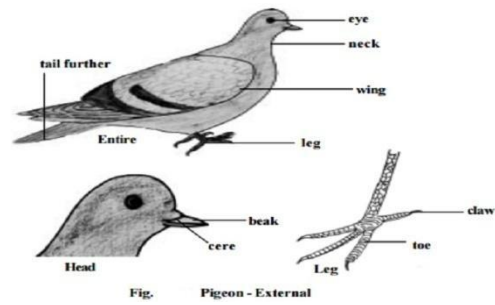


## PIGEON : EXTERNAL FEATURES

Dr.C.V.Narasimha murthy



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Birds are easily recognised group of vertebrates. In birds every part of the body is modified to suit their aerial mode of life. Birds possess feathers, beak and feet modified in relation to their aerial life.

The Pigeons are flying birds(carinate). They are known both as wild and domesticated forms. The Pigeons are seen both in tropical and temperate zones. About 10 species of Pigeons are found in India. The pigeons fly in flocks and roost together. The domestic pigeons have many varieties, namely panter, fantail and tumblers. They differ in size, colouration and feather ar-angement. All of them are, however, descendants of the rock pigeon-*columba livia*.

### External features.

The Body is spindle shaped. Their size varies from 20-25 cm. They are covered by coloured feathers leaving beak and a small portion of the hindlimbs.

The body is divisible into **head**, **neck**, **trunk** and a small, conical **tail**. The head is round and

drawn out anteriorly into a strong, hard, pointed **beak**. The mouth is a terminal wide gape, guarded by elongated upper and lower beaks. The beaks are covered with a horny sheath or **rhampotheca**. A swollen area of soft skin, the **cere**, surrounds the **nostril**. It is present on each side of the upper beak. The **eyes** are large and guarded by upper and lower **eye-lids** and a transparent **nictitating membrane**. A pair of **ear openings** are situated at a short distance behind the eyes. Each opening leads into a short **external auditory meatus**, ending in the **tympanic membrane** forming the ear drum.

The neck is long and mobile. It helps in the movement of the head in various directions. The trunk is compact, heavy and bears a pair of **wings** and a pair of **legs**.

The **cloacal aperture** is at its hind end on the lower surface. Projecting behind the cloacal aperture is the tail. Above the tail is a knob on which opens an **oil gland** or **preen gland** or **uropygeal gland**. It secretes a fluid used for preening the feathers.

The digestive system of pigeon is well developed and includes an alimentary canal and the digestive glands.

### Alimentary Canal:

The alimentary canal of pigeon (Fig. 26.28) is long, tubular and coiled. It comprises mouth, buccal cavity, pharynx, oesophagus, stomach, small intestine and large intestine which opens to the exterior by cloacal aperture. All the segments of alimentary canal fall into following three categories- foregut or stomodeum, midgut or mesenteron and hindgut or proctodeum.

### 1. Foregut or Stomodeum:

The portion of alimentary canal from mouth to stomach region is lined by ectodermally derived layer.

#### It includes following organs:

##### (i) Mouth:

The anterior most opening of alimentary canal is called mouth. In pigeon, mouth is a wide slit-like aperture, bounded by the upper and the lower horny beaks having no teeth. The mouth is followed by buccal cavity.

##### (ii) Buccal Cavity:

The featureless buccal cavity has a large, narrow, triangular and pointed at the tip the tongue at its floor. The tongue has few taste buds and mucous glands, and has the function of manipulation of food. The buccal cavity is followed by pharynx.

##### (iii) Pharynx:

The posterior most part of buccal cavity may be called the pharynx. A pair of elongated apertures, the posterior nares, opens in the roof of the pharynx. They are covered by palatal folds of skull roof. Just behind the posterior nares opens a single median aperture of the pharyngotympanic or eustachian tubes. At the floor of the pharynx occurs an oval aperture with tumid lips which is called glottis. The glottis opens into the trachea. Posteriorly, the pharynx opens into the oesophagus.

