

## **Class Aves – Birds 9,100 species**

- This class comprises the Birds which are Vertebrates adapted for aerial life.
- The body is divided into head, neck, trunk and tail.
- Their internal and external structures are modified to suit the process of flight.
- There are several exoskeletal structures, which are the feathers covering the greater part of the body, the horny scales covering the feet, the claws found at the tips of the digits, and the horny beaks covering the bony beaks. All of these structures are epidermal in origin.
- The fore limbs are modified into wings which are used for flight. They are moved by the chest muscles which are very well developed.
- They move on land by hind limbs.
- Many trunk and tail vertebrae, as well as some bones of the fore and hind limbs are fused, giving compound, compact bones more suitable for flight.
- The bones are generally provided with air spaces.
- The two clavicles unite to form a furcula, and the sternum has a ventral keel in flying Birds.
- The skull is produced anteriorly into upper and lower beaks carrying no teeth, and posteriorly it carries a single occipital condyle.
- The skin possesses a single gland lying dorsally at the base of the tail, and known as oil gland.
- The alimentary canal includes a crop which is a wide sac used for temporary storage of food, and a gizzard which is a thick-walled, muscular part of the stomach used in grinding hard food materials.
- The heart consists of four chambers, which are two auricles, and two ventricles.
- There is only one aortic arch which is the right one.
- There is a special organ of voice, the syrinx, lying at the base of the trachea.
- The lungs are connected with air sacs, which are connected with the spaces inside the bones.
- The urinary bladder is absent, and excretory materials are semisolid.
- In female, there is a single left ovary, and left oviduct; the right elements are usually atrophied.
- Fertilization is internal, and the eggs are large, rich in yolk, and enclosed by hard calcareous shells.

## **Classification of Class Aves**

- Subclass: **ARCHAEORNITHES.**
- This group includes the fossil birds known from the Jurassic. In these forms, the tail is elongate, consisting of more than 13 vertebrae each with a pair of rectrices; the metacarpals and digits are separate, the latter with claws; and the jaws contain teeth.

- Subclass: NEORNITHES
- The remainder of the birds are placed in this subclass. In this group the tail is reduced, being composed of fewer than 13 caudal vertebrae which are also compressed, rectrices attach in a fan-like manner, the metacarpals are fused and the digits reduced, claws not being present on all.
- The Neornithes includes 28 extant orders and several extinct orders dating back as far as the Cretaceous.
- Four of the extant orders and two of the fossil orders are often collectively called the ratites, though many ornithologists consider this to be a polyphyletic assemblage.
- The ratites are flightless, with reduced wings and an unkeeled sternum. The living orders include the
  - Struthioniformes (ostriches, Africa and southern Asia);
  - Rheiformes (rheas, South America);
  - Casuariiformes (cassowaries and emus, Australia and New Guinea); and
  - Dinorithiformes (or Apterygiformes) (kiwis, New Zealand).
- The extinct ratites are the elephant birds of Africa and Madagascar, and the moas of New Zealand. Members of these two orders were gigantic, reaching heights of 3 to 4 m, and weights of up to 450 kg.



**Order: SPHENISCIFORMES. Penguins.**

**Bill short and stout to relatively long and decurved. Neck short, body stout. Wings are paddlelike. Tail very short. Legs short and stout, set far back; feet webbed. Plumage consists of a dense coat of very small feathers. No apteria .**



**Order: GAVIFORMES. Loons.**

**Water birds of duck-like form, with short tails; legs short and inserted at posterior end of the body; tarsus compressed; front toes joined by web (palmate), hind toe not included in web; bill pointed, higher than wide, lacking tail.**



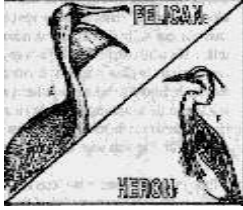
**Order: PROCELLARIIFORMES. Tube-nose Swimmers (Albatrosses, Shearwaters, and petrels).**

**Marine or pelagic birds with oily plumage; wings pointed; fore toes webbed, hind reduced or absent; nostrils tubular; horny sheath of bill formed of several plates.**



