PHYLUM CHORDATA

(Chordates)

Class Amphibia

- The word Amphibian means vertebrates that live two lives, leaving partly on land and partly on fresh water.
- Amphi – dual;
- Bio – life
- The present day representatives of the class are: Toads, Frogs, Salamanders and limbless tropical caecilians
- They consist of 2000 species comprising of 250 genera

Characteristics of Amphibians

- They are coldblooded, (poikilothermic or ectothermic)
- The skin lacks scales, the skin are smooth or rough and kept moist by glands for cutaneous respiration
- They respire by lungs, skin or the mouth lining or gills in the developmental stage
- The skull is provided with two occipital condyles.
- Heart is 3 chambered (2 atria and one ventricle)

Characteristics of Amphibians

- They possess 4 pentadactyl limbs which are supported by girdles and are adapted for locomotion both on land and water as well.
- May produce distinctive sounds.
- Fertilization external
  - Most are oviparous
  - Egg with some yolk and enclosed in gelatinous covering usually laid in water
  - Development is always indirect as larva is formed during life cycle which is generally known as Tadpole.

Classification of Amphibians

- PRO ANURANS - Extinct forms
  - Example*: Eryops*
- ANURANS - Frogs and Toads
  - Example – *Bufo*
- URODELA - Newts and Salamanders
  - Example: *Salamandra*, *Amphiuma*, *Triton*
- APODA - Caecilians
  - Example: *Icthyophis*, *Uraeotyphlus*, *Siphonops*

Eryops

Bufo

Salamandra

Icthyophis

Class Reptilia

- They are coldblooded terrestrial or aquatic animals
- 5000 known species
- They originated from amphibians
- They are regarded as the first true land vertebrates'.
- Whereas the amphibians are imperfectly adapted for life on land, the reptiles are perfectly adapted to living on dry land. They have become totally emancipated from water.

Characteristics of Reptiles

A).Characteristics that have made them truly successful on land.

- The body is covered by horny scales or scutes without epidermal glands (Some have bony dermal plates). The skin is relatively water proof. The scales are dead structures produced from epidermis by hardening or keratinization.
- They developed an intromittent organ in form of a penis which allowed for internal fertilization.

Characteristics of Reptiles

A).Characteristics that have made them truly successful on land.

- They developed a cledoic egg. The cledoic egg is a large yolky egg covered in most cases by a shell of calcium carbonate. The shell functions to protect the egg from desiccation and also to protect the embryo.
  - Parts of the cledoic egg are:
    - Amnion – forms a pond around the embryo
    - Chorion – serves for protection and respiration
    - Allantois – serves for storage of waste products for respiration
    - Yolksac – digest the yolk and pass product to embryo

Characteristics of Reptiles

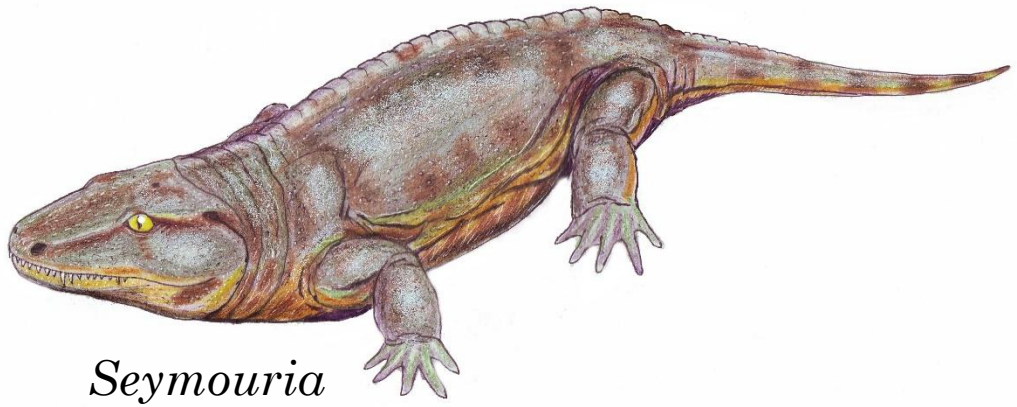
Characteristics that have made them truly successful on land.

- Reptiles developed a true neck.
- Endoskeleton more completely bony than in amphibians.
  - The vertebral column is differentiated into regions
  - Limbs are pentadactyl ending in claws
  - Skull has one single median occipital condyle.
- Lung is better developed than in amphibians, since it is the only respiratory surface.

