CHAPTER FIVE
REPTILES

Reptilia: Amniotic Ectothermic tetrapods

The class name refers to the mode of locomotion (L., repere or reptum = to creep or crawel). **Herpetology** (from Greek "herpien" meaning "to creep" and herpeton = reptile) is the branch of zoology concerned with the study of amphibians and reptiles. Extant reptiles range in size from a tiny gecko that grows to only 1.6 Cm to the salt water crocodile which may reach 6 meters in length and weigh over 1000kg.

Over 7000 species of reptiles now live on earth. Reptiles represent the first class of vertebrates fully adapted for life in **dry** places on land. Their success in leaving the water is due to the following characteristics:

1. The scaly cornified skin.
2. Claw-toed limbs.
3. The egg is covered with shell.
4. Extra embryonic membranes (yolk sacs, amnion, chorion and allantois) appear during development.
5. Internal fertilization and the male mostly has copulatory organ.
6. Direct development.

General characteristics

1. Predominantly terrestrial, creeping or burrowing, mostly carnivorous. They are ectothermic (cold-blooded) vertebrates.
2. Body divisible into 4 regions: head, neck, trunk and tail.
3. Exoskeleton of horny epidermal scales, shields, plates and scutes.
4. Skin dry, cornified and devoid of mucous glands.
5. Jaws bear simple conical teeth, in **turtles**' teeth replaced by horny beaks.
6. Limbs 2 pairs, pentadactyle. Digits provided with horny **claws**, however limbs absent in a few lizards and most snakes.
7. Lateral line system absent. Jacobson's organ (accessory olfactory organ) present in the roof of mouth.
8. Alimentary canal terminates into a cloaca.
9. Sexes separate. Male is usually mostly with muscular **copulatory organ**.
10. Fertilization internal. Mostly oviparous. Large yolky egg, covered with a shells, always lay on land. Embryonic membranes appear during development.
11. No metamorphosis. Young resembles adult (direct development).

12. Gill pouches are present only in the embryo and respiration is entirely by means of lung except in certain aquatic turtles in which cloacal respiration is employed as well.

Classification

In 1895 herpetologist separated Reptilia from Amphibia as a different class. They classified reptile especially in the bases of the skeletal features. The major characteristic feature is the fossa (opening) of the temporal or posterolateral region of the skull. On the basis of absence or presence of fossa or fossae of the reptilian skull, they are classified into 5 subclasses, **(Fig. 1),** and only four living orders are mentioned.

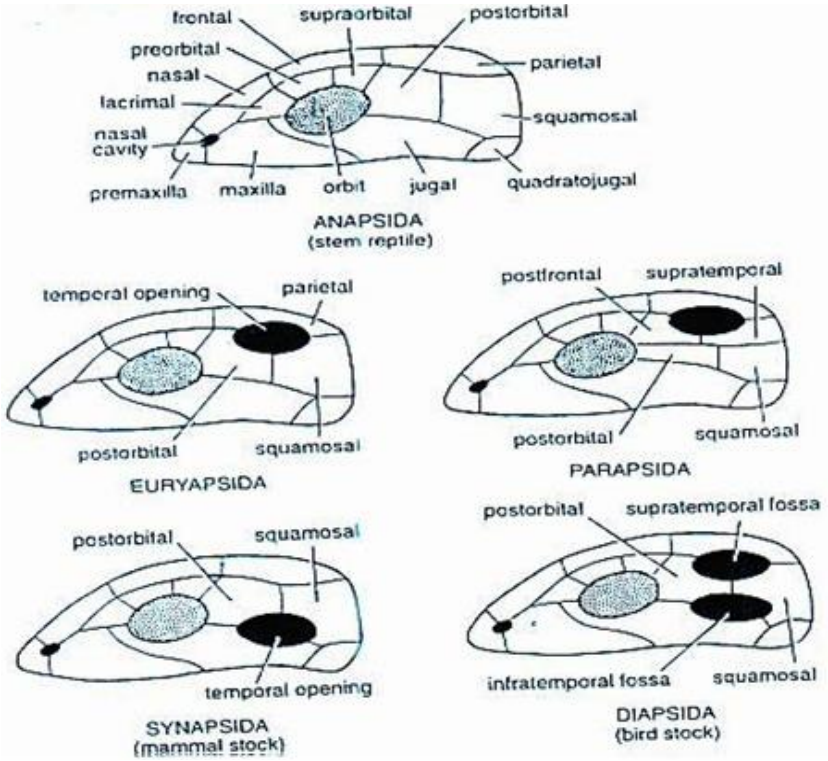


FIGURE 1: Five types of skulls in lateral view in 5 subclasses of reptiles.

