(5) MAMMALS : ORIGIN CLASSIFICATION & GENERAL CHARACTERS

(1) Origin and Ancestry of class mammalia :-

(a) Amphibian ancestry - By T. H. Huxley. (Not accepted)
- Similarity is two occipital condyle i.e dicondylic skull) is present in both amphibia and mammalia
- But, it is not a solid proof as condyles (swelling behind cranium) are derived from exoccipitals in amphibia but from basioccipital in mammalia.

(b) Reptilian ancestory -
- All mammals living today have descendent from reptile.
- Evidence is that monotremes (primitive mammals) have close resemblance with reptiles in anatomical features, - It includes anatomy of soft and hard ~~pat~~ parts both.

(c) Ancestral mammal like reptile -
- A group of extinct reptiles Synapsida, acquired several mammalian characters.
- Age of this reptile was Permian and Triassic Period.
- Order Therapsida included more mammal like reptiles.
- Characters of the Therapsids like mammals
  - Typical upright mammalian limb, capable of generating considerable speed.
  - Skull with two occipital condyles, secondary palate and enlarged lateral temporal fossa.
  - Largest bone of lower jaw was dentary.
  - Dentition consisted of incisor, canine and chewing molar.
- Character of Therapsids like reptiles
  - Skull was intermediate b/t reptiles and mammals.
  - Small cranium, ~~pro~~ parietal foramen, single middle ear bone, reduced quarate and quadrato - jugal, many low jaw bone etc.

* Therapsids are not the direct ancestor of mammals.

(d) First true mammals -
- They were nocturnal and thus a capable to avoid direct confess to giant reptiles. (First mammals were very small sized like rat)
- They were insectivorous.
- Arboreal in living habbit.

(c) Polyphyletic origin –

→ Living mammals represent two different groupings or subclass.

(1) Primitive reptile like egg-laying (oviparous) monotremes → Subclass – Prototheria

(2) Mammals give birth to young one (viviparous) → Subclass – Theria

Diagramatic representation:

Class Mammalia

- Subclass – Prototheria
- Subclass – Theria
  - Infraclass
    - Metatheria (includes marsupials)
    - Eutheria (true placental mammals)

→ According to phylogeny, origin of mammal is polyphyletic Because they derived from atleast two Triassic reptilian stocks

(1) Cynodonts
(2) Ictidosaurs.

– Living prototheria evolved from – docodonts
– Metatheria and eutheria evolved from – pantotherians independently → At end of Cretaceous period

(2) General character of class mammalia :-

→ Presence of mammary (breast) for nourishment of children their off is characteristic feature of this class and so name given.

→ Body usually covered with hairs, which is moulted periodically. Other exoskeleton present are nails, hoofs, claw, horns, spines, scales etc.

→ Skin with many glands containing
(a) Sudoriferous (sweat gland)
(b) Sebaceous (oil gland)
(c) sometimes scent gland in both sexes.

* Teats of female (mammary glands) are example of Sudoriferous (sweat) gland. It is apocrine in nature

→ Animals are mostly terrestrial but animals of order cetacea are aquatic and that of order chiroptera are flying.

→ These are homeothermous, tetrapod, vertebrate animals.

→ Limbs two pairs, pentadactyle, each with five or fewer digit and variously adapted for walking, running, climbing, burrowing, swimming (flippers) and flying.

* Hind limb is absent in cetaceans and sirenians.

→ Muscular ~~diagr~~ diaphragm separates thoracic cavity from abdominal cavity.

→ Endo skeleton –

- Dicondylic skull i.e. with two occipital condyle which are exclusively formed by exoccipitals.
- Cranium large.
- Half of lower jaw is made up of single bone, the dentary, articulated with squamosal of skull.
- Otic (ear) bones ~~contain~~ fused into periotic which forms tympanic bulla with tympanic.
- Neck vertebrae usually 7 (six in sea cow)
- Ribs are bicephalous.
- Mouth usually with teeth in socket (thecodont condi) and heterodont.

→ Ear usually with pinnae. Pinnae is absent in prototherian and aquatic mammals.

→ Heart is four chambered. Only left aortic arch persists. Double circulation found.

- RBCs non-nucleated and biconcave (Nucleated in camel and Llama).

→ Respiration by lungs.

- Larynx with vocal cords (except Giraffe – Thus it can't produce sound).

→ Urinary bladder is present.

→ 12 pairs of cranial nerves.