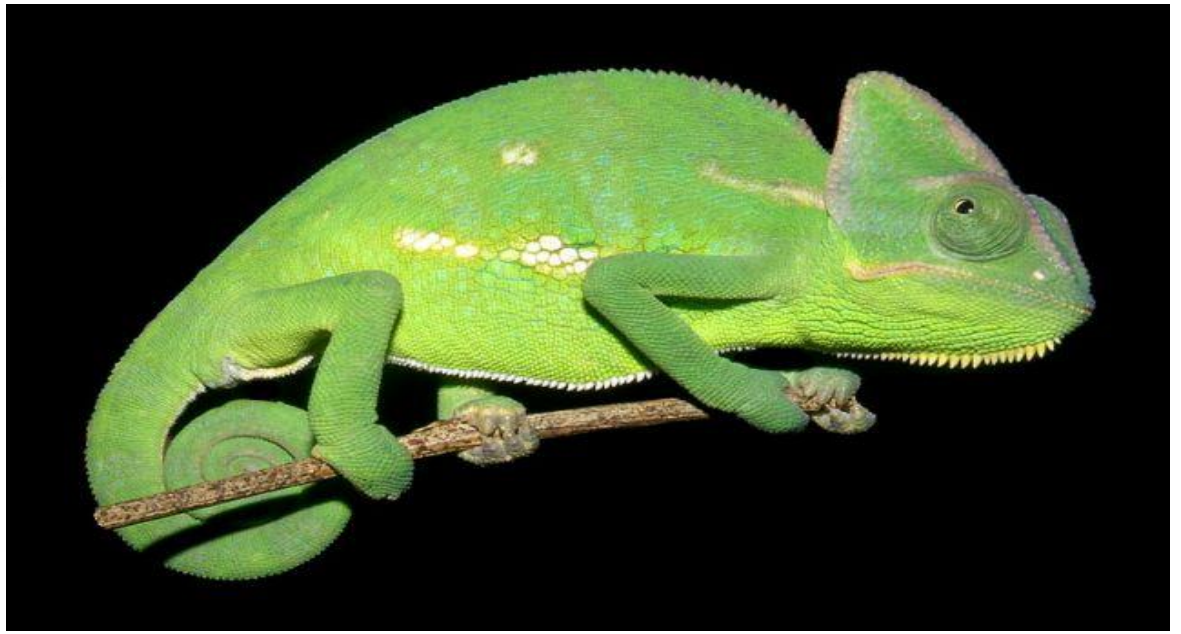
Classification of Reptilia

They have been divided into 4 subclasses:

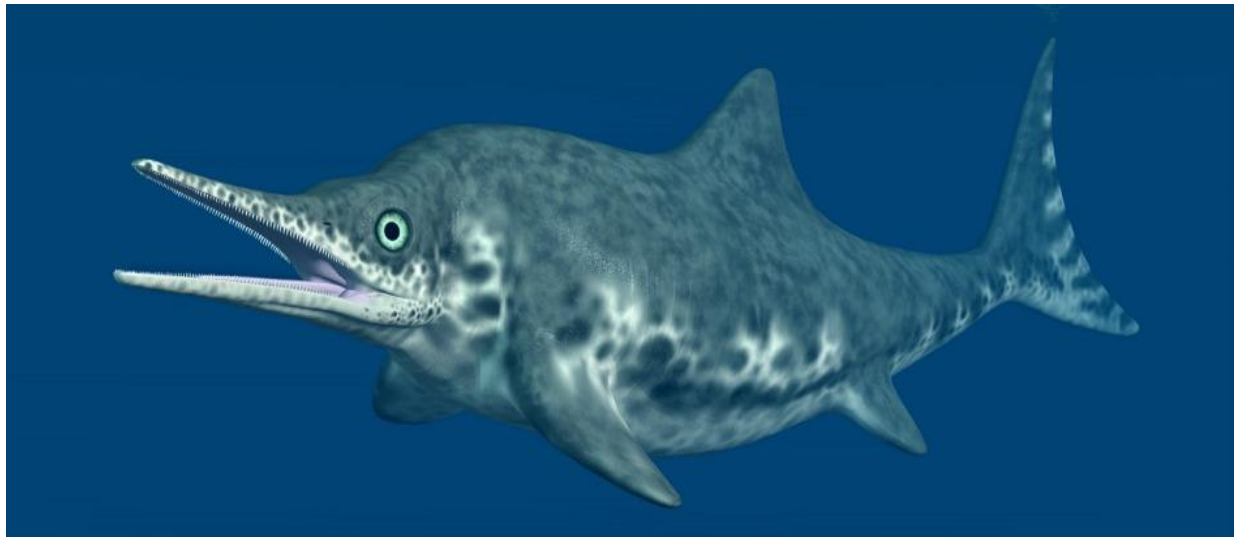
- **ANAPSIDA** - Extinct
  - Example: Seymouria, Chelone, Chrysimis, *Trionyx*
- **PARAPSIDA**
  - Example : *Icthyosaurus*, *Protosaurus*
- **DIAPSIDA**
  - Example: Sphenodon, Gecko, Chamelion, Iguana, Varanus, Crocodile, Alligator
- **SYNAPSIDA**
  - Example: *Dimetrodon, Cynognathus*