Subclass I. Anapsida

Primitive reptiles with a solid skull roof. No temporal opening.

Order 1. Chelonia or Testudinata (Gr.,chelone = turtle ; L., testudo = turtle)

Special features

1. Body short, broad and oval.

2. Teeth are absent and the jaws are covered by horny sheaths form a sharp beak.
3. Body encased in a firm shell of dorsal **carapace** and ventral **plastron**, **(Fig.2)**. They made of dermal bony plates, the shell is externally protected either with polygonal scutes or leathery scales. Thoracic vertebrae and ribs usually fused to carapace.

A B

FIGURE 2: A-Carapace: the dorsal half of the chelonian shell. B-Plastron: the ventral half of the shell.

4. Many of chelonian members can pull their head and legs into the shell as well, for total protection from predators.
5. Weak limbs are pentadactyle and in some marine species modified into paddles.
6. Cloacal aperture is longitudinal slit.
7. The male possesses a copulatory organ that remains attached to the ventral wall of cloaca.
8. These are oviparous animals.
9. This order includes about 400 species of marine turtles, freshwater terrapins and terrestrial tortoises.

Examples: turtle, terrapin, tortoise. Turtle is the umbrella term for all chelonians' species, which are commonly 3 groups: terrapins ; turtles and tortoises. Terrapins dwell in freshwater, turtles live in seas, while tortoises dwell on land. Like turtles, terrapins typically have flat shells to aid with swimming, while tortoise shell dome-shaped. Some species of Chelonia are shown in **Fig.(3).**

Soft-shelled turtle *Trionyx*

Terrapin *Chrysemys sp.* **Tortoise**

FIGURE 3: Turtle, terrapin, and tortoise (order Chelonian).

Subclass II. Diapsida

Skull with two temporal openings on either side separated by the bar of postorbital and squamosal bones.

Order 1. Rhynchocephalia (L.rhynchos = snout, Gr., kephale = head)

Special features

1. Body small, elongated, lizard-like.
2. Skin covered by granular scales and a mid-dorsal row of spines.
3. Skull diapsid, nasal opening separate.
4. Third eye on the top of the head called vestigial pineal eye or parietal eye.
5. Teeth present.
6. Limbs pentadactyle, clawed and burrowing.
7. Cloacal aperture transverse.
8. No copulatory organ in male.

Example: Represented by a single living species, the **tuatara *Sphenodon punctatum*** of New Zealand **(4)**.

FIGURE 4: The tuatara *Sphenodon punctatum*.

Order 2. Squamata (L., squama = scale or squamatus = scaly).

Special features

1. Body elongated small to medium size.
2. Exoskeleton of horny epidermal scales, shields and spines.
3. Skull diapsid.
4. Teeth present.
5. Lower jaw is composed of several pieces of bones.
6. Cloacal aperture is transverse.
7. Male with eversible double copulatory organs (hemipenes).

This biggest reptilian order includes about 6800 species of lizards and snakes. The lizards and snakes possess distinct characteristic features. So it will be better to study this order up to suborders.

Two distinct suborders: 1. **Lacertilia** (L., Lacerta = a lizard), and 2. **Ophidia** with contrasting features, are shown in the **Table (1).**

TABLE 1: Differences between suborders lacertilia and ophidian.

	Suborder Lacertilia or Sauria (Lizards)		**Suborder Ophidia or Serpentina (Snakes)**
1	Body elongated and flattened.	1	Body slender and narrow.
2	Eyelids movable nictitating membranes present.	2	Eyelids fixed nictitating membranes absent.
3	Maxillae, palatines and pterygoids fixed.	3	These skull bones freely movable helping in biting mechanism.
4	Two rami of mandible firmly united anteriorly. Mouth non- expansible	4	Mandibular rami joined by an elastic ligament and can be widely separated during swallowing of large prey.
5	Premaxillae bear conical teeth	5	Premaxillae are toothless
6	Tongue rarely notched or extensile	6	Tongue slender, bifid and extensile.
7	Limbs and girdles usually well developed	7	Absent, vestigial hind limbs and pelvic girdle in boa, python, etc.
Examples: *Phrynosoma* (horned lizard), Chamaeleon, *Heloderma*(gila monster),*Gecko* (giant house lizard), *Calote* (garden lizard), *Uromastyx* , *Varanus*, *Praco* (flying lizard), mabuia , iguana, *Ophisaurus*, etc (Fig.5).		**Examples: whip snake *Dryophis*, *Python*, *Boa*, rattlesnake *Crotalus*, cobra *Naja*…etc. (Fig.6).**	

Horned lizard *Phrynosoma sp.*

Chameleon *Chameleon sp.*

Giant house lizard *Gecko gecko*

Gila monster *Heloderma sp.*

Uromastyx sp.

