

Flight Adaptation

AERIAL OR FLIGHT ADAPTATION.

INTRODUCTION:-

Since the dawn of life on this earth the environmental conditions are changing i.e. environmental condition is not permanent. In this changing environment for successful existence, animals bring change in morphology as well as physiology. Because if there is no any change, animals will die and become extinct. Thus the changes acquired during changing environment are known as adaptations. According to HERBERT SPENCER the continuous adjustment of internal and external relations of body is known as adaptation.

In birds whatever changes are seen all are due to aerial life. So change for successful life in air is known as aerial adaptations.

structural adaptation for flight:-

The secret of the peculiarities of birds lies in their highly flight adaptation in vertebrates. The detailed account may be summarized below:-

① Morphological modification:-

The boat shaped body pointing anteriorly and posteriorly to give the body less resistance while flying in air. It has got broad planing surface capable of adjusting to the varying wind pressure.

② well developed exoskeleton and wings. The governing characters of bird is the modification of the fore limbs as wings. Covered with feathers which are outgrowth of skin and may be

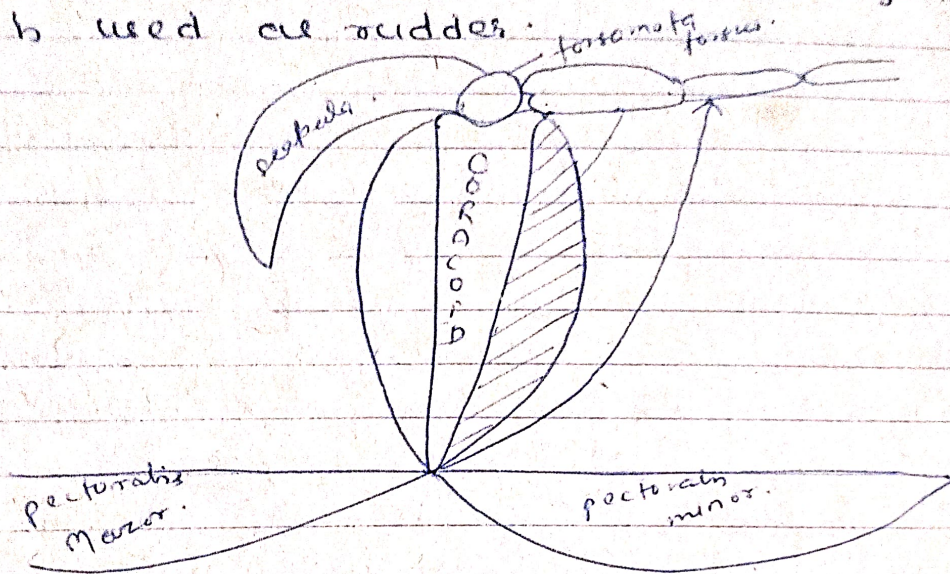
- regarded as highly specialized scale. The wing act as an propellar. The feathers serve in buoyancy by considerable blanket of enveloping air around the body and also serve in preventing loss of heat and maintain constant temperature during flight.
- (iii) The short tail of the body bear a series of long tail feathers which serve as a rudder for steering during flight.
 - (iv) Neck long and mobile.
 - (v) The hind limb are shifted anteriorly so as to balance the entire wt. of the body.

② Wing Muscles:- There are three set of wing muscles and are about one sixth of total weight of the body. The main trust Come from pectoralis major in flying and keep the bird up coming it onward. The pectoral minor which is smaller in size help in upward strake of the wings. The third pectoral muscle is responsible for downward strake of wing.

③ skeleton Modification:-

- (i) The bones are light hallow and pneumatic
- (ii) Skull bones are paper thin and aerated by nasal and eustachian sinus and are firmly fused.
- (iii) The rigidity of the dorsal part of the backbone due to the fusion of vertebrae is of Advantage inaffording a firm fusculum for the wing strakes while the arched clavicles and strong Coracoids adapted to resist the inward pressure on the down strakes.

