ZOOACOR05T – UNIT 9 TOPIC 1

CLASSIFICATION OF MAMMALIA

Introduction:

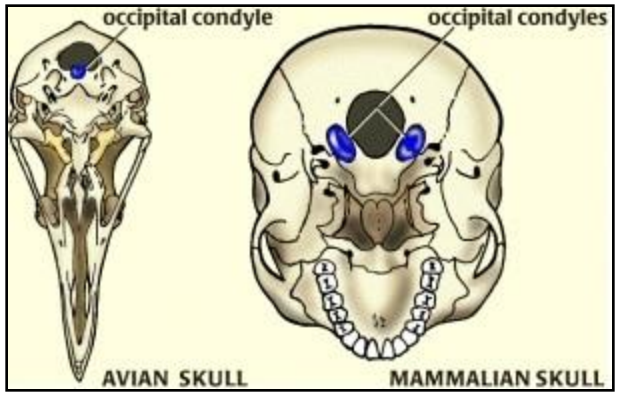
Classification systematizes our knowledge, hence it has major importance in the biology. The collected knowledge regarding, structure, distribution, physiology and other aspects of living organisms become scattered without a proper classification.

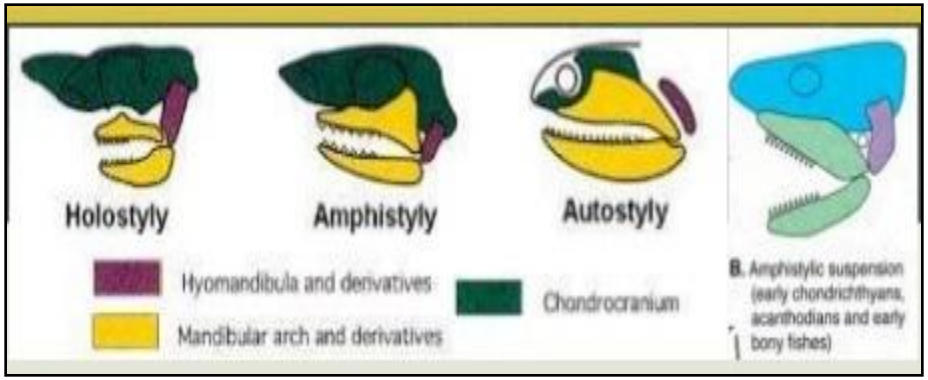
Due to this reason, the living organisms are classified into certain groups based on the similarities and dissimilarities among the extant forms and from the affinities with extinct ones. The knowledge gathered from the study of a selected type individual can be projected to other members of the same group.

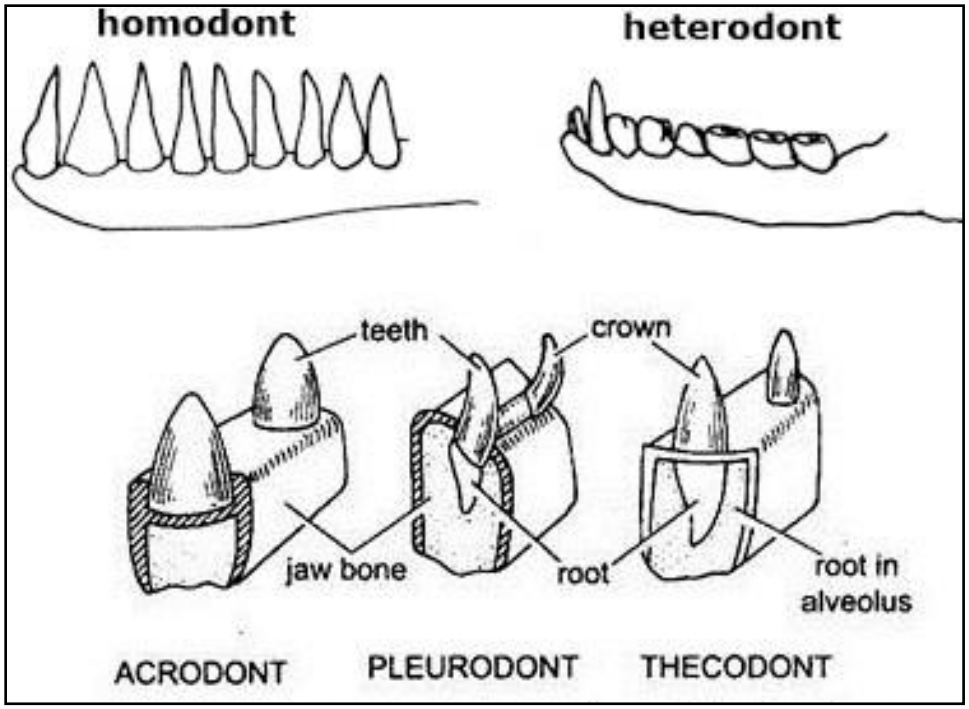
Authorities are unanimous that all that all the classifications are temporary and provisional. Classification of a particular group is subjected to modifications from time to time with the expansion of our knowledge (Romer, 1945).

