

and so, the large supply of oxygen, the respiratory structures are suitably modified.

The respiratory system of Pigeon consist of respiratory tract, respiratory organs or lungs and air sacs.

(a) Respiratory tract: It includes nostrils, ^{glottis} larynx, trachea and syrinx.

(a) Nostrils:

(i) These are paired slit-like opening situated at the base of the beak and surrounded by swollen structure (sensitive membrane) called the cere or operculum.

(ii) The nostril lead into short nasal cavities which open at the pharyngeal roof by internal ^{nares}.

(iii) Nasal cavities contains spongy ethmoid bones with scanty olfactory epithelium.

(b) Glottis: (i) The glottis is slit-like aperture present near the base of the tongue in the pharyngeal floor.

(c) Larynx: The glottis open into larynx which is reduced in bird.

(i) Larynx consists of paired arytenoid and cricoid cartilage divided into four pieces.

(ii) Vocal cords are absent so the larynx of birds not function as sound producing organ.

(d) Trachea: (i) The larynx opens into a large flexible tube called trachea.

(ii) It is supported by complete bony rings.

(iii) Near the junction of neck and trunk trachea

- expanded into syrinx and then divided into bronchi.
- (v) Each bronchus entering into lung of its own side.
 - (vi) Each bronchus is supported by cartilagenous ring which is incomplete, however the first bronchial ring is bony and complete.
- © Syrinx :
- (i) It serve the function of sound producing organ and characteristic of birds (absent in ostrich, Storks and some vulture)
 - (ii) It is formed by the dilatation of last 3 or 4 tracheal ring and first bronchial ring forming a resonating chamber known as tympanum.
 - (iii) The mucous membrane lining the tympanum forms the external tympaniform membrane.
 - (iv) At the bifurcating of the trachea is found a cartilagenous ridge called prescutus, which extends dorsoventrally and support a small vibratory ~~membrane~~ semilunar membrane.
 - (v) The inner membrane lining each bronchus forms the internal tympaniform membrane.

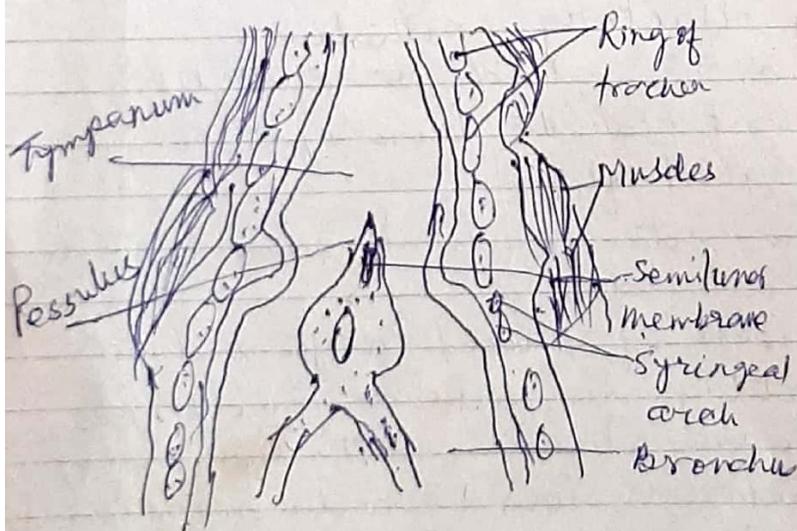
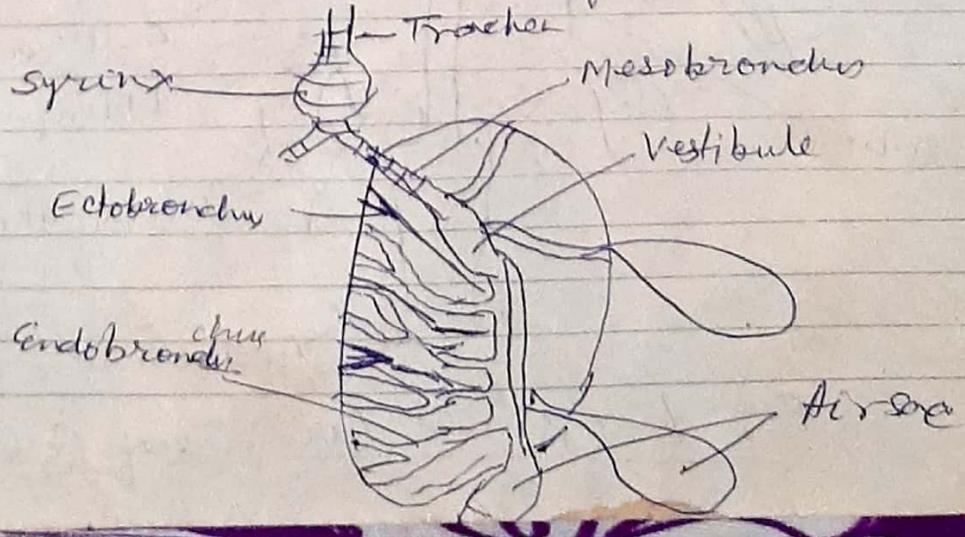