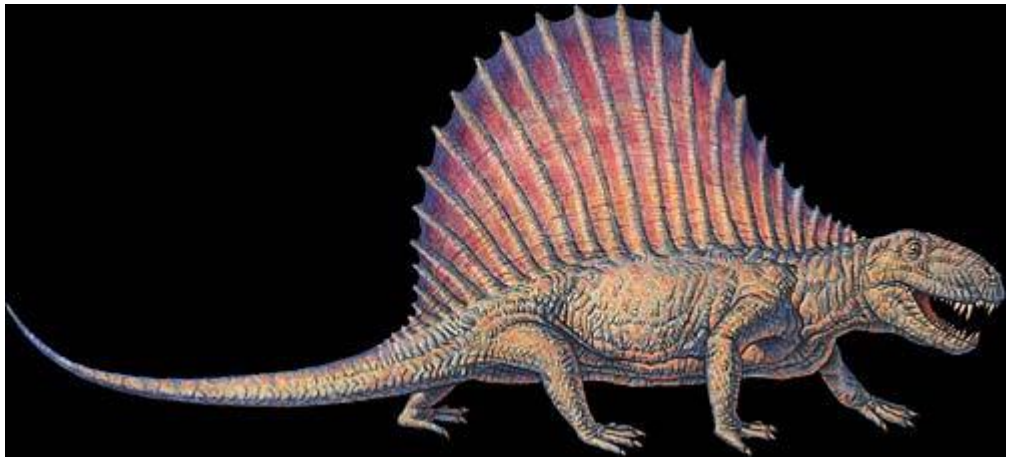
Seymouria



Chamelion



Icthyosaurus



Dimetrodon

Class Aves

- Number 8950 species.
- They are aerial, terrestrial and aquatic.
- They have many characters resembling those of reptiles.
- The Reptilia and Aves are placed together as SAUROPSIDA because of similarities
- *Achaeopteryx* shows characteristics of both reptiles & birds.

Modifications for flight

Birds have become highly modified due to aerial life.

Morphological adaptations:

- Body form fusiform or spindle shaped.
- Body covered with feathers.
- Contour feathers make body streamlined and reduce friction to the minimum.
- Feathers make body light.
- Feathers hold considerable blanket of enveloping air around the body and add much to its buoyancy.

Characters of Aves

- Warm blooded vertebrates.
  - Endothermal craniates.
  - Body temperature, high & constant in correlation with their energy.
- Possess exoskeleton of epidermal feathers on the greater parts of the body.
- Skin devoid of glands except an oil gland on the tail and the tail is much reduced.
- Fore limbs are modified to form wings each bearing 3 clawless digits & provided with feathers
- Hind limbs articulate far forward to support the body weight in standing (bipedal).
- Hind limbs are adapted for walking, perching swimming and bear 4 toes,
- Never more than four digits and they are clawed.

Characters of Aves

Alimentary canal:

- Modern birds have no teeth, a horny beak is present.
- Beak & claws have horny sheath and feet are covered with scale.
- Stomach divided into a glandular proventriculus and a muscular gizzard.

Excretory system:

- They have 3 lobed Meta nephric kidneys; however a urinary bladder is absent.

Blood system:

- Heart is 4 chambered and only the right aortic arch is present.
- Red blood cells are oval, nucleated & biconvex.

Characters of Aves

Reproductive system:

- Sexes separate & sexual dimorphism is well marked.
- Left ovary alone is present
- Oviparous with large yolky eggs enclosed in shell membrane and a hard shell (The embryo has amnion, allantois & yolk sac).
- The young may be precocial or altricial when hatched.
  - Precocial – able to fend for themselves.
  - Altricial - naked and dependent on parents for food for some time, in which case, they receive much parental care.
- Fertilization is internal.