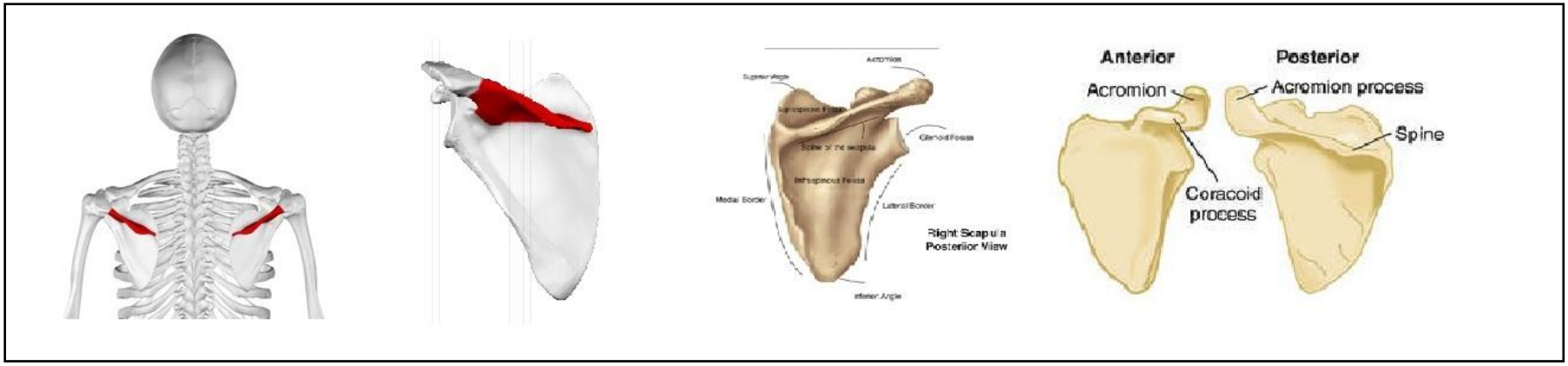
Diagnostic Characteristics of Class Mammalia:

i. Body covered with hairs, which may be scanty (in Pachyderms, e.g. *Hippopotamus* sp.) or secondarily lost (in aquatic mammals i.e. Cetaceans, e.g. *Megaptera* sp.).
ii. Distinct pinnae.
iii. Present of mamma; vestigial in males.
iv. Skull with double occipital condyles.
v. Craniostylic jaw suspension.
vi. Secondary palate formed by fusion of pre-maxillae, maxillae, palatine and pterygoid.
vii. Dentition is of heterodont, thecodont and diphyodont type.
viii. Seven Cervical vertebrae present.
ix. Ribs are double headed.
x. Scapula with spine.
xi. Muscular diaphragm present.
xii. Homoeothermic or endothermic temperature regulation.
xiii. Four chambered heart with single left aortic arch.
xiv. Urino-genital aperture and anus are separate.
xv. Mostly viviparous with Monotremes as exception; placenta chiefly alanto-chorionic with Marsupials as exception.