(iv) Caudal vertebrae fused to form a short pygostyle which supports the tail feathers and free caudal vertebrae which lie in front of pygostyle are responsible for the free movement of the tail which is used as rudder.



(v) Ribs are flattened to provide greater surface area for muscle attachment.

(vi) A well developed keel is present which is modified sternum becoming broad and flattened for the muscle attachment which helps the movement of wings.

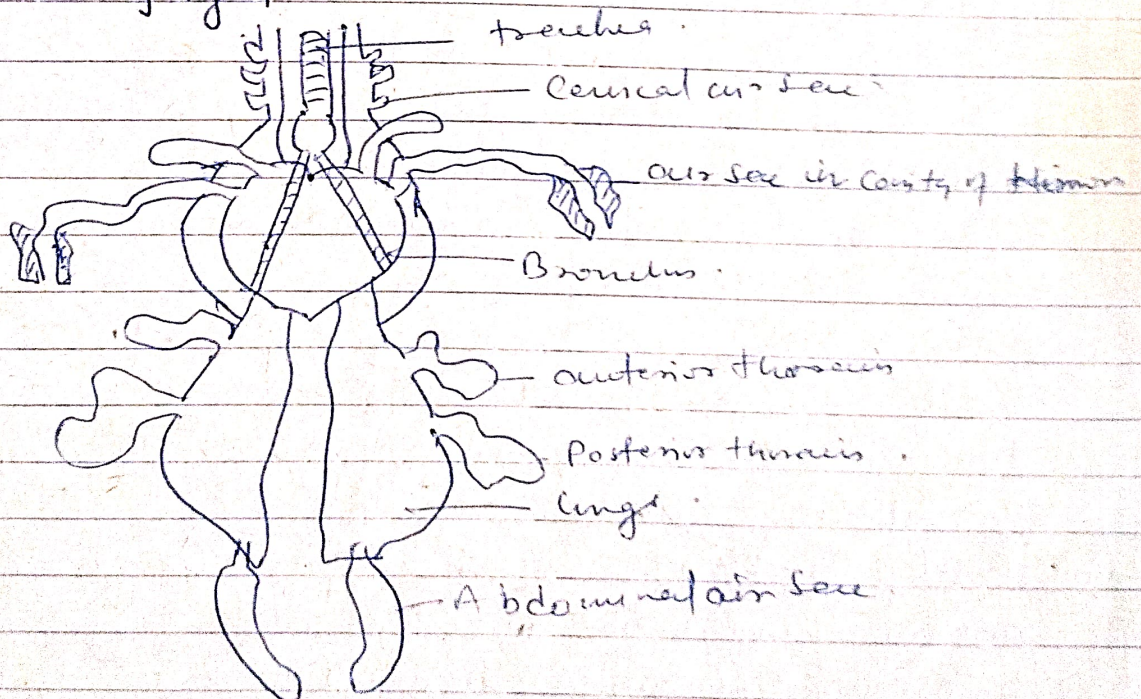
(vii) The pectoral girdle is very large and strong with scapula stout coracoid fixed to the top of sternum and divide ventrally to form V-shaped forcula.

(viii) Pelvic girdle supports entire weight of the body, hence they are modified on the way of synsacrum by the fused sacral vertebrae and ischium to give good rigidity to support entire weight of the body.

(ix) Hind limbs bear three long bones for the support of the body.

