

# Module # 4-Component # 2



## Objective

To gain a complete understanding of the very diverse entities of the group called **lizards**.

## Expected outcome

- ➊ Group this order taxonomically in the animal kingdom.
- ➋ Recognise all **230 South African species** as belonging to the **order Squamata**, based on external morphology.
- ➌ Gain an insight into thermoregulation as it relates to reptiles in general and lizards in particular.
- ➍ Categorise all South African species into their respective families.
- ➎ Have a general understanding of their ecology and their role in all ecosystems where they may be encountered.



*"Reptiles and amphibians are sometimes thought of as primitive, dull and dimwitted. In fact, of course, they can be lethally fast, spectacularly beautiful, surprisingly affectionate and very sophisticated."*

*—David Attenborough*

## Suborder: Sauria

### Origin and classification

The earliest fossil remains of lizards found so far date back to the **Carboniferous period (286-360 million years ago)**, whilst the earliest fossils of worm lizards date to the **Palaeocene** at about **65 million years** before the present. For more insight into the fossil record, please refer to **module # 1, component #2**.

Lizards are **classified** in the following way, as shown in this example of a striped skink:

<b>Kingdom</b>	Animalia	(Animal kingdom)
<b>Phylum</b>	Chordata	
<b>Class</b>	Reptilia	(Reptiles)
<b>Order</b>	Squamata	(Scaly ones)
<b>Suborder</b>	Sauria	(Lizards)
<b>Family</b>	Scincidae	(Skinks)
<b>Subfamily</b>	Lygosomatiinae	(Advanced skinks)
<b>Genus</b>	<i>Trachylepis</i>	(Typical skinks)
<b>Species</b>	<i>striata</i>	(Striped skink)

For more on how animals are classified, please refer to **module # 1, component # 1**.



**Typical striped skink**-*Trachylepis striata*



Lizards are distinguished from other reptiles by the following combination of characteristics:

- The majority have limbs with **claws** at the ends of the digits. Many genera have developed highly specialised digits, depending on their chosen habitat.
- All, **except the geckos**, have **moveable eyelids**.
- Most have **external ear openings**.
- Their **bodies** and **tails** are **elongated**.
- The **right lung** in **worm lizards** is **reduced** or **absent**.
- The majority **can shed** their tails.
- Ventral **scales** are always in **multiple rows**.
- Lower **jaw bones** are **fused** at the anterior edge.
- The **tongue** is usually **short, broad**, and **non-retractile**.

There are more than **4500 described species** and **subspecies of lizards worldwide**, with approximately **338 species** and **subspecies** in **48 genera** and **9 families** occurring in **southern Africa**.



**Drakensberg crag lizard**-*Psuedocordylus melanotus subviridis*

Lizards occur on all continents except Antarctica. Their **highest diversity** is in the **semi-arid parts** of **Australia** and **southern Africa**. Many lizards appear **restricted to their ranges by substrate** (rather than climatic factors like other vertebrates), with a lizard species bound to a particular rock or soil type. Accordingly, patterns and changes in the distribution of lizard species may be affected **by geological processes** as much as by **climate**, impacting the speciation of lizards in southern Africa.



The **sungazer**-*Smaug giganteus*, previously *Cordylus giganteus*, also known as the **giant girdled lizard**, **giant dragon lizard**, or **giant zonure**. Wild-caught sungazers are imported from South Africa to the US, Europe, and Japan, commanding high prices. Most of these animals are smuggled out of the country. They are **not accompanied by the CITES permits required** in legal exports/imports of the species. In its native South Africa, possessing a sungazer (or any other indigenous animal) **without a permit is illegal**. The sungazer is listed as **vulnerable** on The International Union for Conservation of Nature (IUCN) Red List of Threatened Species



## Reptile classification recap

**Kingdom:** Animalia

**Phylum:** Chordata

**Subphylum:** Vertebrata

**Class:** Reptilia

**Order:** Chelonia (Shield reptiles)

**Suborder:** Cryptodira (Tortoises, turtles)

**Suborder:** Pleurodira (Terrapins)

**Order:** Squamata (scaled reptiles)

**Suborder:** Amphisbaenia (worm lizards)

**Suborder:** Sauria (lizards)

**Family:** Agamidae (agamas)

**Family:** Gekkonidae (geckos)

**Family:** Varanidae (monitors)

**Family:** Gerrhosauridae (plated lizards)

**Family:** Chameleonidae (chameleons)

**Family:** Cordylidae (girdled lizards)

**Family:** Lacertidae (old world lizards)

**Family:** Scincidae (skinks)

**Suborder:** Serpentes (snakes)

**Family:** Pythonidae (pythons)

**Family:** Elapidae (cobras, mambas)

**Family:** Viperidae (vipers, adders)

**Family:** Colubridae (boomslang, vine snake)

\*Not all snake families are included here

**Order:** Crocodylia

**Family:** Crocodylidae



**Quartz gecko**-*Pachydactylus latirostris*

## Basic anatomy

The basic appearance of lizards is so familiar to most people that they do not require description.