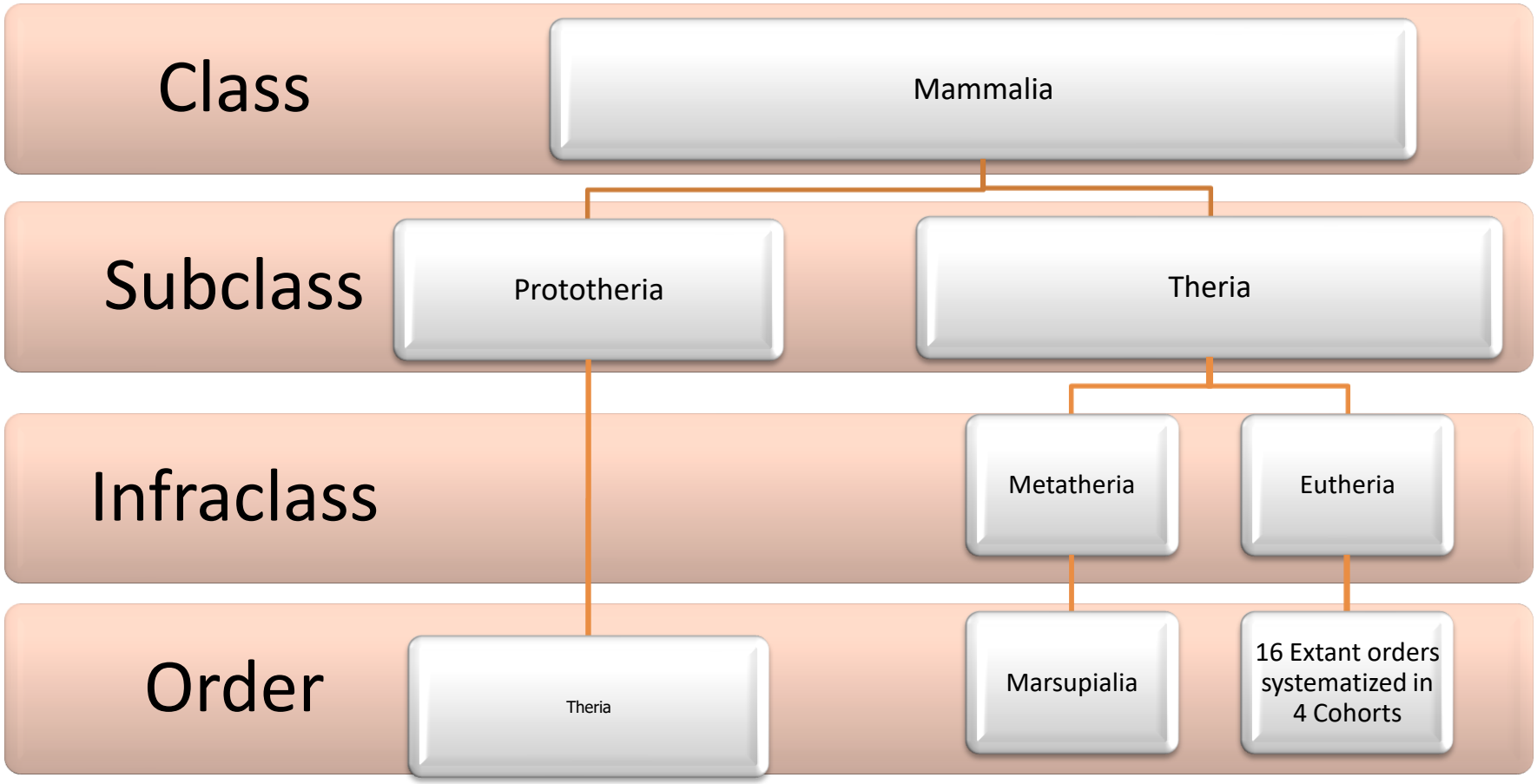




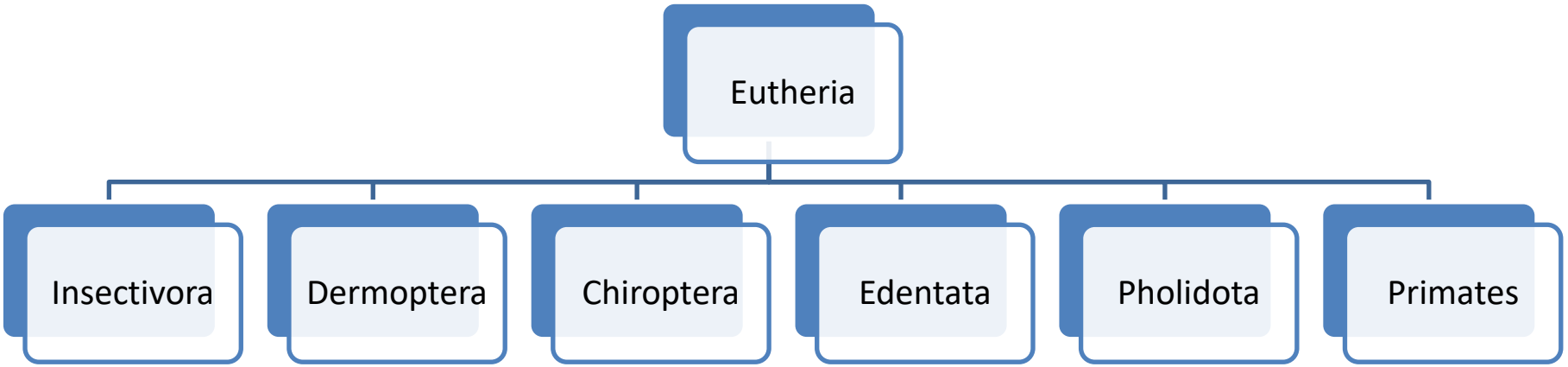




Classification of Mammalia in Outline: According to G.G. Simpson (1945)

