the first four infralabials in contact with anterior chin shield. The two specimens examined from Arusha National Park showed anal shield divided and 10 lower labials.

Geographic Range

From Senegal to Kenya, south to northern Namibia, Botswana and part of South Africa.

Local distribution

Observed along the Ngare Nanyuki river (three individuals) and on the western and southern shores of Big Momela lake.

Ecology

This snake is common in grassland and savannas especially near water and it is often encountered on the roads. It is not an arboreal species even though it may climb on bushes to bask. It moves very quickly and when captured bites fiercely. The mild venom of *P. phillipsii* may cause pain and nausea that will pass within 48 hours. The olive grass snake feeds mainly on lizards, but also on mammals, frogs and small snakes (including venomous species such as puff adder and black mamba).

Natriciteres olivacea
(Peters, 1854)

Common names
Olive Marsh-snake

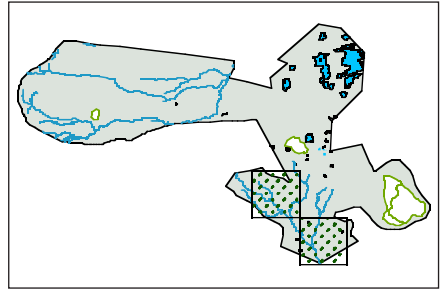
Synonyms
Coronella olivacea Peters, 1854
Natrix olivacea Cott, 1928

Taxonomy
Reviewed by Broadley (1966). This is actually a monotypical species, but in the past Loveridge (1935) described *N.o. uluguruensis* and considered valid *N.o. pembana* that is actually regarded as closely related to the west African form *N. variegata*.

Identification
A small harmless snake (up to 35-40 cm) with smooth scales. The body is grey, olive or brown with dark mid-dorsal band (4-5 scales row wide), ventral scales usually orange or yellow. The pupil is rounded, anal shield divided, 19 scales row at midbody, 130-153 ventrals, 57-87 subcaudals.

Geographic Range
Savannas and Forests from Sudan south to Mozambique westward to Guinea and Angola.

Natriciteres is the most common snake in Arusha N.P.



Local distribution
This small snake was found often in the pitfall traps around wet areas including Mbuga Za Raiden pond and Lokie Swamp. A specimen was found under a stone at the Makersoro river springs and another inside the Kambi ya fisi Forest (i.e. about 1 km from the nearest wet area).

Detail of the head of a Olive Marsh-snake from Lokie swamp.



Ecology
A diurnal savanna species that does not live far from water. Swims well and feeds often in the water on frogs and tadpoles, small fish and some invertebrates. This snake when first caught does not usually attempt to bite.

Crotaphopeltis hotamboeia
(Laurenti, 1768)

Common names

Herald Snake, White-lipped Snake

Synonyms

Coronella hotamboeia Laurenti, 1768

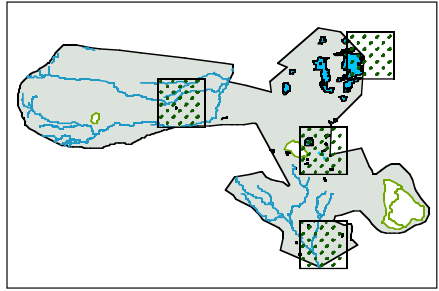
Taxonomy

Since Broadley (1968) has elevated *Crotaphopeltis hotamboeia kageleri* to species level (and moved it to a different genus *Dipsadoboa shrevei*) *C. hotamboeia* is considered monotypic.

Identification

A small snake (up to 60-75 cm, rarely more) with short depressed rounded head, broadened behind. The tail is short. The body is dull grey or blackish grey and unpatterned except for some scattered white dots. The head is usually darker than the body and often iridescent especially in young individuals, lips are usually white as well as the belly. The identification can be based on these characteristics: presence of poison fangs in the upper jaw behind the eye, loreal shield present and excluded from the orbit by a single preocular scale, head quite large, pupil vertical, ventrals 139-174, subcaudals 24-47, dorsal scales in 19 (rarely 21) rows at midbody.

Young White-lipped Snake from Mbuga Za Raiden.



Geographic Range

Tropical Africa excluding a few areas in South Africa.

Local distribution

Regarded as the commonest snake of east Africa (along with *Lamprophis fuliginosus*) and common in Arusha National Park according to Vesey-FitzGerald. We collected many specimens around the amphibian breeding sites, including the pond at Mbuga Za Raiden, lake Longil, lake Tulusia up to Kilimanjaro view point (over 1900 m). The medium search time recorded for this species during systematic sampling surveys was 0.067 snakes per hour.

Ecology

It feeds at night on amphibians that are seized and held until the venom has paralysed the prey and then swallowed. The poison is injected with a blade-like back fang but is mild and has virtually no effect on man. When first approached or captured this harmless terrestrial snake has an aggressive reaction, it flattens the body and the head to such a degree that the white lips became evident on the dark/black head of this snake. It coils and uncoils its body and attempts a few false strikes. The origin of the strange common name "Herald snake" is due to the fact that the presence of this species in South Africa was first published in the Eastern Province Herald newspaper.