**A few anatomical peculiarities are, however, listed here:**

- Most lizard species **shed their tails** when **threatened** or **attacked**. This is known as **autotomy**. The tail can often be **regenerated** after this damage.
- Worm lizards are highly **adapted to burrowing**. Their skins are loosely joined to their body. Therefore, they can thrust up and down in their skin to act as a 'battering ram'.
- **Chameleon species** have a **prehensile tail** (a tail with the ability to grip) which helps them hold onto vegetation whilst feeding.
- Lizards regularly **shed their skins** since this does not grow along with the individual. Unlike snakes, however, the skin is usually **shed in pieces and is frequently eaten**.



**Yellow-throated plated lizard**-*Gerrhosaurus flavigularis*

## Colouration and markings

The colour and markings of most lizard species are designed to provide **maximum camouflage** within that species' chosen habitat. **Chameleons**, however, can **adapt their body colouration to match that of their surroundings**. These colours are generally in shades of green, brown and yellows. Special colour patterns are **displayed** in **courtship** or **threat** scenarios. Its colour may also change in response to **temperature** and other **environmental changes**. The colour change is controlled partly or entirely by the **sympathetic nervous system**. The initial impetus for a colour change will be in response to something the animal has seen.



Luke Kemp

**Flap-necked chameleon**-*Chamaeleo dilepis*

Unlike other reptiles, **male lizards** frequently show a **change of colouration during the breeding season**. These vivid colours are used as **territorial displays**. Therefore, this ability to change colour is **not only limited** to the family that contains the chameleons.



## Size

Lizards vary in size, ranging from the gigantic **Komodo dragon**, which reaches **3 m** [9.8 ft], down to the tiny **dwarf geckos**, which only attain **7 cm** [2.7 in].



**Komodo dragon**-*Varanus komodoensis*



**Spotted dwarf gecko**-*Legodactylus ocellatus*



## The origin of modern reptiles

The origin of modern reptiles is a **controversial** and **much-debated** topic. Some physical evidence supports several competing theories, but none conclusively or definitively enough **to satisfy everyone**.

The **2 main schools** of thought are that **modern reptiles evolved from dinosaurs** or that **they did not**. To determine which scenario is more likely, **palaeontologists** look to the **features of modern reptiles**, specifically **lizards** and compare them to the fossil characteristics of dinosaurs.

**How these groups differ:**

Characteristic	Dinosaurs	Modern reptiles
<b>Size</b>	Massive in many species	Mostly small
<b>Endothermy</b>	Possibly endothermic	Ectothermic
<b>Heart chambers</b>	4 (found in 1 specimen)	Always 3 (except for crocodylians)
<b>Lung structure</b>	Bird-like	Reptile-like
<b>Bipedalism</b>	Many examples	Almost absent
<b>Hip structure</b>	Bird-like	Reptile-like
<b>Colouration</b>	Assumed very variable	Not very variable

Since many of the characteristics of dinosaurs are 'possibilities' and not standard throughout the group, it is difficult **to draw concrete conclusions**.



Graeme Mitchley

**Southern tree agama**-*Acanthocercus atricollis*



## Senses

Lizards generally have a **well-developed sense of smell**. The **monitor lizards** use their tongues for scent in the same way as snakes. Scent particles are transferred to the **Jacobson's organ** (situated on the roof of the mouth) by the tips of the tongue. **Sensory epithelial cells** then interpret the message.



Mariette Pressly

**Rock monitor-***Varanus albigularis*

Most lizards have very **acute eyesight**, which they **use to detect predators and prey**. Since the males of many species **show bright breeding colours**, it has been **assumed** that some lizards can **see colours in some ranges** of the spectrum. The **external ear** opening of lizards is adapted to allow them to **hear quite well**. **Chameleons have poor hearing** because they **do not have a well-developed middle ear**. Hearing is mainly used to detect **the approach of predators**.

## Feeding habits

Lizards have stout, **conical peg-like teeth** that enable them to **crush their prey** before swallowing it. Their jaws are well-developed and are often powered by very **strong muscles**, another adaptation enabling them to crush the **exoskeleton** of their chosen insect prey. Only the **monitor lizards** show any ability to **swallow extremely large prey**.