Classification of Aves

- **Subclass Archaeornithes -** Extinct birds
  - Example: *Archaeopteryx archaeonis*
- **Subclass NEORNITHES** (22 orders) - Living as well as extinct birds.
  - Extinct– *Hesperornis*, *Ichthyornis*
  - Living – Ostrich – *Struthio camelus*

    Kiwi - *Apteryx*

    Penguin - *Apetnodytes*

Archaeopteryx

Hesperornis

Ostrich

Class Mammalia

- Greek word- Mammae –meaning mammary glands.
- Top of the animal kingdom
- Believed (undoubtedly) to have been derived from the reptilian subclass Synapsida. Most probably from a mammal like reptile the THERAPSIDS
- Tertiary period is known as the age of mammals.
- Since this period, mammals have radiated, adapted, and colonized almost all parts of the globe in different ecological conditions.

Class Mammalia
Characteristics of Mammals

- The body is usually covered with hairs which are epidermal in origin (hairs are not found in the cetacae).
- They are warm blooded or ectothermal or homiothermal animals.
- The skin is provided with sebaceous, sweat, scent and milk glands.
  - Milk glands produce milk to nourish the young for sometimes after birth. The possession of milk glands (mammae) is where the name mammalia has been derived.
  - Sudoriporous(Sweats).
  - Sebaceous (oil glands).
- Skull is provided with two occipital condyles (That is Dicondylic skull).

Characteristics of Mammals

- Two pairs of pentadactyl limbs present (digits in fore & hind limb never more than five) which are adapted variously for walking, running, climbing, burrowing, swimming or flying.
  - Limbs are plantigrade, digitgrade or unguligrade.
- Toes is usually provided with horny claws, nails, hoofs or fleshy pads in aquatic forms.
- Nasal passage, usually long and mobile
  - Both jaws are provided with teeth embedded in sockets

Characteristics of Mammals

- External ear or pinna with external auditory meatus present
- The teeth are thecodont, diphyodont and heterodont.
- Thecodont means both jaws are provided with teeth embedded in sockets (Embedded in the alveolar pocket of jaws).
- Diphyodont means two sets of teeth are recognized during the life time; decidous or milk teeth (replacable) and permanent teeth.
- Heterodont: that is the teeth are differentiated into 4 types, depending on feeding habits: Incisor, canine, molars. Teeth are rarely absent.
- Tongue usually mobile.

Characteristics of Mammals

- Eyes is provided with mobile lids.
- Heart 4 chambered
- Respiration occurs only by lungs
- Erythrocytes is more spherical and non-nucleated (except in camel).
- A muscular transverse partition, the diaphragm, separates the body cavity into an anterior thoracic cavity and a posterior abdominal cavity.

Characteristics of Mammals

- Males are with a copulatory organ (penis)
  - They are usually viviparous.
  - Fertilization is internal.
- Development of embryo occurs in uterus of mother where a placenta is formed
- Placenta helps the embryo in the physiological exchange of materials from the maternal blood and thus it brings about nutrition, excretion and respiration of the embryo in the womb.

Classification of Mammals

1. Subclass Prototheria – found in Australia, Tasmania, New Guinea. They have only one Order Monotremata

- Examples of Monotremata: *Echidna* sp, *Ornithorhynchus* sp

2. Subclass Theria - This inludes the Marsupials and placenta animals

a). Infra class Metatheria

i). Order Marsupiala - Marsupium or brood pouch are present in the females. Placenta usually absent.

- Examples: Opossum – *Didelphis*
  Tigercat – *Dasyurus*
  Marsupial mole - *Caenolestes and Notoryctes*
  Bandicoot – *Parameles*
  Kangaroo – *Marcopus*

Echidna

Tiger cat

Didelphis

Kangaroo

Classification of Mammals

b). Infra class Eutheria - Young always nourished for a considerable time in the uterus by means of allantoic placenta and born in a relatively advanced state.

i). Order Insectivora - Snout usually long & tapering.