Thelotornis mossambicanus
(Bocage, 1895)

Common names

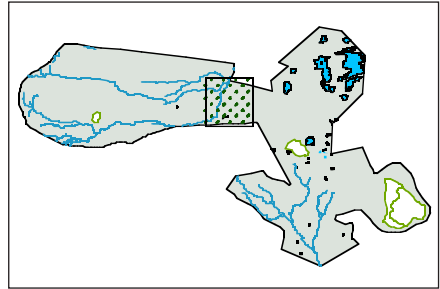
Mozambique Twig Snake

Taxonomy

Broadley (1979) reviewed the genus and recognized three subspecies of *Thelotornis capensis*: *T.c. capensis* (the southern race), *T.c. oatesii* (the western race) and *T.c. mossambicanus* in East Africa. In a recent paper by Broadley (2001) *T. mossambicanus* is recognised as a good evolutionary species, which is sympatric with *T. capensis oatesii* in eastern Zimbabwe. *T. usambaricus* is described from coastal forests of the East Usambaras, but it is also recorded from the West Usambaras, North Pare, Nguru and Uluguru Mts.

Identification

A slender snake (up to about 140 cm) with long tail. The body is brown or grey with marbled and speckled with darker blotches. The head is slender and distinct from the neck, the top is uniform green and, typical of *T. mossambicanus*, the temporal region is always speckled with black. Pupil horizontal "key" shaped, loreal shield present, a pair of enlarged grooved poison fangs behind the eye in the upper jaw.



Geographic Range

Thelotornis mossambicanus ranges from southern Somalia south to central Mozambique, west to the shores of Lake Tanganyika, Malawi and eastern Zimbabwe.

Local distribution

Vesey-FitzGerald reports that the species has never been recorded from Arusha National Park but we observed a large individual among the acacia trees around the Ngare Nanyuki river in November.

Ecology

It is considered an arboreal species but catches a lot of its prey on the ground. It is rarely seen in the field due to its cryptic colours and habit of remaining immobile for a long time. If disturbed can move away swiftly or inflate the neck. The diet consists of small snakes and lizards (especially chameleons and arboreal geckos) but sometimes also few birds, frogs and toads are taken (Broadley, pers. comm.). The bite from these snakes is dangerous as no serum is available and a few fatalities have been recorded. It must be stressed, however, that bites are very rare and that this back fanged snake needs to hold on to its victim for some time to inject poison.

Dasypeltis scabra
(Linnæus, 1758)

Common names
Common Egg-eater

Taxonomy

Many subspecies have been described and then synonymized, the last one was *Dasypeltis scabra loveridgei* (Mertens, 1954) described from specimens collected in Namibia and then regarded as simply colour phase by Broadley (1990). Gans (1959) revised the systematics of the genus.

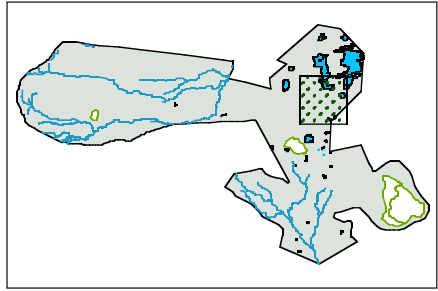
Identification

A medium sized snake (60-70 cm), with a small rounded narrow head barely set off from the neck. Teeth rudimentary. Body slender with relatively short tail (longer in males). Scales strongly keeled with apical pit. Dorsal ground colour slate grey, light brown or olive brown with a median series of brown square blotches. Like *Causus rhombeatus* the top of the head and the neck has a narrow "V" shaped mark.

Geographic Range

Widely distributed in Africa south of the Sahara except in deserts and dense rainforest; there is a relict population in western Morocco.

Common Egg-eater snake from Small Momela lake.



Local distribution

Vesey-FitzGerald considered this species as common in Arusha National Park; we found only one individual that was probably looking for the nests of spur-winged plovers (*Vanellus spinosus*) on the shores of the Small Momela lake.



Ecology

Feeds exclusively on eggs especially of birds, but sometimes lizard eggs too. Eggs are swallowed whole and cracked in the snake's neck by a series of bony projections. The shell is then crushed and regurgitated. When annoyed this harmless species reacts with some spectacular defensive behaviour such as head triangulation to mimic viperid snakes, hissing, false strikes and gape. It is also able to coil and uncoil in a series of serrated loops to produce a rasping sound similar to that produced by *Echis* (Gans & Richmond, 1957; Young *et al.*, 1999).

OTHER SPECIES

Atractaspis bibronii A. Smith, 1849

Common names

Bibron's Stiletto-snake

Identification

Brown to black small burrowing snake, with an average adult total length of 45 cm. The head is rounded and not distinguishable from the neck. Head and neck not as broad as the body. Typical of this family are the long fangs extending backward posterior to the eye, supralabials five, infralabial five (rarely six). *A. bibronii* has 21-25 midbody scales row, 212-246 ventrals in males and 238-260 in females, frontal large, longer than broad, the length is more or less the same as parietals.

Notes

A single snake that probably belonged to the *Atractaspis* genus was found at Kinandia View Point but unfortunately escaped while we were attempting to take a picture of it. Vesey-FitzGerald regards *Atractaspis bibronii* as common in Arusha National Park. This species bites protruding one of its long fangs and stabbing with closed mouth. The poison causes local pain and nasty necrosis, no effective serum is produced.