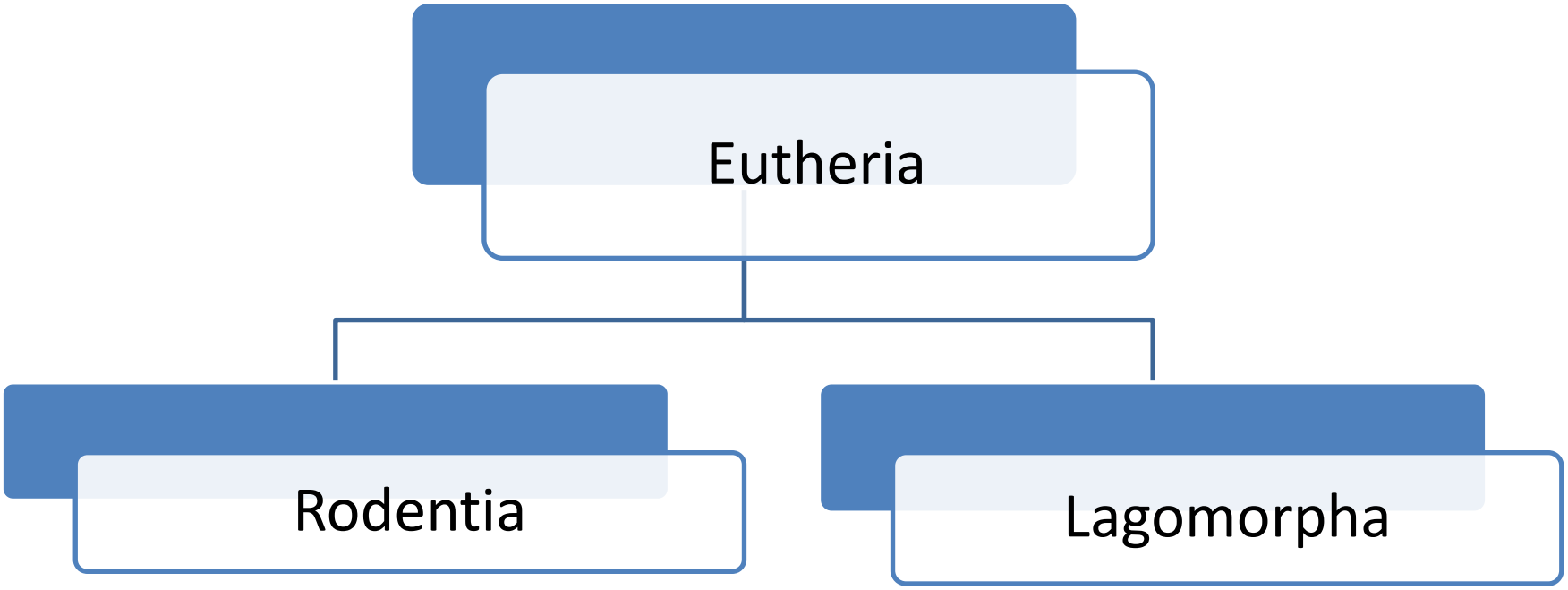


Eutherian orders under Cohort1: Unguiculata



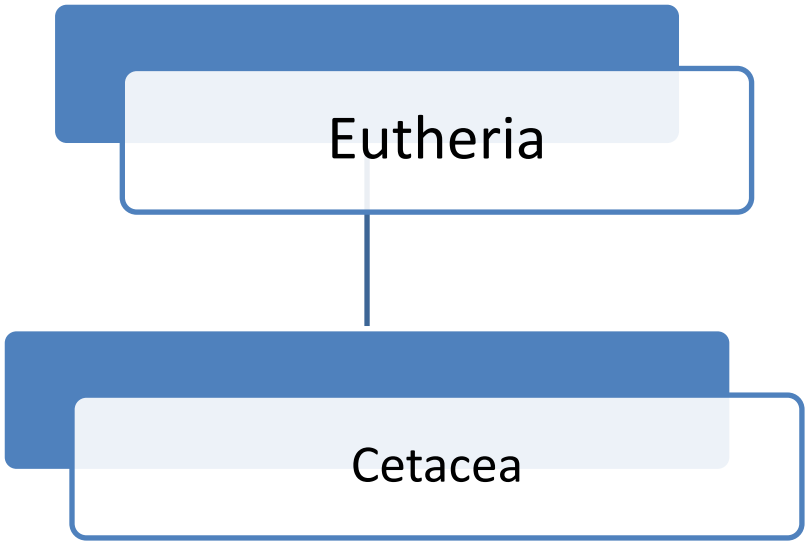
N.B. : Unguiculata comprises of mammals with nails and claws