- Examples: Hedgehog – *Erinaceus*
  Paraechinus
  Mole - *Scapanus*
  Talpa
  Shrew – *Sorex*
  Echinosorex

Erinaceus

Scapanus

Sorex

Classification of Mammals

ii). Order Dermoptera - Commonly known as flying lemurs

- Example - *Galeopithecus*

iii). Order Chiroptera - Commonly known as true flying lemurs

- Examples: Fruit eating bats:(Sub order Megachiroptera): *Pteropus*

Xanthorpyia

Cynopterus

Brown Bat :(Suborder Microchiroptera): *Magaderma*

Rhinolophus

Desmodus

Eptesicus

Galeopithecus

Pteropus

Magaderma

Classification of Mammals

iv). Order primates - Completely hairy and generally arboreal mammals.

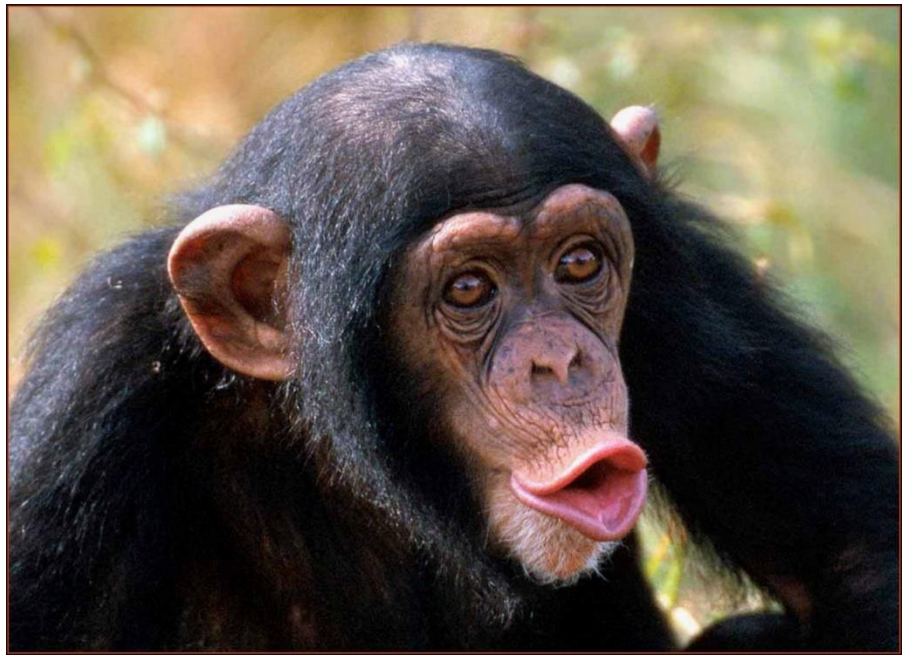
- Examples: Suborder I Lemuroidea: *Lemur*
  Indris
  Chirogale
  Chiromys
  Loris

  Sub order II Tarsioidea: *Torsius*
  Spectrum

  Suborder III Anthropoideo: Monkeys
  Apes
  Man

Lemur

Torsius



Monkey

Classification of Mammals

v). Order Edentata

- Examples: Sloth, Armadillos, American ant eater.

vi). Order Pholidata

- Example: *Manis* (pangolin or scaly anteater)

vii). Order Lagomorpha

- Example: Rabbits & Hares.

viii). Order Rodentia

- Example: Squirrel – *Funambulus*

  Houserat – *Rattus rattus*

  Porcupine – *Hustrix*

  Guinea pig

Armadillo

Manis

Rabbit

Squirrel

Classification of Mammals

ix). Order Cetace

- Examples: Whales, Dolphin

x). Order Canivora

- Examples: Sub order I Fissipedia – Lion – *Panthera leo*
  Tiger – *Panthera tigris*
  Leopard
  Civet cat
  Wolf
  Fox

Sub order II Pinnipedia – Sea lion – *Otario jubata*
Walrus - *Trichecus*
Seal - *Phoca*

Whale

Lion

Sea Lion

Classification of Mammals

xi). Order Tubulidentata

- Example: Aardvark

xii). Order Proboscidea

- Example: Elephant – *Elephas*

xiii). Order Hyracoidea

- Example: Procavia or Hyrax

xiv). Order Sirenia

- Example: Dugong – Halicore dugong
  Trichecus – Manatees

xv). Order Perissodactyla

- Example: Horse – Equas
  Zebra
  Rhinoceros

Aardvark

Procavia

Rhinoceros

Elephant

Dugong

Classification of Mammals

xvi). Order Artiodactyla

- Examples: Hippopotamus
  Camel
  Pig
  Deer
  Giraffe
  Antelope
  Cow
  Buffalo
  Sheep
  Goat

Hippopotamus

Camel

Goat