Causus rhombeatus (Lichtenstein, 1823)

Common names

Rhombic Night-adder

Identification

Medium sized snakes (usually up to 60 cm), the back is pale grey, olive brown or almost black and with a typical "V" shaped mark on the neck and dark rhombic white edged blotches, some individuals are completely unpatterned. Other characteristics: enlarged grooved poison fangs in the upper jaw folded into membranous sheath, head not larger than the body covered by large shields, pupil round, snout not turned up at the tip.

Notes

This nocturnal species is quite similar to the common egg eater snake but has a shorter and thicker body and tail. Vesey-FitzGerald considered *C. rhombeatus* common in Arusha National Park. No fatalities have been recorded from the bite of this species.

Duberria lutrix (Linnæus, 1758)

Common names

Slug Eater Snake

Identification

A small snake (30-35 cm); the specimen we found was completely black above and below except for few scattered white dots on the lower side of the head. The head is

small with nostril pierced in an entire nasal, loreal shield small or absent, eye small with round pupil. No enlarged poison fang in the upper jaw.

Notes

This upland species is regarded by Vesey-FitzGerald as common in Arusha National Park, we collected a specimen freshly killed by a car near the Rest house of the Park.

Aparallactus capensis (A. Smith, 1849)

Common names

Cape Centipede-eater

Identification

Another small snake (up to 25-30 cm) with slender brown body and a distinctive black head backed by a black collar; the belly is grey white. Each nostril is pierced in an undivided nasal shield, loreal shield absent, subcaudal scales single, first pair of infralabials widely separated by the anterior sublinguals.

Notes

This species has enlarged poison fangs in the upper jaw but is completely harmless. Reported from Arusha National Park by Vesey-FitzGerald.

Prosymna stuhlmannii (Pfeffer, 1893)

Common names

Shovel Snout Snake

Identification

A small snake with flat head and short tail that average 30 cm in length. The back is dark brown to metallic black. No enlarged poison fangs in the upper jaw, dorsal scales smooth, anal shield entire, dorsal scales in 15-17 rows at midbody.

Notes

A burrowing nocturnal snake of the savannah, often feeds on geckoes' eggs. Common in Arusha National Park (Vesey-FitzGerald, 1975).

Philothamnus hoplogaster (Günther, 1863)

Common names

Southeastern Green Snake

Identification

A small slender bright green uniform snake, yellow green below (50-70 cm max 96 cm). 73-106 subcaudal shields, anal divided, scales in 15 rows at midbody.

Notes

A species that is usually found near water and that resembles the green mamba. Occurs in Arusha National Park (Vesey-FitzGerald, 1975).

CHECK LIST OF AMPHIBIANS AND REPTILES AT THE ARUSHA NATIONAL PARK

The symbol “*” means that the presence of the species is based on bibliographic data only (Loveridge, 1959; Rand, 1958; 1963; Vesey-Fitzgerald, 1975).

AMPHIBIANS

Order Anura

Suborder Opisthocoela

Family Pipidae

Subfamily Xenopodinae

Xenopus muelleri (Peters, 1844)

Suborder Procoela

Family Bufonidae

Bufo gutturalis Power, 1927

Family Ranidae

Subfamily Raninae

Ptychadena mascareniensis (Duméril and Bibron, 1841)

Rana angolensis Bocage, 1866

Strongylopus fasciatus merumontanus (Lönnerberg, 1910)

Subfamily Phrynobatrachinae

Phrynobatrachus keniensis Barbour and Loveridge, 1928

Family Hyperoliidae

Subfamily Kassiniinae

Kassina senegalensis (Duméril and Bibron, 1841)

Subfamily Hyperoliinae

Hyperolius viridiflavus ommatostictus Laurent, 1951

Hyperolius nasutus Günther, 1864

Family Hemisotidae

Hemisus marmoratum (Peters, 1854)

REPTILES

Order Chelonii

Family Testudinidae

* *Geochelone pardalis* (Bell, 1828)

Order Sauria

Family Gekkonidae

- Pachydactylus turneri* (Gray, 1864)
- Hemidactylus mabouia* (Moreau de Jonnès, 1818)

Family Agamidae

- Agama agama* (Linnæus, 1758)

Family Chamaeleonidae

- Bradypodion tavetanum* (Steindachner, 1891)
- * *Chamaeleo dilepis* Leach, 1819
- Chamaeleo gracilis* Hallowell, 1842
- * *Chamaeleo jacksonii merumontanus* Rand, 1958
- * *Chamaeleo rudis* Boulenger, 1906

Family Scincidae

Subfamily Lygosomatinae

- Mabuya striata* (Peters, 1844)
- Mabuya varia* (Peters, 1867)
- Lygosoma afrum* (Peters, 1854)
- Panaspis wahlbergii* (A. Smith, 1849)

Family Lacertidae

- Adolfus jacksoni* (Boulenger, 1899)
- Nucras boulengeri* Neumann, 1900

Order Scolecophidia

Family Leptotyphlopidae

- Leptotyphlops scutifrons merkeri* (Werner, 1909)