**All lizard species in southern Africa are carnivorous** and prey on various **insects, scorpions, spiders, amphibians, mammals, birds, fish, bird's eggs**, and other **lizards**. Their digestive juices are very strong but are **incapable of digesting keratin**, the substance comprising the exoskeleton of insects. Most lizards simply **rush up** to their prey, **seize it** and **crush** the entire body in a rapid chewing motion up and down the body. The prey is swallowed thereafter. After feeding, lizards often **rub their mouths on the ground** to wipe off any body fluids and dirt that may have accumulated there.

**Chameleons** show the remarkable ability to shoot their **tongues** out to capture prey. This is achieved by a special arrangement of bones and muscles on the floor of the mouth. Contrary to popular belief, **chameleons do not roll up their tongues**.



**Veiled chameleon**-*Chamaeleo calytratus*  
Native to the Arabian Peninsula in Yemen and Saudi Arabia.



## Reproduction

Male lizards have **paired copulatory organs** known as **hemipenes**. These lie on either side of their tail just behind the cloaca and are retracted into the body when not in use. Before copulation, the hemipenes are **projected forwards**. They are **turned inside out** by a muscle attached to the end of each organ. Copulation takes place with **only 1 of the pair** of hemipenes penetrating the cloaca of the female.

Most species of **lizards** are **oviparous** and lay eggs that are like those of snakes in that they are covered in a **parchment-like material**. The eggs are laid and left to **incubate under natural conditions**.



**A female flap-necked chameleon-*Chamaeleo dilepis* digging her nest**





**Digging a nesting chamber**



**Laying her eggs, after which she will cover them**



Other species, however, **retain the eggs within the body cavity** until incubation is complete and, after that, give birth to **live young**. This is known as **ovoviviparous**. In addition, some **gecko species** have **communal egg-laying sites** and congregate there to mate and lay eggs.



A new life emerges from a **variable skink**-*Trachylepis varia*

## Defence

**Lizards** are not usually able to defend themselves successfully from predators since they are so small. Therefore, most species rely on **agility** and **speed** to **escape predation**. If this is not successful, many species can **shed their tails**, which begins to wriggle around once free of the body. This movement is aimed at **attracting the attention of the predator** and thereby allowing the lizard to escape. Should a lizard be grasped by the tail by a predator, the same system of **autotomy** is implemented. Other species of lizards have developed warning signs to scare would-be predators.

**Chameleons hiss**. They gape their mouths and inflate their bodies to make themselves look large and dangerous. They also **change their colour to black** to appear more intimidating. Chameleons change colour by expanding and contracting pigment cells in their skin in response to changes in light intensity and their emotional state. These colour changes originate in special cells under the epidermis called **chromatophores** and **melanophores**. Both are **specialised skin cells with pigments** inside them. **Nerves control the rearrangement of pigments** under the skin. Chameleons **do not consciously choose** to turn a particular colour. Instead, it is a physiological **response to external stimuli**.



**Flap-necked chameleon-*Chamaeleo dilepis***

- Some species of **worm lizard wave their tail** around in the air if cornered by a predator. This is to **attract attention to it** rather than to their more **vulnerable head**.
- **Monitor lizards will hiss** and **lash out** with their tails at predators. Should they be attacked, they often **bite** and **scratch viciously** and **empty their bowel** content over the attacker. If this does not deter the predator, they sometimes **play dead**, hoping that the attacker will lose interest in them.



## Thermoregulation and hibernation

**Lizards are ectothermic.** This means that **external conditions determine their body temperature.** Therefore, temperature regulation is carried out by the lizard positioning itself to take advantage of direct, convected or conducted heat. This allows it to adopt its ideal operating temperature. If the temperature gets too high, the animal will remove itself from all heat sources until the correct temperature is again reached.

Most species of lizards (and indeed reptiles in general) prefer conditions ranging from about **25-30°C [77-86°F]**. At temperatures below **21°C [70°F]**, lizards become **inactive**. Most lizards **hibernate** during the cold winter season, surviving on large **fat reserves** they build up during the summer. Hibernation is characterised by a **reduction in the speed of all body functions**. In warmer areas of the country, some species do not hibernate but are simply inactive on the very coldest or overcast days.



**The endangered Pondo or Transkei dwarf chameleon-*Bradypodion caffer***

## Venomous lizards

Of the **3700** or so species worldwide, there used to be only **2 species** classified as **venomous**, both found in the Americas. These are the **Gila monster** and the **Mexican beaded lizard**.



**Gila monster**-*Heloderma suspectum*

Southern African lizards are **not considered venomous**. However, recent research revealed that the group of lizards most closely related to snakes do produce toxins in their saliva. This reptile group, including all **snakes**, is referred to as the '**Venom Clade**' and includes the **agamans, chameleons, and monitors** in **southern Africa**. All studied examples displayed **salivary glands producing toxins with a venomous action**.