**Order: PELECANIFORMES. Totipalmate Swimmers (Tropic-Birds, Pelicans, Boobies, Cormorant, Anhingas, Frigatebirds).**

**Wings large; legs short; all 4 toes included in web (totipalmate); nostrils tiny or lacking external openings; epidermal covering of bill compound; gular pouch present, small in some instances.**



**Order: CICONIIFORMES. Long-legged Wading birds ( Whalehead, Herons, Storks, Ibises, Flamingos, and New World Vultures).**

**Long necks; rounded wings; long legs; feet partially or not webbed, hind toe on level with fore toes; bill longer than head, straight spatulate or decurved, nail absent; head with bare areas or naked lores.**



**Order: ANSERIFORMES. Waterfowl (Ducks, Geese, Swans, and Screamers). Duck-like form; legs and tail short; front toes webbed; bill broadened.**



**Order: FALCONIFORMES. Diurnal Birds of Prey, Vultures, Secretary birds, Hawks, Eagles, Ospreys, and Falcons (but not the New World vultures).**

**Feet raptorial, toes 3 in front, 1 behind, outer more or less opposable; claws generally strongly curved and sharp for**

grasping prey; beak strong and hooked, with sharp cutting edges. Eyes directed more or less laterally.



**Order: GALLIFORMES. Fowl (Turkeys, Grouse, Pheasants, Curassows, Quail, Prairie Chickens, etc.)**

**Stout-bodies; wings short and rounded, primaries stiff and curved; feet large, not webbed, toes 3 in front, 1 behind; bill short, culmen decurved, upper mandible vaulted.**

**Order: GRUIFORMES. Marsh Birds (Cranes, Limpkins, Rails, etc.)**

**Wings squarish or rounded, outer primary markedly shorter than second, primaries usually concealed by secondaries when wings closed; legs long, feet not fully webbed; bill usually longer than head; lores feathered or bristled.**

**Order: CHARADRIIFORMES. Shore-birds, Gulls, and Auks.**

**Wings pointed, outer primaries usually longer than secondaries; front toes webbed to varying degree; hind toe rudimentary or absent; lores feathered.**



**Order: COLUMBIFORMES. Pigeon-like Birds.**

**Wings long and pointed; short legs; feet rather small, 3 toes in front, 1 behind, latter elevated; bill slender, constricted in middle, swollen at base, with a fleshy operculum.**

**Order: STRIGIFORMES. Owls.**

**Nocturnal birds of prey; plumage fluffy, prominent facial disc; eyes directed forward; feet zygodactyl, outer toe reversible, bill with cere, strongly hooked.**

**Order: APODIFORMES. Swifts, hummingbirds.**

**Bill very small, slightly decurved; gape large. Wings very long and pointed. Tail short and truncate (with feathers in some species spin-tipped) to long and forked. Legs extremely short; tarsi or even toes) feathered in many species.**



**Order: CORACIIFORMES. Roller-like Birds (Kingfishers, Motmots, Hornbills, etc.)**

**Legs moderate to short; feet small and weak, syndactyl-outer anterior toes joined at the base and provided with a common sole; bill long.**

**Order: PASSERIFORMES. Passerine Birds (Flycatchers, Larks, Swallows, Orioles, Crows, Titmice, Nuthatches, Creepers, Wrens, Shrikes, Warblers, Finches, etc.).**

feet adapted to perching, with three toes in front, 1 behind; rear toe incumbent (inserted at same level as front toes) and about equal to or longer than lateral toes; rectrices usually 12; bills various; lores feathered.



#### **Ex: *Columba livia domestica* – Pigeon**

- The body of Pigeon is divided into head, neck, trunk and tail.
- The head is small, with terminal mouth guarded by upper and lower beaks.
- The eyes are large, and each is provided with an upper and lower eyelids, and a transverse nictitating membrane.
- Posterior to each eye is a shallow depression, the external auditory aperture.
- The neck is long, cylindrical and very mobile.
- The trunk carries anteriorly the fore limbs or wings, and posteriorly the hind limbs or legs.
- The hand possesses only three fingers, representing the first, second and third.
- The foot is provided with four toes, which are the first, second, third and fourth.
- At the posterior end of the trunk, on its ventral surface, is a large, transverse cloacal aperture.
- The tail is short, and carries an oil gland secreting oily substance used in lubricating the feathers.
- The feathers are of three principal types, which are the contour feathers occurring all over the body, the filoplumes lying at the bases of the contour feathers, and the down feathers which cover the body of the young.