Eutherian orders under Cohort2: Glires



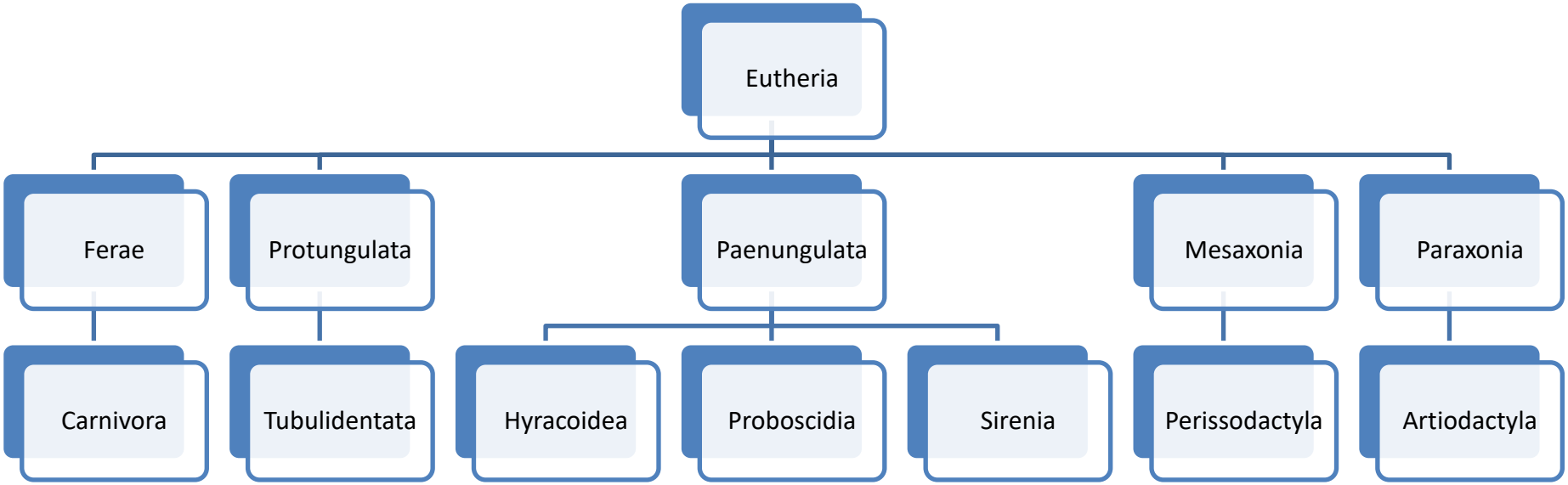
N.B. : Glires comprises of mouse or mouse like mammals.

Eutherian orders under Cohort3: Mutica



N.B. : Mutica comprises of marine mammals.

Eutherian orders under Cohort4: Ferungulata



N.B. : Ferungulata comprises of ungulate mammals.

Classification with characters:

A) Subclass I – Prototheria:

a) Persistent cloaca with oviparous reproduction
b) True teeth absent in adults.

N.B. : -- Endemic to Australia and New Guinea.

Order – Monotremata (= one aperture):

1. Large cleidic eggs with buttery shell.
2. Presence of reptilian pterygoid.
3. Female reproductive system and development fairly reptilian.
4. No teat, milk is liked baby from a tuft of specialized hair.
5. Development of a temporary brood pouch in breeding season.

Example: *Ornithonynchus* sp. (Platypus); *Tachyglossus* sp. (Australian Echidna or Spiny ant-eater); *Zaglossus* sp. (New Guinean Echidna or Spiny ant-eater)

B) Subclass II – Theria:

a) Viviparous reproduction.
b) Development of placenta.

1} Infraclass – Metatheria:

1. Temporary and imperfect placenta is yolk-sac type, allantois does not have nutitive function expect one species (i.e. *Peramelis* or Bandicoot).

Ornithonynchus sp. (Platypus)

Tachyglossus sp. (Australian Echidna or Spiny ant-eater)

Opossum with babies

Tasmanian wolf -photograph of the last living specimen circa 1920s

Kangaroo Baby inside Marsupium

Red Kangaroo

Tasmanian Devil

Classification with characters:

Order – Marsupialia

1. Fenestrated palate.
2. Angle of the lower jaw inflected.
3. Presence of brood pouch or marsupium in the females.
4. Presence of epipubic or marsupial bone to support brood pouch.
5. Primitive brain with corpus calosum and exposed cerebrum.
6. Presence of common cloacal sphincter surrounding the arms and the urino-genital apertures.
7. Uterii and vaginae double.

Example: *Macropus* sp. (Kangaroo); *Didelphis* sp. (Opposum); *Thylacinus* sp. (Tasmanian wolf); *Sarcophilus* sp. (Tasmanian Devil)

2} Infraclass – Eutheria:

a) Permanent alanto-chorionic placenta.
b) Complete uterine gestation.