Fig - Syrinx of bird

- vii) A pair of intrinsic laryngeal muscles arises from the side of trachea and is inserted into larynx
- viii) Another paired sterno-brachial muscles originate from the sternum and are inserted into the trachea
- ix) The voice is produced by the vibration of the tympaniform when expelled air passes between tympaniform membrane vibrating the pessulus and semilunar membrane. The pitch is controlled by laryngeal muscles.

Bronchus: Trachea bifurcates into two bronchi. Each bronchus enter the lung of its own side. On entering the lung the bronchi lose their supporting rings. Each is now known as primary bronchus. Instead of branching immediately continues up to the distal end of the lung as meso-bronchus. In pigeon the primary bronchus dilate slightly at anterior end as vestibulum. The secondary mesobronchus divides into secondary bronchus within lung and are arranged in two sets - (a) 7-10 dorsal ectobronchi and (b) 4-6 ventral endobronchi. The secondary bronchi divided into still thinner tertiary bronchi or parabronchi. These again branches breaks into a system of thin air capillaries. The parabronchi also connect with the recurrent bronchi of air sacs.

Fig. Lung of Pigeon showing relation between ecto, endo and Parabronchi



② Respiratory Organs in Pigeons

① Lungs: Pigeon lungs are small, spongy, highly vascular and slightly distensible organ. They are situated in the pleural cavity which are separated from abdominal cavity by an oblique septum. The lungs are attached firmly to the ribs & thoracic vertebrae dorsally. The ventral surface of lungs covered by peritoneal membrane called pleura or pulmonary aponeurosis. (Small fan like costopulmonary muscles are attached to the pleura and these originate from the junction of vertebral and sternal ribs.)