Order Scolecophidia

Family Pythonidae

- Python natalensis* A. Smith, 1840

Family Colubridae

- Crotaphopeltis hotamboeia* (Laurenti, 1768)
- Dasyplectis scabra* (Linnæus, 1758)
- Duberria lutrix* (Linnæus, 1758)
- * *Hemirhagerrhis hildebrandtii* (Peters, 1878)
- Lamprophis fuliginosus* (Boie, 1827)
- Lycophidion capense jacksoni* Boulenger, 1893
- Natriciteres olivacea* (Peters, 1854)
- * *Philothamnus hoplogaster* (Günther, 1863)
- * *Prosymna stuhlmannii* (Pfeffer, 1893)
- Psammophis phillipsii* (Hallowell, 1844)
- Thelotornis capensis mossambicanus* (Bocage, 1895)

Family Viperidae

- * *Bitis arietans arietans* (Merrem, 1820)

Family Viperidae

- * *Causus rhombeatus* (Lichtenstein, 1823)

Family Atractaspidae

- * *Aparallactus capensis* (A. Smith, 1849)
- * *Atractaspis bibronii* A. Smith, 1849

Family Elapidae

- Elapsoidea loveridgei loveridgei* Parker, 1949
- Naja haje haje* (Linnæus, 1758)
- Dendroaspis angusticeps* (A. Smith, 1849)

The species listed below have been collected in a large area around the Meru crater by Yngve Sjösted during the Swedish Zoological Expedition in 1905 (Lönnerberg, 1910); few of them come from lower altitude areas along the Ngare Nanyuki and are completely absent from the Park, but some others could be confirmed with further field researches.

Reptiles (29 species): *Geochelone pardalis*, *Pelomedusa subrufa*, *Hemidactylus squamulatus*, *Lygodactylus conradti*, *Agama doriae* [?, this is a West African species], *Agama mwanzae*, *Laudakia atricollis*, *Varanus albigularis*, *Nucras boulengeri*, *Latastia longicauda*, *Heliobolus neumanni* [or *Heliobolus speckii*], *Gerrhosaurus nigrolineatus*, *Gerrhosaurus flavigularis*, *Mabuya megalura*, *Mabuya varia*, *Mabuya striata*, *Lygosoma sundevalli*, *Leptosiaphos kilimensis*, *Panaspis wahlbergii*, *Chamaeleo gracilis*, *Bradypodion tavetanum*, *Leptotyphlops scutifrons*, *Lamprophis fuliginosus*, *Lycophidion capense*, *Dasypeltis scabra*, *Crotaphopeltis hotamboeia*, *Psammophis subtaeniatus*, *Aparallactus jacksoni*, *Causus rhombeatus*.

Amphibians (8 species): *Rana fasciata merumontana*, *Rana angolensis*, *Rana fuscigula* [probably again *Rana angolensis*], *Ptychadena oxyrhynchus*, *Ptychadena mascareniensis*, *Phrynobatrachus natalensis* [probably *Phrynobatrachus keniensis*], *Bufo gutturalis*, *Xenopus laevis*.



REFERENCES

- Andersson L.G., 1911. – Batrachians. In: Andersson L.G. & Lönnberg E. Reptiles, Batrachians and fishes collected by the Swedish Zoological Expedition to British East Africa 1911. *Kungl. Svenska Vetenskapsakademiens Handlingar*, 47 (6): 25-41 + 1 plate.
- Barbour T. & Loveridge A., 1928a. – New frogs of the genus *Phrynobatrachus* from the Congo and Kenya colony. *Proceedings of the New England Zoological Club*, 10: 87-90.
- Barbour T. & Loveridge A., 1928b. – A comparative study of the herpetological faunae of the Uluguru and Usambara mountains, Tanganyika territory with descriptions of new species. *Mem. Mus. Comp. Zool., Harvard College*, 50 (2): 87-265 + 4 plates.
- Bauer A., 1999. – Evolutionary scenarios in the *Pachydactylus* Group geckos of southern Africa: new hypotheses. *African Journal of Herpetology*, 48(1/2): 53-62.
- Bauer A., Branch W.R. & Haacke W.D., 1993. – The herpetofauna of the Kamanjab and adjacent Damarland, Namibia. *Madoqua*, 18(2): 117-145.
- Benyr A., 1995. – *Systematik und Taxonomie der Geckos des Pachydactylus bibronii - laevigatus Komplexes (Reptilia: Squamata: Gekkonidae)*. Diplomarbeit: Universität Wien, Naturwissenschaftliche Fakultät. 75 pp + figs.
- Blomberg S. & Shine R., 1996. – 7 reptiles. In: W.J. Sutherland (Editor), *Ecological census techniques: a handbook*. Cambridge University Press, Cambridge, pp. 218-226.
- Bowker R.G. & Bowker M.H., 1979. – Abundance and distribution of Anurans in a Kenyan pond. *Copeia*, 1979(2): 278-285.
- Branch B., 1994. – *Field guide to Snakes and other reptiles of Southern Africa*. Struik, Cape Town, 330 pp.
- Branch W. R. & Haacke W.D., 1980. – A Fatal Attack on a Young Boy by an African Rock Python *Python sebae*. *Journal of Herpetology*, 14 (3): 305-306.
- Brandstätter F., 1995. – *Eine revision der Gattung Psammophis mit Berücksichtigung der Schwestergattungen innerhalb der Tribus Psammophiini (Colubridae: Lycodontinae). Teil 1: Die Gattungen und Arten der Tribus Psammophiini. Teil 2: Rasterelektronenmikroskopische Untersuchungen zur Schuppenultrastruktur bei den Arten der Tribus Psammophiini mit besonderer Berücksichtigung der Arten der Gattung Psammophis*. Dissert. Doktor Naturwiss. Math.-Naturwiss. Fak. Univ. Saarlandes.
- Brandstätter F., 1996. – *Die Sandrennattern*. Westarp-Wiss., Magdeburg; Spektrum Akad. Verlag, Heidelberg.
- Broadley D.G. 1966a. – A review of the *Riopa sundevalli* group in southern Africa. *Arnoldia (Rhodesia)*, 2(34): 1-7.
- Broadley D.G. 1966b. – A review of the genus *Natriciteres* Loveridge (Serpentes: Colubridae). *Arnoldia (Rhodesia)*, 2(35): 1-11.
- Broadley D.G. 1966c. – A review of the African Stripe-bellied sandsnakes of the genus *Psammophis*. *Arnoldia (Rhodesia)*, 2(36): 1-9.
- Broadley D.G. 1968. – A new species of *Crotaphopeltis* (Serpentes: Colubridae) from Barotseland, Zambia. *Fieldiana Zoology*, 51(10): 135-139.
- Broadley D.G., 1971. – A revision of the African snake genus *Elapsoidea* Bocage (Elapidae). *Occ. Pap. natn. Mus. Rhod. Ser. B*, 4(32): 577-526.