③ Respiratory system:-

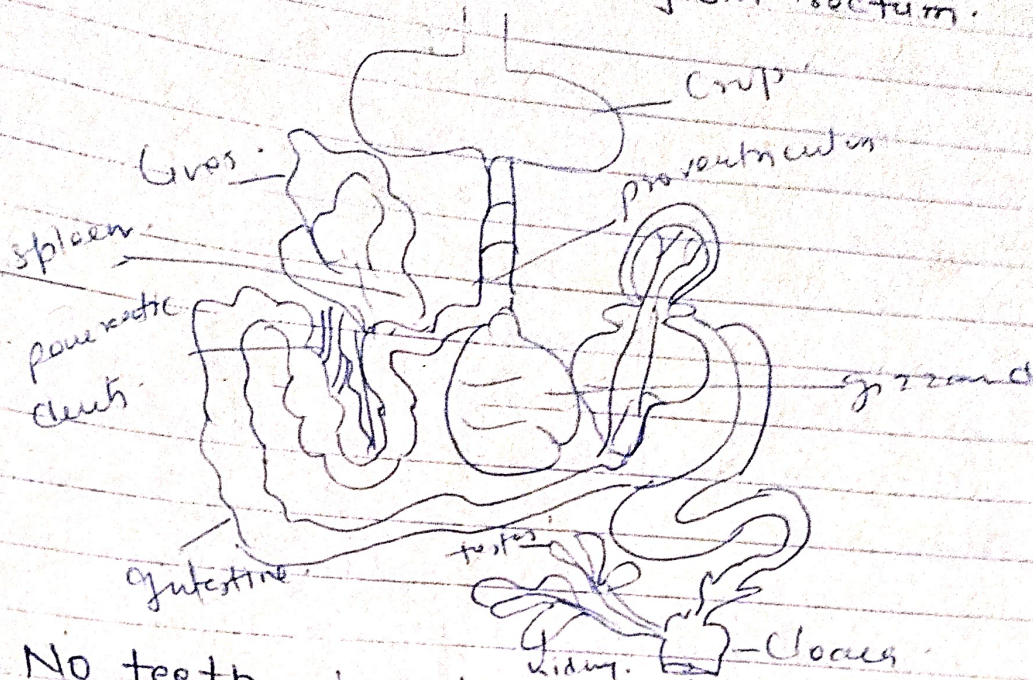
- ① Respiratory system of bird consists of air sacs which are attached with pneumatic bones of the body between the space.
- ② Lungs are small and spongy lie into the space between ribs and peritoneal covering thus such type of constitution of respiratory organs helps the bird in their buoyancy.
- ③ The aeration is perfected and oxidation is completely producing large amount of energy. The heat liberated makes the air inside the bones warm and to overcome cold when bird is on high altitude.
- ④ The perfect aeration provides a great mechanical energy to birds enabling by conversion of chemical enables them to use this energy in their flight.



④ Digestive system:-

- ① Crop is large and rectum is very small as to birds high rate of metabolism need more food and minimum waste resulting in small rectum.

10 To avoid weight, the undigested food is immediately get out from rectum.



- (11) No teeth in upper or lower jaw decreasing the wt. of the body and to substituted this last beak is provided with sharp edges.

(5) Circulatory System:- The bird is warm blooded animal. The perfect aeration of blood is responsible for the high temperature of the body (40 to 46°C) for flight which requires efficient circulatory system. Therefore heart is large and divided into 4 chambers blood vessels are voluminous and efficient both in transport and carry back of the blood.

(6) Sense Organs & Nervous System:-

- (i) Eyes are well developed in size and in sense of sight and are situated on either side of beak enabling the bird to sight food and enemy from a large distance ~~and~~ ~~stereoscopic~~ ~~plate~~ ~~to~~ ~~protect~~.
- (ii) The bird flying above ground don't depend only upon sight but also have a great sense of smell and hearing in addition to sight.

- (iii) well convoluted Cerebellum indicates the delicate sense of equilibrium and great power of co-ordination.
- (iv) Brain has large optic lobes due to highly developed sight.

(2) Reproductive System:- It also present a modification in having.

- (i) Single ovary in female.
- (ii) Urinary bladder is reduced or absent enabling the bird in reduction of weight.

Conclusion:-

It can be said that birds are more specialized for their aerial life than any other flying animal and are capable of spending a long time continuously in the air.