Garden lizard *Calote*

Monitor lizard *Varanus sp.*

Flying lizard *Draco sp.*

Skink *Mabuia sp.* **Common iguana *Iguana sp.***

FIGURE 5: Some interesting lizards (suborder Lacertilia).

Rattlesnake *Crotalus sp.* **Cobra *Naja sp.***

FIGURE 6: Two interesting snakes (suborder Ophidian).

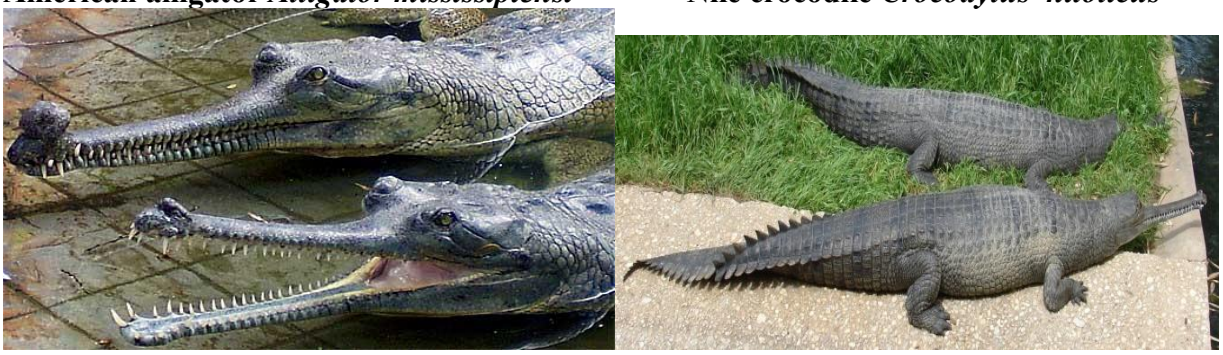
Order 3. Crocodilia (Gr., Krokodeilos = crocodile).

Special features

1. Aquatic carnivorous reptiles.
2. Eyes, nostrils and ears are in striaght line on top of the head. This enables the animal to use its major sense organs when only a small part of the body is exposed above water.
3. Skin bears epidermal scales which are supported by dermal bones or scutes.
4. Nostrils are situated at the tip of the snout and the single internal naris is situated at the back of the buccal cavity.
5. Teeth numerous, thecodont, lodged in sockets.
6. Skull diapsid.
7. Two pair of short legs. There are five toes are webbed.
8. They creep on land with the help of their less powerful limbs.

9. They swim by the undulation of the powerful laterally compressed long tail.
10. Cloacal aperture is longitudinal.
11. Males are provided with single copulatory organ. Clitoris is present in female.
12. With the exception of certain giant marine turtles, crocodiles and alligators are the largest living reptiles.
13. Crocodiles, alligators, caimans and gavials are reptiles included in this order. Caimans, which closely resemble alligators, are native to Central America. Gavials are a group of fish-eating crocodilians with long, slender snouts that live only in India and Burma. However, the term crocodile is sometimes used more loosely to include all extant members of the order Crocodilia.

American alligator *Alligator mississipiensi* **Nile crocodile *Crocodylus niloticus***



Gavial or gharial ***Gavialis gangeticus***

FIGURE 7: Common crocodilians.

Suggested questions

1. Reptiles are:

A. ectothermic anamniotes
B. ectothermic amniotes
C. endothermic amniotes
D. endothermic anamniotes

2. Most reptiles lay eggs, hence they are:

A. oviparous B. viviparous C. ovoviviparous D. none of thes

3. Which of the following reptiles respire by gills?

A. snakes B. lizards C. crocodiles D. marine turtles E. none of these

4. Give the common name for the animals belong to the following taxa?
Ophidia, Lacertilia, Crocodilia, Rhynchocephalia, Chelonia.

5. Count the characteristics which lead to success the reptiles to don't need water during reproduction?

6. Enumerate the characteristics which make the reptiles to live on dry land?

7. The Latin name for the class Chelonia is…….

8. Reptile in Greek means……

9. Your toes are supported by nail, while of reptiles are supported by…….

10. All living orders of reptiles except chelonian are belong to subclass……..

11. Give perfect classification of snake till suborder?

12. Why skin of reptiles lack mucous glands?