### An important update:

The **Komodo dragon**, found on the island of Komodo east of Java, was initially believed to be venomous, but later this assumption was overturned, and the '**venom effect**' was then attributed to its **vile saliva**, which teemed with over **80 species** of bacteria, a product of carrion rotting between its teeth. Those bitten by a Komodo dragon experience effects that range from shock, massive bleeding and neurotoxicity within the first few hours and then **death**. Curiously, no other known bacteria work in this manner.

Enter Bryan Fry PhD (Dept. Of Biochemistry University of Melbourne, Australia), whose research has found that **the Komodo dragon has the same venom glands found in snakes**.



Using magnetic resonance imaging to scan the head of a Komodo dragon, researchers noticed that it has **large bulges along the lower jaws** on either side of its head. This revealed an arrangement of **venom glands like those found in snakes**.

The lizard's sharp, serrated teeth **open wounds into which the venom flows from the gland that runs along the jawline**. The venom acts as an **anticoagulant, increasing the blood flow and reducing blood pressure**, sending the victim into **shock**. As a result, the victim's **blood cannot clot**, and it bleeds to death. The venom makes the animals formidable killers, even though their bite is much weaker than that of a crocodile. 'The teeth and the venom work in perfect harmony,' said Fry, the head of the international team whose research on the lizard's killing powers is published in the US journal Proceedings of the National Academy of Sciences.



**Komodo dragon-***Varanus komodoensis*

The venom is **as potent** as those found in the world's most venomous snake, **Western Australia's inland taipan**. Typically, snakes have a **single venom duct** that leads to their fangs. But Komodos have **multiple ducts located between their teeth**. However, this means Komodo dragons do not deliver their venom as efficiently as snakes. Rather than injecting venom directly via a forceful bite, **the dragons use a specialised bite-and-pull motion to ooze the toxin into wounds** during a sustained, frenzied attack.

## Lizard families in southern Africa

Southern African lizards and worm lizards are divided into the following **families**:

### Tropical worm lizards-*Amphisbaenidae* of the suborder *Amphisbaenia*\*

Small, highly specialised burrowing reptiles capable of burrowing in extremely hard ground. **All are limbless**. All **lack external ear openings** and have **rearward-facing nostrils** to **prevent the ingress of dirt** during burrowing. Scales are arranged in **annuli** (rings), giving them an **earthworm-like appearance**. The annuli that cover the body are made up of **smooth square scales**, with **2 annuli for each vertebra** of the body. The skin is loosely attached to the body and can move independently to facilitate burrowing. Most species prey on **termites** and other **soft-bodied invertebrates**. **Some species lay eggs**, while **others** appear to **give birth to live young**.

\*Amphisbaenians were historically classified as lizards but then subsequently placed in a separate suborder within the Squamata named Amphisbaenia. However, recent molecular evidence reveals a close relationship between amphisbaenians and lacertid lizards. Therefore, they are considered **highly specialised burrowing lizards**. Internally, amphisbaenians show many derived characteristics, including a reduced right lung, a unique middle ear, vestigial eyes, and backwards-pointing nostrils.

**4** of the **18 genera** and **17** of the **154 species** are found in southern Africa.



**Van dam's dwarf worm lizard**-*Zygaspis vandami*



## Chameleons-*Chamaeleonidae* of the suborder Sauria

All have **protruding, independently moveable eyes** which are very mobile. Their eyes are **large** and **turreted** (having a long spiral shape), with a **thick granular lip** and a small opening in the **middle for the pupil**. They all have **laterally compressed bodies**. Their **scales are small** and **granular** and **do not overlap**. Their **limbs are long** and **well-developed**. The **digits of their feet are opposable** and able to exert a strong grip for climbing. Their **tail is prehensile** and **not sheddable**.



Graeme Mitchley

### Flap-necked chameleon-*Chamaeleo dilepis*

Their tongue is telescopic and can be protruded for a distance greater than the body length. Most species are **arboreal and diurnal**. All display the ability to change colour according to the surroundings. **Both egg-laying** and **viviparous** species exist. South Africa's dwarf chameleons give birth to **5-20 live young** after mating in spring. They produce **2-3 litters per season**. This differs from the *Chamaeleo* species (the flap-neck and Namaqua chameleons), **who lay eggs**.

Chameleons are found throughout Africa, Madagascar, the southern Arabian Peninsula, southern Spain, southern India, and Sri Lanka. Fossils indicate that they were once more widespread.

Today, there are **8 known genera** with **162 species**, with **19 species** known in southern Africa.