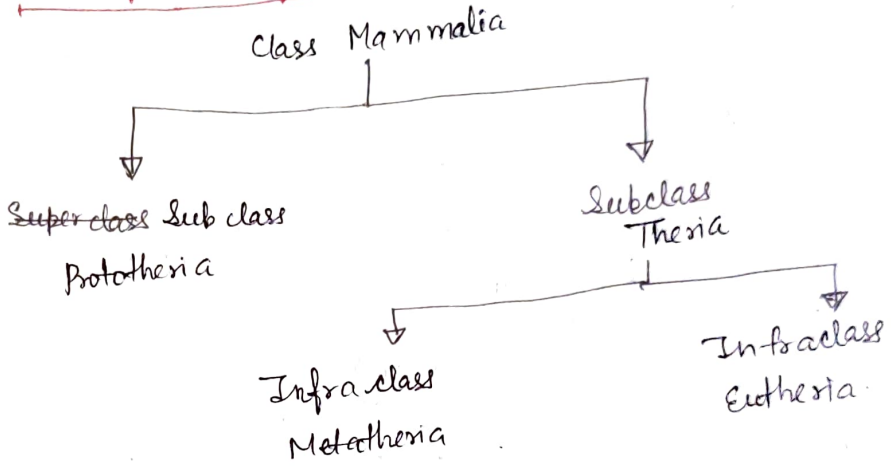
→ Cerebrum in brain is highly developed

→ Reproduction –

- Male with copulatory organs.
- Testes usually outside the abdominal cavity in scrotum.
- Egg usually microlecithal (with little yolk) or alecithal.

• Nourishment through placenta by uterine wall of mother
→ Except. egg - laying monotremes, mammals are viviparous (giving birth to youngone).
→ After birth, mammary gland activates to suckle the young ones.
→ Extreme parental care is found.
→ Mammals show greatest level of intelligence.
→ Sense organ - well developed.
• Eyes protected by eye-lid (upper movable).
• External ear has pinnae for amplification of sound
• Middle ear cavity with three ear ossicles
(i) malleus
(ii) Incus
(iii) stapes.
→ Corpus callosum (a nerve stripe) is exclusively present in brain

(3) Classification of class mammalia:-



(I) Subclass - prototheria

Contains only one order

(1) Order - Monotremata (monos - single, treme - opening)
- Cloacal opening present (as genital opening)
- No pinna
- Teeth in youngone only
- Mouth in form of horny beak
- Testes in abdomen.
- Penis conducts sperms only.
- Uterus and vagina absent
- Mammary gland without nipple.
- oviparous or ovoviviparous.
- Found in Australian region only.

e.g. Spiny ant eater - Tachyglossus (Echidna). → oviparous
Duck billed platypus - Ornithorhynchus. → Ovoviviparous

(II) Sub class theria.

(A) Infra class – Metatheria

Contains only one order

(1) Order – Marsupialia (marsypion – pouch)

– Epipubic bone usually present
– Females with marsupium (ventral pouch) surrounding nipples on abdomen.
– Uterus and vagina double.
– Usually without placenta.
– Eggs, fertilised internally and starts developing in uterus but after a few days in premature stage crawls to marsupium and attaches itself to nipples of mammary gland by its mouth and remain there until fully formed (mammary foetus).
– After birth youngones retreat to marsupium for shelter.
– Thus marsupials are oviviparus in nature.

e.g. Macropus (Kangaroo) and Megaleia.
Chironectes (Water opposum).

* In macropus, tail act as 5th limb.

(B) Infra class – Eutheria / Placental mammals.

→ Vagina single.
→ Foetus develops entirely within uterus attached by chorionic placenta.
→ It includes following orders.
→ Dentition never exceed 3143/3143 = 44

(1) Order – Insectivora (Insectum – insect + vorare – to eat)

– Small primitive mammal with long pointed snout.
– Feet plantigrade (when entire toes & sole touches the ground).
– Discoidal placenta.
– Nocturnal and terrestrial.

e.g. Mole (Talpa)
Shrew, Hedge Hog

* American shrew – smallest mammals.

(2) Order – Dermaptera (derm – skin, pteron – wing)

– Four equal sized limbs.
– Tail included in lateral furry skin fold c/a patagium.
– Nocturnal.
– Gliding mammal.

e.g. Cynocephalus (Flying lemurs).