### (iv) Oesophagus and Crop:

Oesophagus or gullet is a long, wide, distensible and thick-walled tube which runs backward through the neck to join a large dilated reservoir or crop.

It is a large, thin-walled, bilobed, elastic and non-glandular sac. The crop enables the bird to store quickly swallowed food for later digestion. It is specially large in granivorous (grain-eating) birds such as pigeons, finches, buntings, parrots, etc.

The grains are moistened and softened in it. The epithelial lining of the crop in both sexes thickens and sheds a white, slimy, proteinous and fatty "crop milk" during the breeding season on which the young are fed by both parents. Pigeon milk is produced by the degeneration of the epithelial cells lining the crop, under the control of prolactin hormone, secreted by the anterior lobe of the pituitary gland. This hormone stimulates and controls the formation of pigeon's milk. Pigeon's milk contains water (65-81%), protein (casein) (13.3-18.8%), fat (6.9-12.7 %) and lactose (1.5%).

It is more nourishing than the cow's milk. Pigeon's milk contains 35 per cent of fat in comparison to 3 to 5 per cent in cow's milk. The young ones fed on it double their weight in two days. The pigeon's milk is regurgitated to the young.

The crop also contains some mucus secreting glands. Beyond the crop, before opening into the stomach, the oesophagus become thick-walled and narrow tube.

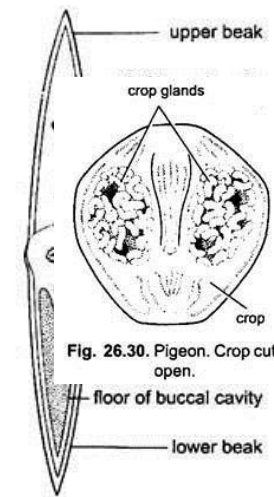


Fig. 26.29. Pigeon. Bucco-pharyngeal region.

Fig. 26.30. Pigeon. Crop cut open.

### **(v) Stomach:**

The stomach is differentiated into an anterior glandular proventriculus and a posterior muscular gizzard.

#### **(a) Proventriculus:**

The proventriculus is a small, thick-walled and glandular structure appearing externally as a slight dilation of the oesophagus but it is a gastric structure. Its thick mucus lining secretes the gastric juice. The spleen is a small, oval red body and remains attached to the right side of the proventriculus by peritoneum.

#### **(b) Gizzard:**

The gizzard represents the pyloric region. It is large hard, muscular and laterally compressed having the shape of biconvex lens. The thick walls of gizzard have thick muscles radiating from two tendons. Its narrow lumen is lined by an epithelium in which are present numerous minute tubular glands, which secrete a fluid (koilin) which becomes thick, horny and of a yellow or green colour and lines the gizzard. Its yellow or green colour is due to regurgitated bile.

The cavity of gizzard always contains small stones or grit swallowed by the bird. These stones help the gizzard in grinding the food. The gizzard into small intestine and the opening of gizzard into small sphincter, called the pyloric valve or pylorus. In carnivorous birds the gizzard is not so muscular.

### **2. Midgut or Mesenteron:**

The midgut, mesenteron or small intestine is a narrow tube and has a lining of endodermally derived epithelium. The small intestine is divided in an anterior duodenum and a posterior ileum. The bile and pancreatic ducts usually open into the distal

limb of duodenum. In pigeon the left bile duct enters close to the pylorus.

#### **(a) Duodenum:**

The duodenum arises from the dorsal side of gizzard so that the pyloric opening of gizzard into duodenum lies close to the cardiac opening of proventriculus into gizzard. The duodenum forms a U-shaped loop enclosing the pancreas between its two limbs.

#### **(b) Ileum:**

The portion of the small intestine behind the duodenum is called ileum. Ileum is a long and coiled tube of uniform diameter. Its inner epithelial lining is thrown into numerous minute, finger-like processes or villi, which greatly increase its area of secretion and absorption.