- **Cape dwarf chameleon**-*Bradypodion pumilum*
- **Drakensberg dwarf chameleon**-*Bradypodion dracomontanum*
- **Eastern Cape dwarf chameleon**-*Bradypodion ventrale*
- **Elandsberg dwarf chameleon**-*Bradypodion taeniabronchum*
- **Flap-neck chameleon**-*Chamaeleo dilepis*
- **Kentani dwarf chameleon**-*Bradypodion kentanicum*
- **Knysna dwarf chameleon**-*Bradypodion damaranum*
- **KwaZulu dwarf chameleon**-*Bradypodion melanocephalum*
- **Little Karoo dwarf chameleon**-*Bradypodion gutturale*
- **Namaqua chameleon**-*Chamaeleo namaquensis*
- **Natal Midlands dwarf chameleon**-*Bradypodion thamnobates*
- **Pondo dwarf chameleon**-*Bradypodion caffer*
- **Qudeni dwarf chameleon**-*Bradypodion nemorale*
- **Setaro's dwarf chameleon**-*Bradypodion setaroi*
- **Swartberg dwarf chameleon**-*Bradypodion atromontanum*
- **Western dwarf chameleon**-*Bradypodion occidentale*
- **Wolkberg dwarf chameleon**-*Bradypodion transvaalense*



**Southern dwarf chameleon**-*Bradypodion ventrale*



The most significant threat to chameleons is **habitat transformation**. Removing natural vegetation to make modern developments such as malls, golf courses, housing developments, and agriculture causes habitat loss and fragmentation. Chameleon species have evolved in response to specific habitat conditions, and some species are highly sensitive to habitat changes. Therefore, habitat alterations not only decrease their numbers but may also bring about their local extinction.



**A sleeping Setaro's dwarf chameleon-*Bradypodion setaroi***

**Flap-neck chameleon-interesting facts:**

- Body length of about **150 mm** [5.9 in].
- Has a strongly **prehensile tail** equal to the length of its body.
- The common name is derived from the **occipital flap** extending from the posterior edge of the head, covering part of the neck. However, the size of this flap varies over its range. It is almost lacking in some populations, especially in the south-eastern parts of its range.
- Taxonomists used this variation in flap size to form several varieties. However, there are no clear boundaries between large-and small-flapped populations, with flap size also depending on sex and age, with males having the largest flaps.
- Renowned for its ability to **change colour**, varying from almost black when stressed through all shades of green, yellow, and brown. Handling usually induces black spots over the whole body. When on the move, the body is usually covered in light or dark green blotches. The body becomes a **faded whitish green** or **yellow when asleep**.



**Flap-necked chameleon**-*Chamaeleo dilepis*



- The skin between the scales on the throat of adult males is **usually orange**, with this interstitial skin being on display against rivals.
- They respond to danger by **inflating their bodies**, hissing, gaping, and changing their colour to dark mottled shades. When highly agitated, the occipital flaps are raised forward.
- They also employ colour change for **thermoregulation**.
- Males have a pronounced swelling at the base of the tail and a small spur projecting backwards on each hindfoot.
- In the late summer, females lay **25-60 small eggs** in a self-dug hole. Egg-laying takes much time due to the slow and deliberate manner this is done. First, eggs are deposited in layers, with each layer being covered with soil. Once the clutch is laid, she fills the hole and pats down the surface carefully.
- Eggs can incubate for **almost a year**, only hatching the following spring or summer.



**Flap-necked chameleon**-*Chamaeleo dilepis*

## Agamas-Agamidae

These are stout, triangular-headed lizards with small **granular body scales**. **Tails are short and thin** and **not sheddable**. Pupils are round, and **eyelids are moveable**. Some species show the **third eye** or **pineal eye**. **Limbs are well-developed**, and digits have **strong recurved claws**. All are active, diurnal species, with most being rock-dwelling, although some are arboreal. Most species are insectivorous, with some species in southern Africa feeding on **ants** and **termites**. Males develop distinct breeding colouration and are quite territorial. **Males tend to grow larger than females** and display head bobbing and body posturing to rivals and females. Although well-established hierarchies keep fighting to a minimum, rival male **southern tree agamas** can engage in **savage battles**. Females lay an average of **10 eggs** in a clutch in midsummer, which hatch after about **2 months**.