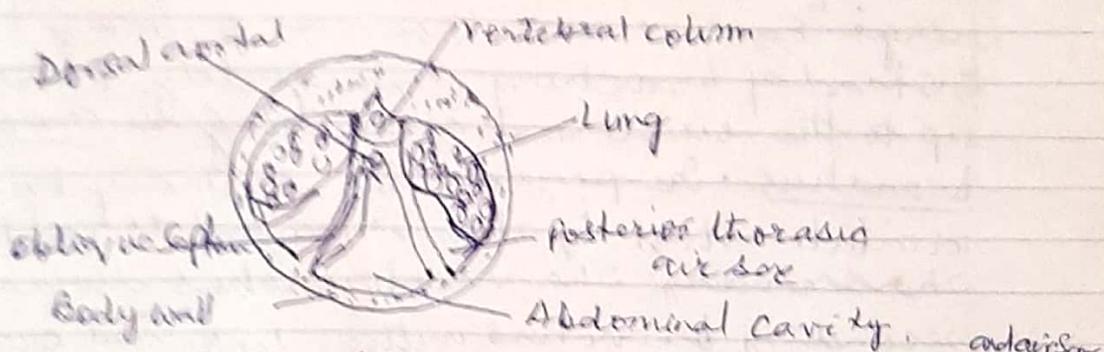


Fig - TS of body showing relative position of lung and

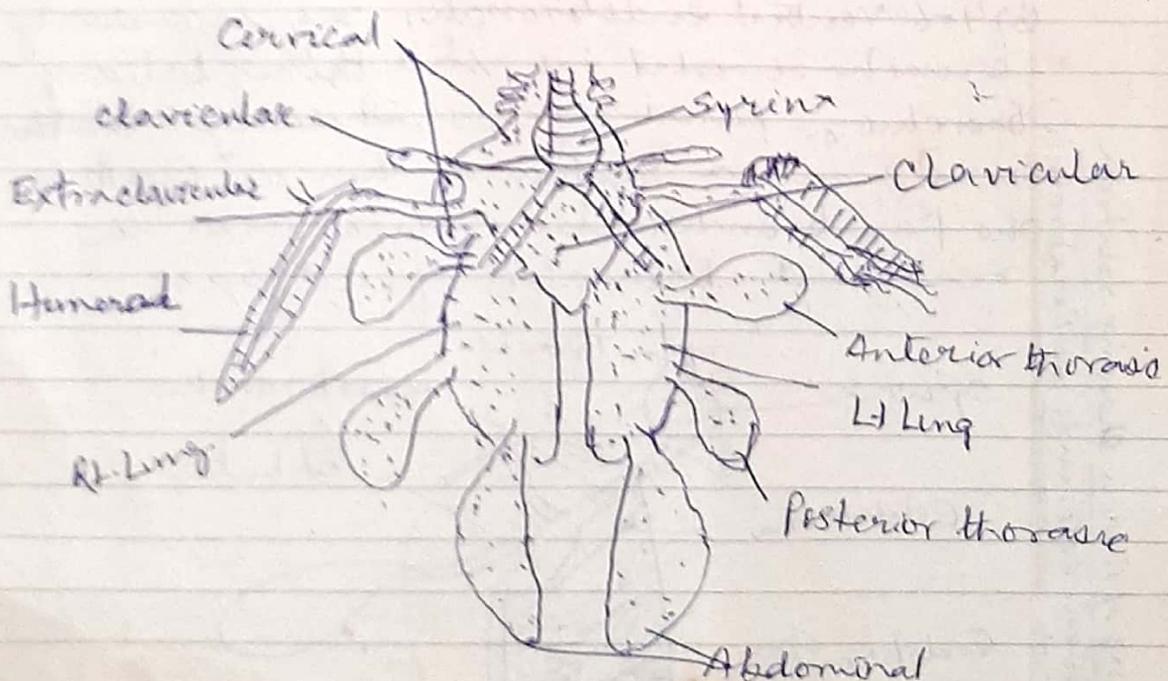


Fig - Lungs and Air Sac of Pigeon

10) new structures. They open into the lungs through an aperture called ostea. They lack blood supply and mainly serves as accessory respiratory organs. There are nine air sacs as follows:

i) Cervical: These are small paired air sacs placed near the base of neck and arise from the anterior side of each lung. Each sac sends of small diverticular into the adjacent vertebrae.

ii) Interclavicular: It is a single median air sac situated in the angle between the two limbs of the furcula. It is connected with both the lungs. On each side it gives two tubular sacs clavicular and extra clavicular.

iii) Anterior thoracic: These are paired air sacs arising from the sides of the lungs and extend up to the edge of the sternum.

iv) Posterior thoracic: These paired air sacs are placed just behind the anterior thoracic air sacs and are ~~too~~ closely applied to the lateral walls of the body. The left sac is slightly larger than the right.

v) Abdominal: These are the largest paired air sacs which arise from the distal end of lungs and lie among the coils of intestine.

Mechanism of Respiration:

In Pigeon and other birds as well, there are two different modes of respiration.

a) During Rest: In a resting bird the air is inspired by lowering the sternum. The sternum is moved forward and downwards by the contraction of costo-pulmonary or intercostal muscles and thus by the body cavity is enlarged. Air is drawn into the lungs and also into air sacs.

expiration is brought about by contraction of abdominal muscles which decrease the body cavity and air is forced out of the lungs.

b) Swing Flight:

Swing flight the inspiration and expiration is brought about by the movement of flight muscles and to some extent by the elevation and depression of the vertebral column.

The inspired air ultimately goes to the air capillaries where exchange of gases takes place. Air from air sac is also sent to the air capillaries for exchange of gases through recurrent bronchi. Thus there is double supply of fresh air for efficient oxygenation of blood.

Fayaz Ahmed