

## **Sense Organs in Pigeons (With Diagram)**

The pigeon, like other vertebrates, has receptors or sense organs for touch, smell, taste, sight and hearing which are stimulated by the environment. These sense organs are termed external receptors or exteroceptors.

### **The pigeon possesses following exteroceptors:**

#### ***1. Tactile Organs:***

These are poorly developed in birds due to feathery covering of the body. Tactile organs of pigeon remain confined to the bill and tongue of pigeon. The cere is a sensitive soft fold of skin at the base of the upper beak in pigeons, is said to have a stimulating effect during love making. The corpuscles of Grandry in the bill of ducks and other birds are probably tactile receptors.

They are composed of cells with a flattened nerve ending between cells. These are comparable to Meissner's corpuscles in mammals. Merkel's corpuscles are also found in many birds. The corpuscles of Herbst, resembling Pacinian corpuscles of mammals, are found in the dermis, are vibration receptors, sensitive to mechanical deformation by rapid pressure changes.

They are found in great numbers in the beaks of all birds and also in the feather follicles, between tibia and fibula and in the tip of the tongue of woodpecker. Tactile nerves are also present at the base of the feathers, especially those of the wings and tail.

#### ***2. Gustatory Organs (Chemoreceptors):***

Sense of taste and smell are little developed. The sense organs of taste, the taste buds, occur in limited number on the dorsal surface of tongue. The sense of taste is poorly developed in pigeons.

#### ***3. Olfactory Organs:***

Birds are usually unable to distinguish delicate odours, and on the whole their sense of smell is very poor, as flying animals cannot depend on smell. The nasal cavity is large but the olfactory epithelium is restricted. Birds use the nose to test air coming from the internal nostrils. In kiwis, olfactory sense is well developed. These birds are nocturnal and terrestrial.

### **Structure of Olfactory Organs:**

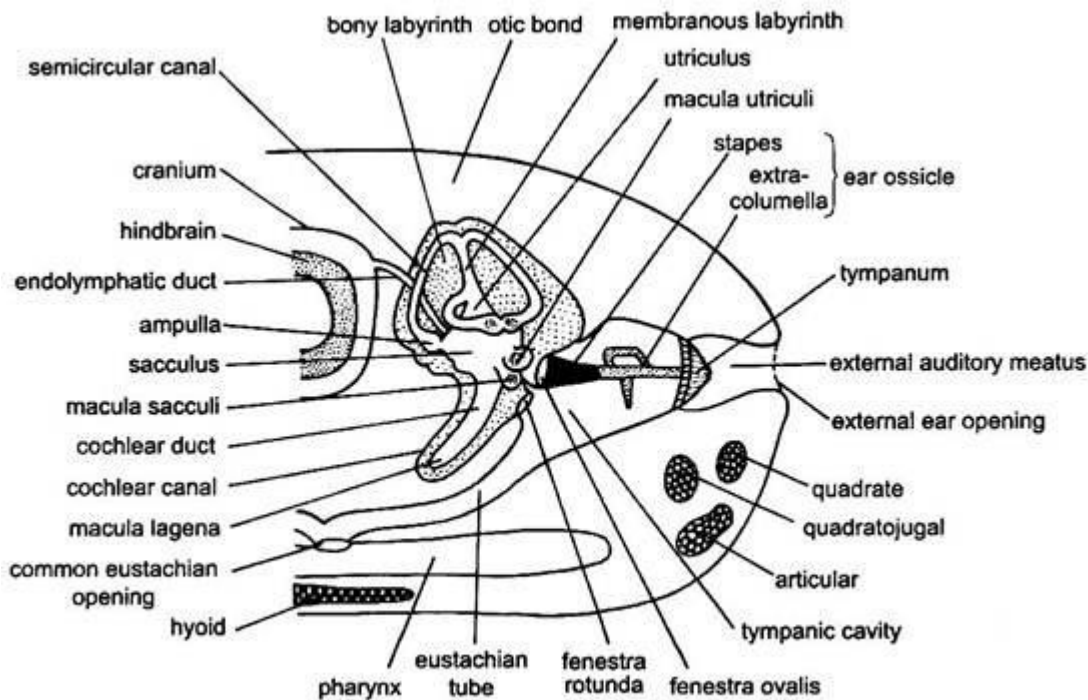
The nostrils, overhung by cere, lead into the small, paired olfactory sacs or nasal chambers in the base of upper beak. The two chambers are separated medially by mesethmoid and bounded externally by ectoethmoid. The ectoethmoid produces inwards three scroll-like turbinal processes to increase the olfactory surface.