**12 species** belonging to **2 genera** occur in southern Africa.



**Southern rock agama**-*Agama atra*



**Southern African species:**

- **Anchiera's agama**-*Agama anchietae*
- **Etosha agama**-*Agama etoshae*
- **Ground agama**-*Agama aculeata*
- **Kirk's rock agama**-*Agama kirkii*
- **Knobel's agama**-*Agama atra knobeli*
- **Makgadikgadi spiny agama**-*Agama hispida ssp. makarikarika*
- **Mozambique agama**-*Agama mossambica*
- **Namibian rock agama**-*Agama planiceps*
- **Peter's ground agama**-*Agama armata*
- **Southern rock agama**-*Agama atra atra*
- **Southern spiny agama**-*Agama hispida*
- **Southern tree agama**-*Acanthocercus atricollis*



**Southern rock agama**-*Agama atra*

## Geckos-*Gekkonidae*

Geckos have **only small scales on the head**, and their teeth are small, numerous and cylindrical. Their eyes are usually large, especially in nocturnal species. **All have fixed eyelids** and **clean their eyes with their tongues**. **All species are vocal**, the **only reptiles in which this ability is well-developed**. Toes are highly adapted and may be **webbed**, **sticky** or **fringed** depending on the substrate on which the species is found. Many have **pads under their digits**. These pads consist of **minute hairs** that adhere strongly to many substrates, **even smooth glass**, allowing them access to a wide variety of microhabitats.

The **skin is shed periodically**, coming off in patches which the gecko then eats. **All are oviparous**, typically laying clutches of **2 hard-shelled eggs** with more than **1 clutch** occasionally being laid in a season. **All have tails that can be shed**. The **majority are nocturnal**. **Geckos can store calcium inside glands inside the neck**.

Geckos occur throughout **warmer parts of the world** (although they can live in much colder climates than other reptiles), with **over 1130 species** belonging to **108 genera**. This is the most speciose lizard family in southern Africa, with **15 genera** and **4 111 described species**. The gecko assemblage in southern Africa is exceptionally diverse, and some of the lineages appear to be ancient.



**Wahlberg's velvet gecko**-*Homopholis whalbergii*



**Southern African geckos:**

- Barking geckos: 3 species
- Common geckos: 5 species
- Day gecko
- Delicate geckos: 3 species
- Dune geckos: 3 species
- Dwarf geckos: 12 species
- Festive gecko
- Flat geckos: 15 species
- Giant ground gecko
- Ground geckos: 2 species
- Large-headed geckos: 2 species
- Large-scaled geckos: 2 species



**Quartz gecko**-*Pachydactylus latirostris*

- Leaf-toed geckos: 10 species
- Marico gecko
- Namib day geckos: 6 species
- Peringuey's coastal leaf-toed gecko
- Rough-scaled geckos: 4 species
- Smooth geckos: 4 species
- Spotted geckos: 3 species
- Tropical house geckos: 4 species
- Tubercled geckos: 3 species
- Velvet geckos: 2 species
- Western geckos: 22 species



**Rough thick-toed gecko**-*Pachydactylus rugosus*



### Tropical house geckos-interesting facts:

- The **4 species** that make up this group are all relatively closely related and similar in appearance.
- **Body length: 60-90 mm** [2.4-3.5 in].
- Scales on the body are granular and interspersed with large tubercles.
- **Original tails are slightly longer than the body** and have **6 longitudinal rows** of enlarged, backwards-pointing tubercles. **Regenerated tails lack these tubercles.**
- **Each toe** has a **retractable claw**.
- **Able to change colour** (individuals that live around security lights that remain on all night are usually very pale, even almost translucent).
- May occur in dense colonies of **20 or more** individuals in a single rock crevice.
- Although natural populations may occur on large trees, they are **commensal with humans**. They are extremely common on buildings and building rubble and other **artificial microhabitats**. They are especially common in buildings with security lights that attract insects at night.



**Tropical house gecko**

- They tend to be **very vocal**, communicating with each other by making a 'tek-tek-tek' call. If calls do not keep intruders at bay, they will bite rivals to defend their favourite feeding spot.
- They often appear to **outcompete other gecko species** too, due to their fierce competitiveness.
- Each female lays **2 hard-shelled eggs** at a time in communal depositories under bark, rocks, debris, or crevices. A female may lay several clutches in a season.
- **2 species** of tropical house geckos on Pacific islands are **parthenogenic**, meaning **they can reproduce without sex**. These are **all-female populations** that produce offspring that are genetic clones of their mothers. Many **parthenoforms arise due to hybridisation** between **2 normal sexual species**. Many also have a condition known as **polyploidy**, referring to a **double chromosome number**.



**Common tropical house gecko**-*Hemidactylus mabouia*



## Monitors- *Varanidae*

This family contains the **largest lizards in the world**. All have **muscular bodies and tails**, and their **limbs are strong** and **armed with well-developed claws**. Their **tails tend to be longer than their body**, being used as a **whip in self-defence**. **Tails cannot be shed** or regenerated if damaged. Their **tongues are forked** and **retractable**. **Ear openings are distinct**. Their **eyes are well-developed** with **round pupils**, and their **eyelids are moveable**. Many species are **semi-aquatic**. **All are oviparous** and **lay their eggs in termite mounds**.