Order – Insectivora:

1. Presence of the remnant of cloaca.
2. Primitive dentition; molars with prominent cusps.
3. Dental formula typical eutherian.

$$\frac{I.C.PM.M}{I.C.PM.M} X2 = \frac{3.1.4.3}{3.1.4.3} = 44$$

4. Primitive brain with exposed cerebellum.
5. Pelvic symphysis may be reduced.

Example: *Talpa* sp. (common mole); *Solenodon* sp. (the alamiqui); *Tupaia* sp. (the tree shrews); *Suncus* sp. (common shrews)

Order – Dermoptera

1. Presence of parachuting membrane or patagium extending from the neck to the anus and down the sides of the body.
2. Tail moderately long.
3. Primitive brain is macrosomatic.
4. Peculiar dentition; lower incisor procumbent and comb-like.

Example:

Cynocephalus volans (Colugo or flying lemur of Philippines Is.)

Order – Chiroptera

1. Mammals with true fight.
2. Forelimbs modified into wings supported by skin-fold or patagium.
3. Knee directed backward.
4. Sternum in keeled for the attachment of the pectoral muscles.
5. Mammae auxiliary.

Example: *Pteropus* sp. (Fruigivorous bats or Flying foxes), *Rhinolophus* sp. (Horseshoe bat); *Desmodus* sp. (Carnivorous bats)

Order – Edentata (=toothless)

1. Primarily insectivorous.
2. Zygomotic arch reduced or absent.
3. Brain simple.
4. Feet with strong claws.
5. Tongue highly protrusible and sticky.
6. Testes abdominal

Examples: *Tolypeutes* sp. (Three banded Armadilos); *Chlamyphorus* sp. (Pink fairy Armadilo); *Bradypus* sp (Three-toed sloth); *Choloepus* sp. (Two-toed sloth).

Order – Pholidota

1. Body covered with scales.
2. Scales imbricating and horny.
3. Hair scattered among the tail
4. Teeth entirely absent.
5. Skull long and cylindrical

Examples: *Manis* sp. (Pangolin).

Order – Primates

1. Mostly arboreal; a few are terrestrial.
2. Orbits looking forward; in higher forms cranium is rounded.
3. In most forms pollex and hallux opposable.
4. Tail present.
5. Mammary glands are pectoral.

Example: *Tarsius* sp. (Tarsiers of SE Asia); *Microcebus* sp. (Lemurs of Madagascar Is); *Macaca* sp. (Old World/ Asian monkeys), *Homo sapiens* (human).

Solenodon sp. (the alamiqui)

Suncus sp. (common shrews)

Colugo_Flying

Colugo_Resting

Murid Rat

European Rabbit

Indian Hare

Mammalian specimens belong to Cohort Unguiculata

Intermediate Horseshoe Bat

Three banded Armadillo

Three toed sloth

Pangolin

Tarsiers

Mouse Lemur – World's smallest primate

Old world Monkey – Rhesus Monkey

Common Marmoset(*Callithrix jacchus*) – World's Smallest Monkey

Primate specimen of different species – Monkeys & Non hominid Apes

Hoolock Gobbon - India's Only Primate species

Orangutan

Gorilla

Chimpanzee

Order – Rodentia

1. Animals with gnawing habit .
2. Incisor with open roots.
3. Canine absent.
4. Jaws with highly developed masseter muscles.
5. Limbs pentadactyle and plantigrade.

Examples: *Cavia* sp. (Guinea pig); *Rattus* sp. (Muroid rats with large body size); *Mus* sp. (Muroid rats with small body size).

Order – Lagomorpha

1. Upper incisor in two rows i.e. 2+2.
2. Three upper and two premolars
3. Maxillae have fenestrations.
4. Hind limbs larger than the fore limbs.

Example: *Oryctolagus* sp. (European rabbit); *Lepus* sp. (European Hare).