- Broadley D.G. 1977. – A review of the genus *Psammodphis* in southern Africa (Serpentes: Colubridae). *Arnoldia (Rhodesia)*, 8(12): 1-29.
- Broadley D.G. 1979. – Problems presented by geographical variation in the African vine snakes, genus *Thelotornis*. *S. Afr. J. Zool.*, 14: 125-131.
- Broadley D.G., 1989. – A reappraisal of the genus *Panaspis* Cope with the description of a new species of *Leptosiaphos* (Reptilia, Scincidae) from Tanzania. *Arnoldia Zimbabwe*, 9(32): 439-449.
- Broadley, D.G., 1990. – *Fitzsimons' snakes of southern Africa, revised and updated by Donald G. Broadley*. Jonathan Ball and Ad Donker publisher, Johannesburg, 387 pp.
- Broadley D.G. 1994. – A review of *Lygosoma* Hardwicke and Gray, 1827 (Reptilia Scincidae) on the East African Coast, with the description of a new species. *Tropical Zoology*, 7(1): 217-222.
- Broadley D.G., 1995. – The snouted cobra, *Naja annulifera*, a valid species in southern Africa. *J. Herpetol. Ass. Africa*, 44: 26-32.
- Broadley D.G., 1996. – A revision of the genus *Lycophidion* Fitzinger (Serpentes: Colubridae) in Africa south of the Equator. *Syntarsus*, 3: 1-33.
- Broadley D.G., 1999. – The southern African python, *Python natalensis* A. Smith 1840, is a valid species. *African Herp News*, 29: 31-32.
- Broadley D.G. 2000. – A review of the genus *Mabuya* in southeastern Africa (Sauria: Scincidae). *African Journal of Herpetology*, 49(2): 87-110.
- Broadley D.G. 2001. – A review of the genus *Thelotornis* A. Smith in eastern Africa, with the description of a new species from the Usambara Mountains (Serpentes: Colubridae: Dispholidini). *African Journal of Herpetology*, 50(2): 53-70.
- Broadley D.G. & Howell K.M., 1991. – A Check List of the Reptiles of Tanzania, with Synoptic Keys. *Syntarsus*, 1: 1-70.
- Broadley D.G. & Watson G., 1991. – A review of the worm snakes of southeastern Africa (Serpentes: Leptotyphlopidae). *Occ. Pap. natn. Mus. Rhod. Ser. B*, 5: 465-510.
- Channing A., (in press). – *Field guide to the frogs of Central and Southern Africa*.
- Channing A. & Griffin M., 1993. – An annotated checklist of the frogs of Namibia. *Madoqua*, 18(2): 101-116.
- Chippaux J.P., 1999. – *Les serpents d'Afrique occidentale et centrale*. Faune et Flore tropicales. IRD Editions, Paris.
- Daniel P.M. 1961. – Notes on the life history of *Agama agama africana* (Hallowell) in Liberia. *The Ohio Herpetological Society, Special Publication*, 3: 1-5.
- Duellman W.E. 1993. – *Amphibian species of the world: additions and corrections*. Univ. Kansas Mus. Nat. Hist., Special Publications No. 21, 372 pp.
- Duellman W.E. & Trueb L., 1994. – *Biology of Amphibians*. 2nd edition. The Johns Hopkins University Press, London, XXI + 670 pp.
- FitzSimons V.F., 1943. – *The Lizards of South Africa*. Transvaal Museum Memoir No. 1, Pretoria, XV + 528 pp + 28 plates.
- FitzSimons V.F., 1962. – *Snakes of southern Africa*. Mac Donald, London, 423 pp.
- Frank N., & Ramus E., 1996. – *A complete guide to scientific and common names of reptiles and amphibians of the world*. Reptile and Amphibian magazine, Pottsville, 377 pp.
- Frost D.R. 1985. – *Amphibian species of the world, a taxonomic and geographical reference*. The Association of Systematic Collections, Lawrence, Kansas, 732 pp.
- Frost D.R., 2000. – *Amphibian Species of the World: An online reference*. V2.20 <http://research.amnh.org/herpetology/amphibia/index.html> (1 September 2000).