#### **Digestive system:-**

- The alimentary canal of Pigeon begins with the mouth which is large, and contains no teeth inside it.
- The buccal cavity joins a pharynx forming a baccopharyngeal cavity, leading to a long esophagus, which becomes greatly dilated at the base of the neck forming a thin-walled sac known as the crop.

- Inside the crop the food, which consists of grains, becomes macerated before it goes to the stomach.
- A short distance behind the crop, the esophagus joins the stomach.
- The stomach consists of two parts, the proventriculus which secretes the gastric juices, and the gizzard which has the shape of a biconvex lens.
- The gizzard has thick walls, and small cavity, which contains small stones to help the gizzard in grinding up the food.
- The duodenum leaves the gizzard close to the entrance of the proventriculus, and forms a distinct loop enclosing the pancreas.
- Following the duodenum is the ileum which is much coiled, leads to the rectum, and the junction between the two is marked by two small rectal caeca.
- The liver is large and bilobed, and each lobe joins the duodenum by its own duct.
- There is no gall bladder.
- The pancreas is compact and discharges its secretion into the duodenum by three pancreatic ducts.
- The spleen is comparatively small, and attached to the proventriculus.

### **Respiratory system:-**

- The glottis lies directly behind the tongue, and leads into the larynx which does not act as an organ of voice as in other Vertebrates.
- The larynx leads to a very long trachea, supported by complete bony rings.
- The posterior end of the trachea divides into right and left bronchi which are supported by incomplete cartilaginous rings.
- The organ of voice is the syrinx which lies at the junction of the trachea with the two bronchi.
- The lungs are comparatively small, spongy organs.
- The bronchi are connected with a system of large air sacs, two cervical found at the root of the neck, two anterior thoracic and two posterior thoracic, two abdominal and a single interclavicular between the lungs.
- The air sacs are in communication with the air spaces present inside the bones.
- Such arrangement increases the efficiency of respiration, and adds to the lightness of the bird.

### **Circulatory system**

- The heart of Pigeon is comparatively large, and consists of four chambers, two auricles, and two ventricles.
- There is no sinus venosus or conus arteriosus.
- The right auricle receives the right and left anterior venae cavae, and posterior vena cava, bringing venous blood from different parts of the body.
- The left auricle receives four short pulmonary veins, bringing oxygenated blood from the lungs.
- The right ventricle gives the pulmonary arch which divides into two pulmonary arteries, through which the venous blood passes to the lungs to be oxygenated.



- The left ventricle gives the right aortic arch which curves to the right side, and then extends backwards as the dorsal aorta, supplying different parts of the body with oxygenated blood.

### **Urinogenital system:-**

- 1- The kidneys of Pigeon are flattened, and each is divided into three lobes.
- 2- Along the ventral surface of each kidney, a narrow ureter extends backwards to open into the middle chamber of the cloaca.
- 3- In female Pigeon, only the left ovary and left oviduct are present.
- 4- There is a rudimentary right oviduct.
- 5- The loss of an ovary and oviduct reduces the weight of the Bird, and thus represents an advantage in flight.
- 6- The left oviduct is long and convoluted, its anterior end is enlarged forming a wide funnel for the reception of ripe ova, and its posterior end leads to the cloaca.
- 7- In male Pigeon, there are two oval testes, each of which is attached by a thin peritoneal membrane to the ventral surface of the anterior lobe of the kidney of its side.
- 8- The vas deferens is a convoluted tube arising from the inner edge of the testis, and extends posteriorly lateral to the ureter, to open into the cloaca.
- 9- The posterior end of the vas deferens is dilated forming a small vesicular seminalis.
- 10- There is no copulatory organ, and copulation is effected by contact of the cloaca of male with that of female.