### **3. Hindgut or Proctodaeum:**

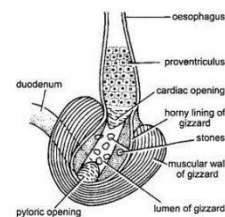
The slender ileum continues into large intestine of similar diameter. The function of ileum and large intestine is externally marked by the presence of a pair of small conical, blind pouches, the rectal or colic caeca. The rectal caeca probably absorb some water from digestive food. The large intestine or hindgut (proctodaeum) is a short tube and comprises an anterior rectum and a posterior cloaca.

#### **(a) Rectum:**

The rectum is narrow and is of same diameter as the ileum. It opens into cloaca. Its opening into cloaca is guarded by an anal sphincter.

#### **(b) Cloaca:**

The cloaca is a large chamber and divided into three linear compartments: an anterior coprodaeum which receives the rectum, a



short middle urodaeum into which urinary and genital ducts open, and a proctodaeum which opens to the outside by the cloacal aperture or vent.

The urinary products are made solid by absorption of water in the urodaeum and the walls of other chambers serve a similar purpose. A small, thick-walled, glandular, blind pouch of lymphatic tissue, the bursa Fabricii, lies on the dorsal side of the cloaca.

### **Digestive Glands:**

**In pigeon, following digestive glands occur:**

#### **(i) Buccal Glands:**

Pigeon has no salivary gland in the buccal cavity, but has a median sub-lingual gland and a pair of angle glands near the corners. These glands are the only buccal glands which secrete mucus to moisten the food and probably the amylase enzyme. The tongue also bears few mucous glands.

#### **(ii) Gastric Glands:**

The epithelial lining of proventriculus contains many gastric glands which secrete certain gastric juices containing peptic enzymes.

#### **(iii) Liver:**

The liver of pigeon is large, compact, dark red, bilobed, containing a large right lobe and a small left lobe. From each lobe of the liver arises a bile duct, the left bile duct opens into the proximal limb near the pylorus and the right duct opens into the distal limb of duodenum. In pigeon, gall bladder is lacking, but it is present in Gallus and many other species. The liver secretes bile Juice.

#### **(iv) Pancreas:**

Between two limbs of the duodenum is a large, compact, reddish digestive gland, the pancreas. Pancreas gives off three separate pancreatic ducts which pour the pancreatic secretions containing many enzymes into the distal limb of duodenum.

### **(v) Intestinal Glands:**

The epithelial linings of intestine have many glands which secrete many enzymes. The duodenum is lined with villi and single or branched crypts of Lieberkuhn. Goblet cells are also present.

### **Respiratory System**

The high metabolism and athletic life-style of birds require a great deal of oxygen.

Four organs work together to carry oxygen to the cells: nostrils, trachea, lungs, and air sacs. With each breath, air moves through the nostrils, down the trachea and into the lungs and air sacs. From the lungs, oxygen passes into the bloodstream and then to the body cells. The air that passes into the air sacs cools the internal organs and helps maintain body temperature. Nearly all of the air in the lungs is replaced with each breath. When flying, birds require ten to twenty times more oxygen than at rest. To supply the extra oxygen, birds increase their breathing rates.

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## **Circulatory System**

A bird's circulatory system consists of a four-chambered heart and blood vessels. With each beat, or stroke, of the heart, a large volume of blood is carried throughout the bird's body by vessels called arteries. Blood is then returned to the heart by vessels called veins. Birds are nature's best athletes. With their powerful hearts, they can keep up extraordinary levels of physical exertion for long periods. A ruby-throated hummingbird's heart is about 3 percent of its total body weight, but it is strong enough to supply fuel and oxygen to the flight muscles for a nonstop flight across the Gulf of Mexico.

The high metabolism of birds requires rapid circulation of the blood because waste products build up quickly in the cells and must be removed before they reach a toxic level. Typically, small birds have a higher metabolism than large birds and therefore have a faster heart rate.