- Gans C., 1959. – A taxonomic Revision of the African Snake Genus “*Dasypeltis*” (Reptilia: Serpentes). *Ann. Mus. R. Congo Belge, Terv. (sér. 8) Sci. Zoo.*, 74: 1-237 + Xpp + 13 pl.
- Gans C. & Richmond N.D., 1957. – Warning behaviour in snakes of the genus *Dasypeltis*. *Copeia*, 1957(4): 269-274.
- Grafe T.U., 1996. – Energetics of vocalization in the African reed frog (*Hyperolius marmoratus*). *Comparative Biochemistry & Physiology*, 114(3): 235-243.
- Grafe T.U. & Linsenmair K.E., 1989. – Protogynous sex change in the reed frog *Hyperolius viridiflavus*. *Copeia*, 1989: 1024-1029.
- Greer A.E. Jr., 1974. – The generic relationships of the scincid lizard genus *Leiopisma* and its relatives. *Aust. J. Zool.*, Suppl. Ser. 31: 1-67.
- Hailey A. & Coulson I.M., 1999. – The growth pattern of the African tortoise *Geochelone pardalis* and other chelonians. *Canadian Journal of Zoology*, 77(2): 181-193.
- Halliday T.R., 1996. – 6 *Amphibians*. In: W.J. Sutherland (Editor), *Ecological census techniques: a handbook*. Cambridge University Press, Cambridge, pp. 205-217.
- Heyer R.W., Donnelly M.A., McDiarmid R.W., Hayek L.A.C. & Foster M.S., 1994. – *Measuring and monitoring Biological Diversity. Standard Methods for Amphibians*, 1. Smithsonian University Press, 364 pp.
- Hodgson P.S. & Davidson T.M., 1996. – Biology and treatment of the mamba snakebite. *Wilderness & Environmental Medicine*, 7(2): 133-145.
- Houlahan J., Findlay C.S., Schmidt B.R., Meyer A.H. & Kuzmin S.L., 2000. – Quantitative evidence for global amphibian population declines. *Nature*, 404: 752-755.
- Howell K.M., 1982. – Geographic distribution – Sauria: *Eremias* cf. *neumanni* Tornier (Neumann's Sand lizard). *Herp. Review*, 13(2): 52.
- Hughes B., 1999. – Critical review of a revision of *Psammophis* (Linnaeus, 1758) (Serpentes, Reptilia) by Frank Brandstätter. *African Journal of Herpetology*, 48(1/2): 63-70.
- Inger R.F. & Marx H., 1961. – *The food of amphibians*. In: *Mission G.F. de Witte: Exploration du Parc National de l'Upemba*. Institute des Parc Nationaux du Congo et du Ruanda-Urundi, 64: 1-86.
- Jacobsen N.H.G., 1997. – Sub-order Sauria, family Agamidae. Page 6 in: van Wyk (Ed.), *Proceedings of the Fitsimons Commemorative Symposium, South African lizards: 50 years of progress and Third H.A.A. Symposium on African Herpetology held at the Transvaal Museum, Pretoria, South Africa 11-15 October 1993*. H.A.A., Cape Town, IX + 227 pp.
- Jacobsen N.H.G. & Broadley D.G. 2000. – A new species of *Panaspis* Cope (Reptilia: Scincidae) from southern Africa. *African Journal of Herpetology*, 49(1): 61-71.
- Jakobsen A. 1997. – A review of some East African members of the genus *Elapsoidea* Bocage with the description of a new species from Somalia and a key for the genus (Reptilia, Serpentes, Elapidae). *Steenstrupia*, 22: 59-82.
- Joger U., 1991. – A molecular phylogeny of Agamids lizards. *Copeia*, 1991: 616-622.
- Kabigumila J., 2000. – Growth and carapacial colour variation of the leopard tortoise, *Geochelone pardalis babcocki*, in northern Tanzania. *African Journal of Ecology*, 38(3): 217-223.
- Klaver C. & Böhme W., 1986. – Phylogeny and classification of the Chamaeleonidae (Sauria) with special reference to hemipenis morphology. *Bonn. zool. Monogr.*, 22: 1-64.
- Klaver C. & Böhme W., 1997. – Chamaeleonidae. *Das Tierreich*, 112(14): 1-85.