(3) O- Chiroptera (cheiros - hand + pteron wing)
- Flying mammals are bats.
- Forelimb modified into wings (patagium).
- Sternum provided with keel.
- Clavicle are stout and fused with scapula and sternum.
- Weak vision.
- Ear have large pinnae.
- Bats have sonar system i.e. they can detect ultrasonic sound waves.
- Divided into two sub-orders
  (1) Megachiroptera - eg. (Fruit bat) Flying fox.
  (2) Microchiroptera - eg. Myotis (brown bat)
  Desmodus (vampire bat)

(4) O - Edentata (edentatus - toothless)
- Teeth absent or reduced to molar.
- Enamel absent.
- Toes large.
- Curved claws.
- Abdominal testes

e.g. Myrmecophaga (giant ant eater)
Dasypus (armadillo)

(5) O- Pholidota (pholis - a horny scale)
- Body covered with large hornified scales with sparsh hair in between.
- No teeth.
- Protrusible tongue

Porcupine
e.g. Manis (Pangolin/ scaly ant eater)

(6) O- Lagomorpha (lagos - hare + morphae - form)
- With second pair of small upper incisor behind first pair long chisel - like incisor.

eg. Rabbit (Oryctolagus)
Hare (Lepus)
Pikas (Ochotona)

(7) O- Rodentia (rodo - gnaw)
- Largest order of class mammalia.
- No canine.
- Diastema found
- Incisor growing throughout life.

e.g. Rat (rattus)
Squirrel (Spermophilus)

(8) O- Cetacea (cetus - a whale)
- Large, marine fish - animal - like mammals, well adapted for aquatic life.
- Hairs of skin are reduced.
- No claw
- No hind limb.
- No pinnae.
- Skull bones are spongy and contains oils.
- It is divided into two sub orders
  (i) Odontoceti - toothed whale eg. sperm whale & dolphin
  (ii) Mysticeti - Whalebone whale eg. Blue whale.

(9) O- Carnivora (caro - flesh, vorare - to eat)
- Predatory, flesh-eating mammals.
- Large canine, fang like.
- Clavicle are incomplete or reduced.
- Divided into two suborders
(a) Fessipedia - Modern terrestrial carnivore whose feet containing separate toes
  eg. Dog (Canis familiaris)
  Wolf (C. lupus)
  Jackal (C. aureus)

(b) Pinnipedia - Marine carnivore with streamlined body. Reduced tail. Limbs modified into flippers.
  eg. Walrus (odobenus)
  Common seal
  Sea lions.

(10) O- Tubulidentata (tubulus - tube like + dent - tooth)
- Slender, protrusible tongue.
- No incisor and canine.
- Ear are long, erect and pointed.
- Zonary placenta.
  eg. Aardvark or Cape anteater (Orycteropus)

(11) O- Proboscidia (pro - Infront + boskein - to eat)
- Largest living land animal.
- Practically hairless skin - pachyderm.
- Upper lip modified as an elongated flexible proboscis.
- Upper incisor elongated as Ivory tusks.
  eg. Indian or Asiatic Elephants)
  Loxodonta (African elephants)

(12) O- Hyracoidea (hyrax - shrew + eidos - form)
- Cavia - pig like mammals.
- Hoof like nail.
- Mammae are six paired.

eg. Coneys.

(13) O- Sirenia (seiren - sea nymph)
- Herbivorous aquatic mammals.
- Paddle like forelimb.
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eg. Trichechus (Manatees)
Hydrodamalis (Sea ~~cow~~ cow) - having 6 cervical vertebras.
Rhytina (Stellers sea cow) - Recently extinct.

(14) O- Artiodactyla (artios - even + dactylos - digit)
- Even toed - hooted mammals
- Compound stomach with 4 - chambers.

eg. Hippopotamus.
Camel, Llama
Ovis (sheep)
Bison (buffalo)
Giraffe.

(15) O- Perissodactyla (perissos - odd + dactylos - digit)
- Odd toed - hooted mammals.
- Simple stomach.

eg. Equus (Horse, ass, zebra)
Rhinoceros. Tapir

(16) O- Primata (primus - first ~~rank~~)
- Flat nails on finger and toes.
- Opposable thumb.
- Great development of brain.

It contains 3 sub orders
(a) Leumeroidea - leumer.
(b) Tarsioidea - Tarsiers
(c) Anthropoidea - It is divided into two ~~sub~~ infra orders

Ceboidea (Platyrrhini)
Catarrhini
Superfamily - Cercopithecoidea
Hominoidea
Family - Hylobatidae
eg. Gibbon.
Pongidae
eg. Gorilla, Chimpanzee
Hominidae
eg. Human