## **Nervous System**

The nervous system of a bird consists of the brain, sense organs, and nerves. Nerves carry messages from sense organs, such as the eyes, to the brain. Nerves also carry messages from the brain to the muscles. The term "birdbrain" may need to be forgotten. Researchers have found that although birds lack a cerebral cortex — the brain structure associated with intelligence in mammals — they can still pass messages between higher and lower brain regions. This functionality helps explain how birds are capable of complex behaviors.

As a group, birds have the best vision of all animals. Their large eyes, which sometimes weigh more than their brain, provide keen sight and excellent color perception. Birds that are most active at night, or nocturnal, also have well-developed sight. Range of vision depends on whether the eyes are on the sides of the head or on the front of the

head.

Hearing is also well developed in birds, with some night birds having especially acute hearing. Only a few birds, such as the kiwi, have a highly developed sense of smell. The kiwi is nearly blind and relies on its sense of smell to find food.

## **General approach to bird migration**

- Bird migration is a two-way journey from breeding or resting place to feeding or nesting place and vice versa.
- It is a periodic, regular, to and fro movement.
- Birds are the greatest migrants, however, some species of birds do not migrate. The birds which remain in a country throughout the year are called residents. Eg: Bobwhite, Rufflet, sand goose etc.
- The birds from the northern hemisphere are more migratory than the southern hemisphere. Eg: Siberian crane, golden plover, cuckoos etc.
- Bird migration may be diurnal, nocturnal or both. Eg: hawk, robin of diurnal, sparrow, warbler of nocturnal and duck, gull of both.
- Distance travelled by migratory birds depends on the local condition and species of birds. Eg; golden plover is the non-stop fighter, Arctic terns are the king of migrants.

## **Causes of bird migration:**

### **Bird migration**

- Due to seasonal changes, scarcity of food, the shortening of daylight, increase in cold, etc.
- According to Bissonnette, decrease in pituitary activity in winter cause bird to migrate southward. In summer, the pituitary activity becomes active and gonads develop,

so, the birds return northward for breeding.

- Migration is a part of the sexual cycle. Birds begin to migrate northward as their gonads begin to swell.

### *Factors affecting on bird migration*

#### **Physical factor**

Light, temperature, a velocity of the wind, etc. affect bird migration.

#### **Metabolic factor**

When birds consume more amount of food, the fats deposited under subcutaneous layer affects the nervous system, then, the birds migrate towards the breeding place.

#### **Biological or Hormonal factor**

Due to the intensity of light, the pituitary gland stimulated which secretes the gonadotrophic hormone (FSH and LH). These hormones activate gonads which affect nervous system then the birds migrate towards breeding place.

#### **Shortage of food**

In the northern hemisphere, due to ice sheet during winter, shortage of food occurs. So, the birds migrate towards southern hemisphere.

### *Types of bird migration*

**Latitudinal migration:** North to south and vice-versa. Eg; Siberian crane.

**Longitudinal migration:** East to West and vice-versa. Eg; Starling bird.

**Vertical migration:** Up and down in the mountainous region. Eg; Daphe.

**Partial migration:** Within a single species, some do migrate and some do not. Eg; birds of the temperate region.

**Irregular migration:** Migrate in all direction covering few or many miles. Eg; Herons.

**Regular migration:** Birds came out from their nest in the morning to search food and return back in evening hour daily. Eg; Pigeon, Sparrow.

**Seasonal migration:** Some birds are winter visitors like snow bunting whereas some birds are summer visitors like swift.

### *Advantages of bird migration*

- Birds get more food, better climatic condition, and breeding place.
- Birds get better adaptability in new places.
- There will be the wide geographical distribution of birds.

### *Disadvantages of bird migration*

- Predator will die due to the shortage of food when birds of that place migrate.
- During migration, birds need to face several risks in which enormous numbers of birds die.
- They can carry the germs like bird flu.