- Lambert M., 1985. – A-herping in Tanzania, but hardly in Loveridge's footsteps. *British Herpetological Society Bulletin*, 12: 19-27.
- Lambert M.R.K., 1987. – More of the herpetofauna in the Commonwealth (Ethiopian Zone). *British Herpetological Society Bulletin*, 21: 13-22.
- Lambert M.R.K., & Dewhurst C.F. 1998. – Gecko predation by skink observed in Tanzania., *British Herpetological Society Bulletin*, 62: 29-30.
- International Commission on Zoological Nomenclature 1999. – International Code of Zoological Nomenclature. ICZN, Padova, 306 pp.
- Laurent R.F., 1964. – *Reptiles et Amphibiens de l'Angola*, Subsídios para o estudo da biologia na Lunda. Companhia de Diamantes de Angola, Serviços Culturais, Lisboa, 165 pp.
- Laurent R.F., 1968. – A re-examination of the snake genus *Lycophidion* Duméril & Bibron. *Bull. Mus. comp. Zool. Harvard*. 136(12): 461-482.
- Laurent R.F., 1972. – Tentative revision of the genus *Hemiscus* Günther. *Annls. Mus. R. Afr. Cent. Sci. Zool.*, (8)194: 1-67.
- Lambiris A.J.L., 1989a. – A review of the amphibians of Natal, *Lammergeyer*, 39: 1-212.
- Lambiris A.J.L., 1989b. – *The frogs of Zimbabwe*, Monografia X. Museo Regionale di Scienze Naturali, Torino, 247 pp.
- Largen M.J., 1997. – An annotated checklist of the amphibians and reptiles of Eritrea, with keys for their identification. *Tropical Zoology*, 10: 63-115.
- Lönnerberg E., 1910. – 4. *Reptilia and Batrachia*. In: Sjöstedt Y. (Ed.), *Wissenschaftliche ergebnisse der schwedischen zoologischen Expedition nach dem Kilimandjaro, dem Meru und den umgebenden Massaissteppen Deutsch-Ostafrikas 1905-1906*. Band 1, Abteilung 1-7, Stockholm: 1-28 + 1 plate.
- Lönnerberg E. 1911. – Reptiles In: Andersson L.G. & Lönnerberg E. Reptiles, Batrachians and fishes collected by the Swedish Zoological Expedition to British East Africa 1911. *Kungl. Svenska Vetenskapsakademiens Handlingar.*, 47 (6): 1-24 + 1 plate.
- Loveridge A., 1925. – Notes of East African batrachians, collected 1920-1923 with the description of four new species. *Proc. Zool. Soc. London*, 1925 (2): 763-791 + 2 tav.
- Loveridge A., 1935. – Scientific Results of an Expedition to rain forest regions in Eastern Africa. I New Reptiles and Amphibians from East Africa. *Bull. Mus Compar. Zool.*, Cambridge, 79(1): 1-19.
- Loveridge A., 1936. – Scientific Results of an Expedition to rain forest regions in Eastern Africa. V Reptiles. *Bull. Mus Compar. Zool.*, Cambridge, 79(5): 209-337 + 9 pl.
- Loveridge A., 1936. – Revision of the African snakes of the genera *Dromophis* and *Psammodphis*. *Bull. Mus. comp. Zool. Harvard*, 87(1): 1-69.
- Loveridge A., 1953. – Zoological results of a fifth expedition to East Africa IV: Amphibians from Nyasaland and Tete. *Bull. Mus Compar. Zool.*, Cambridge, 110(4): 325-406.
- Loveridge A., 1957. – Check list of the Reptiles and Amphibians of East Africa (Uganda; Kenya; Tanganyika; Zanzibar). *Bull. Mus Compar. Zool.*, Cambridge, 117(2): 153-362 +XXXVI.
- Loveridge A., 1959. – On a fourth collection of reptiles, mostly taken in Tanganyika territory by Mr.C. J. P. Ionides. *Proc. zool. Soc. London*, 133(1): 29-44.
- MacKay A. & MacKay J. 1985. – *Poisonous snakes of Eastern Africa and the treatment of their bites*. A. & J. MacKay, Nairobi, 95 pp.
- Marais J., 1992. – *A complete guide to the snakes of Southern Africa*. Krieger