**Water monitor-***Varanus niloticus*



Graeme Mitchley



**Rock monitor or tree monitor or white-throated monitor -*Varanus albigularis***



The **single genus** *Varanus* includes about **59 known species**, of which **2 species** are found in southern Africa. They are **the largest in the region**.

- **Rock monitor** or **tree monitor** or **white-throated monitor** -*Varanus albigularis*
- **Water monitor** or **Nile monitor** -*Varanus niloticus*

Rock monitor	Water monitor
Body about <b>800 mm</b> [31.5 in].	Body just under <b>1000 mm</b> [39.4 in].
Their <b>tail</b> is more <b>cylindrical</b> , just a little longer than the body.	Their <b>tail</b> is <b>laterally compressed</b> and 1,5 times the body length.
<b>Habitat: land</b> and <b>trees</b> .	<b>Habitat: land</b> and <b>water</b> .
<b>Cryptic colouration</b> .	<b>Yellow spotting</b> and blotching over the body.
Their <b>head</b> is <b>angular</b> and <b>box-like</b> with a <b>bulbous snout</b> .	<b>Snout</b> is <b>elongated</b> , dorsally concave and more <b>pointed</b> .



## Skinks- *Scincidae*

Most skinks are terrestrial, rock-living or fossorial, being generally diurnal and very active. Many of the fossorial or semi-fossorial species have reduced limbs, with several species having lost all evidence of limbs. Skinks are cosmopolitan, with the highest species diversity in Australia, southern Asia, and Africa. They also occur on many islands in the Indian Ocean.

**Scales are tight-fitting, smooth, and overlapping, often appearing iridescent.** Their head is not usually distinct from the neck and is covered with large symmetrical head scales. Their stout neck and cylindrical body result in a robust body form. **All species can shed and regenerate their tails. Some species lay eggs, but many are live-bearing.** They have even developed their own equivalent of a placenta to nourish the developing young. **Most skinks actively hunt invertebrates** for food.

A total of **127 genera** with over **1305 species** occur worldwide. They are second only to geckos in species richness in southern Africa, with **10 genera** and **74 species** currently described.



**Striped skink**-*Trachylepis striata*



### Southern African skinks:

- Legless burrowing skinks: 22 species
- Snake-eyed skinks: 2 species
- Legless dwarf burrowing skinks: 10 species
- Short-legged dwarf burrowing skinks-13 species
- Writhing skinks: 3 species
- Typical skinks: 23 species



**Giant legless skink**-*Acontias plumbeus*



### Specialised species features:

- **African legless skinks** are specialised burrowing skinks.
- **Blind legless skinks** have adaptations for living underground and have almost lost their eyes.
- **Old World skinks** are burrowing and very secretive.
- **Advanced skinks** are a diverse group, including the **typical skinks**, **writhing skinks**, and **snake-eyed skinks**, all of which have legs.
- Important species to know are the **rainbow skinks** and **striped skinks**.



**Sundevall's writhing skink**-*Mochlus sundevallii*



### Snake-eyed skinks-Interesting facts:

There are only 2 species in southern Africa:

- **Spotted-neck snake-eyed skink**-*Panaspis maculicollis*
- **Wahlberg's snake-eyed skink**-*Panaspis wahlbergi*



**Wahlberg's snake-eyed skink**-*Panaspis wahlbergi*

- Occur in the **northern** and **eastern parts** of southern Africa.
- Small cylindrical bodies with smooth, shiny scales.
- **Very slender**: about **50 mm** [2 in] long, but only **6 mm** [0.2 in] wide.
- Although each limb usually has **5 toes**, the **legs are small**, and some toes may be missing on some limbs. Lack of toes in some individuals may be genetically based, as it is prevalent in certain populations.
- The **eyelids are permanently fused**, and a **transparent lower eyelid covers the eye**. They are, therefore, **unable to blink** like snakes (hence their common name).
- During mating season (August to December), males develop a **bright reddish-orange colour** on their neck and belly.
- The **2 southern African species** were once considered **1 species** until a detailed taxonomic investigation in **2000** proved them to be different species, based mainly on **the shape of the scales under their feet**.
- **Able to 'swim'** through grass or leaf litter without much aid from their legs.
- **Active foragers** of **small invertebrates** like **ants, termites, small woodlice, and crickets**.
- Females lay **2-6 soft-shelled eggs** per clutch under logs or in leaf litter. Communal clutches numbering over **30 eggs** have been recorded. After **about a month** of incubation, hatchlings literally 'burst' out of their eggs and **begin foraging almost immediately**.