Order – Cetacea

1. Aquatic carnivorous mammals.
2. Hind limbs and pelvic girdle often reduced.
3. Body hair absent.
4. Skin with sub-cutaneous layer of fat – blubber.
5. Forelimbs modified into flipper.
6. Often hyperphalangy and hyperdactyly.

Examples: *Balaenoptera* sp (Blue whales), *Physeter* sp (Sperm whale); *Delphinus* sp. (Dolphins).

Blue Whale - Largest Extant Mammal

Common Dolphin

←Cetaceans

Tiger

Lion

Bear with cubs

Indian Wolf

↖↑↗
Carnivores

Aardvark

←Tubulidentate

Hyrax

Order – Carnivora

1. Digitigrades often with reduction in the number of digits.
2. Canines well developed.
3. Post-canine teeth reduced in most cases.
4. Toes with sharp claws and often retractile.

Example: *Canis* sp. (dogs, Wolfs, Jackals); *Panthera* sp. (Tigers, Lions etc.) *Felis* sp. (Cats).

Order – Tubulidentata (= Tube-teeth)

1. Head produced into a long muzzle; body is thick.
2. Pinnae are large.
3. Fore-limbs short and stout.
4. Small mouth with long tongue.
5. Teeth with fine permeating tubules.

Example: *Orycteropus* sp. (Aardvark). This mammal is nocturnal and native to Africa.

Order – Hyracoidea

1. Manus and pes plantigrade.
2. Digits end in hooves.
3. Skull shows many special characters.

Example: *Procavia* sp. (Hyrax).

Order – Proboscidia

1. Nose and upper lip fused to from trunk.
2. Upper incisor produced to form tusk.
3. Testis abdominal.
4. Molars are large and lophodont.

Example: *Elephas* sp. (Asiatic Elephant); *Loxodonta* sp. (African Elephant).

N.B. – Largest land Animal.

Order – Sirenia (=mermaids)

1. Aquatic and herbivours.
2. Forelimb modified into paddle.
3. Bones solid, without oily-deposits.

Example: *Trichechus* sp. (Sea-cow or Manatee of Pacific & Indian Ocean or Dugong of Atlantic ocean)

Order – Perissodactyla

1. Unguligrade, without lateral digits.
2. Bony weight passes through the central digit (i.e. 3rd digit).
3. Molars with a large grinding surface.
4. Digits hoofed.
5. Mammae inguinal

Example: *Eqqus* sp (horses, donkeys, and zebras); *Rhinoceros* sp(Rhinoceroses); *Tapirus* sp (Tapir).

Order – Artiodactyla

1. Bony weight passes through 2nd and 3rd digits.
2. Hooves present.
3. Lateral digits reduced.
4. Molars with large cusps.
5. Mammae inguinal.

Example: *Bos* sp (Cows), *Axis* sp (goats); *Sus* sp (Hogs).

Asiatic Elephant

African Elephant

Proboscidians

Sea Cow

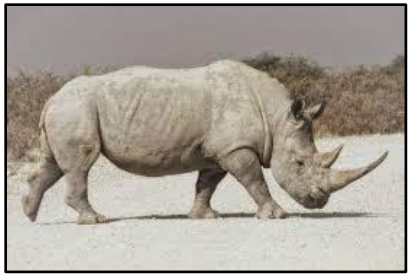
Sirenian

Horse

Zebra

Wild Ass of Kutch

Indian Rhinoceros (One horned)



African White Rhinoceros (Two Horned)

Asiatic Tapir

Perissodactyles

Cows

Wild Hog

Artiodactyles

Nilgiri Tahr

Bibliography:
1. Simpson, G.G. (1945): **The Principles of Classification and A Classification of Mammals**, *Bull. Amr. Nat. Hist. Soc.* v85.
2. Young, J.Z. (1991): The Life of Vertebrates
3. Kardong, K. (2011):Vertebrates – Comparative Anatomy, Function, Evolution.

DISCLAIMER: The author wishes to express his indebtedness to late Dr. Swapan Kumar Das for the text of this study material.