- Publishing Company, Malabar, Florida, 208 pp. + 210 plates.
- Meirte D., 1992. – Clés de détermination des serpents d'Afrique. *Musée Royal de l'Afrique Centrale, Sciences Zoologiques*, 267: 1-152.
- Meshaka W.E., 2000. – Colonization dynamics of two exotic geckos (*Hemidactylus garnotii* and *H. mabouia*) in Everglades National Park. *Journal of Herpetology*, 34(1): 163-168.
- Moodley G.K. & Biseswar R., 1997. – Reproduction in male *Hemidactylus mabouia* (Sauria: Gekkonidae). page 201 in: van Wyk (Ed.), *Proceedings of the Fitsimons Commemorative Symposium, South African lizards: 50 years of progress and Third H.A.A. Symposium on African Herpetology held at the Transvaal Museum, Pretoria, South Africa 11-15 October 1993*. H.A.A., Cape Town, IX + 227 pp.
- Moody S.M., 1980. – *Phylogenetic and historical biogeographical relationships of the genera in the family Agamidae (Reptilia: Lacertilia)*. Ph.D. thesis, University of Michigan, Ann Arbor, USA.
- Neças P., 1999. – *Chameleons, nature's hidden jewels*. Chimaira, Frankfurt am Main, 352 pp.
- Nishikawa K.C., Kier W.M., Smith K.K., 1999. – Morphology and mechanics of tongue movement in the African pig-nosed frog *Hemisis marmoratum*: A muscular hydrostatic model *Journal of Experimental Biology*. 202(7): 771-780.
- Passmore N.I. & Carruthers V.C., 1995. – *South African frogs. A complete guide*. Revised edition. Witwatersrand University press, Johannesburg, 322 pp.
- Passmore N.I., Carruthers V.C. & Zähringer J., 1995. – *South African frog calls, Passmore & Carruthers CD guide*. Megatone studios, Johannesburg, 4 pp + Audio CD.
- Patterson J.W., 1990. – Female reproductive cycles in two subspecies of the tropical lizard *Mabuya striata*. *Oecologia*, 84: 232-237.
- Perret J.L., 1975. – La différenciation dans le genre *Panaspis* Cope (Reptilia, Scincidae). *Bull. Soc. neuchateloise, Sci. Nat.*, 98: 5-16.
- Pitman C.R.S., 1974. – *A guide to the snakes of Uganda. Revised edition*. Whelon & Wesley, London, 290 pp.
- Poynton J.C., 1964. – Amphibia of the Nyasa-Lungwa region of Africa. *Senck. Biol.*, 45 (3/5): 193-225.
- Poynton J.C. & Broadley D.G., 1985a. – Amphibia Zambesiaca 1. Scolecomorphidae, Pipidae, Microhylidae, Hemisidae, Arthroleptidae. *Ann. Natal Mus.*, 26(2): 503-553.
- Poynton J.C. & Broadley D.G., 1985b. – Amphibia Zambesiaca 2. Ranidae. *Ann. Natal Mus.*, 27(1): 115-181.
- Poynton J.C. & Broadley D.G., 1987. – Amphibia Zambesiaca 3. Rachophoridae and Hyperoliidae. *Ann. Natal Mus.*, 28(1): 161-229.
- Poynton J.C. & Broadley D.G., 1988. – Amphibia Zambesiaca 4. Bufonidae. *Ann. Natal Mus.*, 29(2): 447-490.
- Poynton J.C. & Broadley D.G., 1991. – Amphibia Zambesiaca 5. Zoogeography. *Ann. Natal Mus.*, 32: 221-277.
- Rand A.S., 1958. – A new subspecies of *Chameleo jacksoni* Boulenger and a key to the species of three-horned chameleons. *Breviora*, 99: 1-8.
- Rand A.S., 1963. – Notes on the *Chamaeleo bitaeniatus* complex. *Bull. Mus. com. Zool., Harvard*, 130(1): 1-29.
- Richards C.M., 1981. – A new color pattern variant and its inheritance in some members of the superspecies *Hyperolius viridiflavus* (Duméril & Bibron), (Amphibia Anura). *Mobit. Zool. Ital.*, n.s. 15 suppl. (16): 337-351.

- Rödel M.O., 2000. – *Herpetofauna of West Africa. Vol. I Amphibians of West African Savanna*. Edition Chimaira, Frankfurt am Main, 334 pp.
- Rose W., 1962. – *The reptiles and amphibians of Southern Africa*. Maskew Miller, Cape Town, XXIX + 494 pp.
- Schiøtz A., 1975. – *The treefrogs of eastern Africa*. Steenstrupia, Copenhagen, 232 pp.
- Schiøtz A., 1999. – *Treefrogs of Africa*. Edition Chimaira, Frankfurt am Main, 350 pp.
- Schleich H.H., Kastle W. & Kabish, K., 1996. – *Amphibians and Reptiles of North Africa, biology, systematics, field guide*. Koeltz Scientific books, Koenigstein, 630 pp.
- Snelson D. & Bygott D., 1987. – *Arusha National Park*. Tanzania National Parks & African Wildlife Foundation, Nairobi, 52 pp.
- Stebbins R.C. & Cohen N.W., 1995. – *A natural History of amphibians*. Princeton University Press, Princeton, 316 pp.
- Stewart M.M., 1967. – *The amphibians of Malawi*. State University of New York Press, New York, 164 pp.
- Uetz P., 2001. – *Classification of living reptiles*, <http://www.embl-heidelberg.de/~uetz/LivingReptiles.html> (4th July 2001).
- Van Dijk D.E., 1997. – Parental care in *Hemisus* (Anura, Hemisotidae). *South African Journal of Zoology*, 32(2): 56-57.
- Vesey-Fitzgerald D.F., 1975. – A guide to the snakes of the Tanzania and Kenya borderlands. *Jl. E. Africa nat. Hist. Soc. & natn. Mus.*, 149: 1-26.
- Wieczorek A. M., Drewes R. C. & Channing A., 2001. – Phylogenetic relationship within the *Hyperolius viridiflavus* complex (Anura: Hyperoliidae), and comment on taxonomic status. *Amphibia Reptilia* 22(2): 155-165.
- Webb J.K., Shine R., Branch W.R. & Harlow P.S., 2000. – Life history strategies in basal snakes: reproduction and dietary habits of the African thread snake *Leptotyphlops scutifrons* (Serpentes: Leptotyphlopidae). *J. Zool. Lond.*, 250: 321-327.
- Young B.A., Lalor J. & Solomon J., 1999. – The comparative biomechanics of an ophidian defensive behaviour: head triangulation in hognose snake (*Heterodon*) and an egg-eating snake (*Dasypeltis*). *Journal of Zoology*, 248(2): 169-177.