**Wahlberg's snake-eyed skink**-*Panaspis wahlbergi*



## Girdled lizards-*Cordylidae*

Cordylids are **generally robust lizards** with **large distinct heads** and **stout limbs**. **Slenderisation** has occurred in **1 group of grass specialists** (the **grass lizards**) and **dorsoventral flattening** in a group of **rock-living species** (the **flat lizards**). Most species are **strictly rock-dwelling**, but **some are terrestrial** or **arboreal**. **All species are diurnal**. **Body scales** are usually **overlapping, rectangular plates** that may or may not be **heavily keeled** and **armoured**, and arranged in longitudinal and transverse rows (girdles).

Their **head** is usually covered with **rugose bony dermal plates above** and **large symmetrical scales below**. Their **eyes** and **ears are well-developed**. Their **eyelids** are well-developed and **moveable**. Their body is normally **dorso-ventrally depressed** with a lateral fold in the skin, running from the armpit to the back legs. Their **tail has regular whorls** or **rings of spinose** or **strongly keeled scales**. Tails are only shed when physically grasped, but they **do not regenerate**. Most species **give birth to live young**, but **flat lizards lay eggs**.

**Cordylids are restricted to Africa**, with their highest species richness in southern Africa, with **4 genera** and **53 species** known in the region.



**Van Dam's girdled lizard-*Smaug vandami***

## Southern African Cordylids:

- Crag lizards: 8 species
- Flat lizards: 13 species
- Girdled lizards: 28 species
- Grass lizards: 3 species
- Sungazers



**Jone's girdled lizard-*Cordylus jonesi* with recently born young**  
Girdled lizards give birth to live young



## Plated lizards-*Gerrhosauridae*

Plated lizards occur in Africa, south of the Sahara and Madagascar. They are generally **large** and **robust lizards**, but some species have undergone **extensive slenderisation** (grass swimmers and sand swimmers). Their **head** is covered with **large symmetrical scales**. Their **body is covered with large rectangular overlapping plates** arranged in longitudinal and transverse rows. A **prominent lateral body fold** runs from the back of the jaw to the hindlegs. Their **ear is distinct** and **usually exposed** but is partially covered with a tympanic scale in some species. All species have **prominent eyes** and **moveable eyelids**. **Most are diurnal**, and **all lay eggs**.

The **2 subfamilies** include **5 genera** and at least **32 species**, of which **3 genera** and **13 species** occur in southern Africa.

### Southern African plated lizards:

- **Desert plated lizard**-*Gerrhosaurus skoogi*
- **Dwarf plated lizard**-*Cordylus subtaenulatus*
- **Seps: 5 species** (Sadly, **Eastwood's long-tailed seps** is regarded as **extinct** and listed as such by the IUCN)
- **Typical plated lizards**-**6 species**



**Yellow-throated plated lizard**-*Gerrhosaurus flavigularis*



## Old World lizards-*Lacertidae*

All have **slender bodies, elongated tails, and well-developed limbs with claws**. Most have **small granular dorsal scales** and **large rectangular ventral scales** arranged in regular transverse and longitudinal rows. Their **head scales** are **large** and **symmetrical**. Tails are usually much longer than their body and may be shed and rapidly regenerated. Most are active and **diurnal**. Most species are terrestrial, but some are known to be **fossorial or arboreal**. All **southern African species are oviparous**.

Lacertids comprise **2 subfamilies** with a total of **31 genera** and over **279 species**. **37 species** are known in the region. Current research suggests several cryptic species exist, and the count is likely to increase in the future.



**Bluetailed sandveld lizard**-*Nucras caesicaudata*



**Common Lacertids in southern Africa:**

- **Mountain lizards: 4 species**
- **Rough-scaled lizards: 3 species**
- **Sand lizards and related species: 27 species**



**Delalande's sandveld lizard**-*Nucras lalandii*

**Bushveld lizard-interesting facts:**

- Has **well-developed legs**, especially hindlegs, for speed.
- Their **head is distinct from the body**, with a **well-defined collar across the throat**. This collar is a fold of skin that gives the appearance of a cut across the neck.
- Terrestrial and diurnal.
- **Active foragers** of prey or ambush hunters.
- **Bimodal activity pattern**: in summer, they are more active during the early morning and late afternoon, but in winter, they are active during midday.
- **Can shed their tail** if grasped by a predator, but the tail **does not regenerate**.
- **Hatchlings have very different colours** from the adults, a black body with white spots and a brown tail to blend with the substrate. **Adults are typically brown** with stripes.
- The **colouration** and very unusual **stiff-legged walk** of juveniles suggest that they **mimic oogpister beetles** (*Anthia*). Oogpister beetles can deliver a nasty bite and squirt formic acid up to **350 mm** [13.8 in] when threatened. This mimicry is thought to provide the young lizards with some measure of protection from predators.
- Females lay **1-9 soft-shelled eggs** during the summer months in burrows excavated under rocks or bushes. Several clutches may be laid in a season.



**Bushveld lizard**-*Heliobolus lugubris*