The nasal chamber has an anterior non-sensory respiratory part and a posterior sensory part. The non-sensory part or vestibulae contains the anterior turbinal covered by laminated epithelium.

The sensory or olfactory part contains the middle and posterior turbinas invested by the one-layered olfactory mucous epithelium or Schneiderian membrane, which is made of basal cells, supporting cells and elongated neurosensory cells. The neurosensory cells remain connected with olfactory nerve. Both the olfactory chambers remain communicated to the pharynx by the internal nares.

#### *4. Auditory Organs or Ears:*

The sense of hearing is acute in most birds. Its auditory sense organs, the ears, serve their dual function of equilibrium and hearing. Auditory organs consist of a fundamental ear, the internal ear or membranous labyrinth and middle ear or tympanic cavity, like mammals. But, unlike mammals they lack external ear.



**Fig. 26.41.** Pigeon. T.S. head through internal ear.

### **Internal Ear:**

The internal ear or membranous labyrinth lies embedded in a dense ivory like bone in the side wall of the skull and is surrounded with a perilymph fluid. Membranous labyrinth is filled with a dense fluid, called endolymph. It contains a high concentration of potassium as in mammals, maintained by the activity of a tegmentum vasculosum, which also absorbs sodium.

It consists of three semicircular canals (one horizontal, one antero-vertical and one postero-vertical), relatively small sacculus and utriculus and a short blind tube, the cochlear duct or lagena. Lagena is larger than in reptiles and less developed than in mammals.

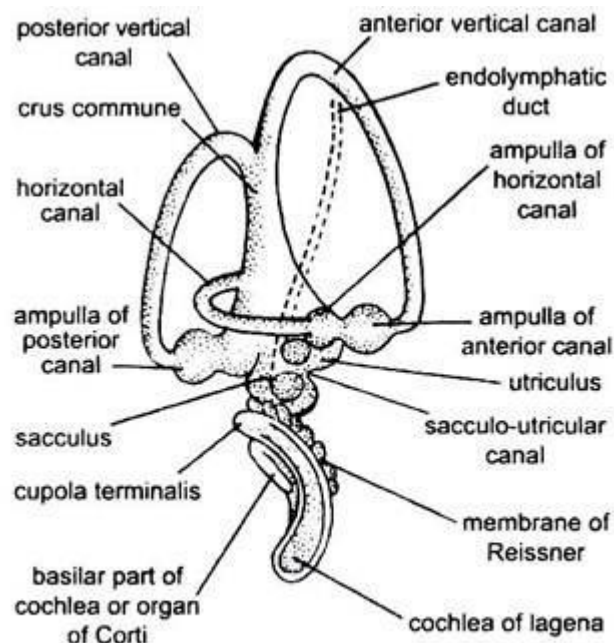
The proximal limbs of anterior and posterior semicircular canals unite to form a crus commune. The sacculo-utricular connection is narrow. From the sacculus arises an endolymphatic duct which ends in the duramater.

The cochlear duct, with its surrounding bony labyrinth or cochlear canal, is called cochlea. The cochlear duct is a slightly curved tube, surrounded by a perilymphatic space within a bony tube. In a transverse section, the cochlea shows three chambers: an

upper scala vestibuli, a middle scala media and a lower scala tympani. The scala media is the actual cochlear duct and contains endolymph, while other two scalae are filled with perilymph.

At the apex of the cochlea (scala media) the scala vestibuli and scala tympani are continuous, this junction is known as the helicotrema, near it the scala media ends blindly. At the inner end of cochlea, scala vestibuli is continuous with fenestra ovalis, while the scala tympani with the fenestra rotunda. The floor of scala media is formed by the basilar membrane and the roof by the Reissner's membrane. The basilar membrane consists of tall auditory hair cells (40), together constituting an organ of Corti.

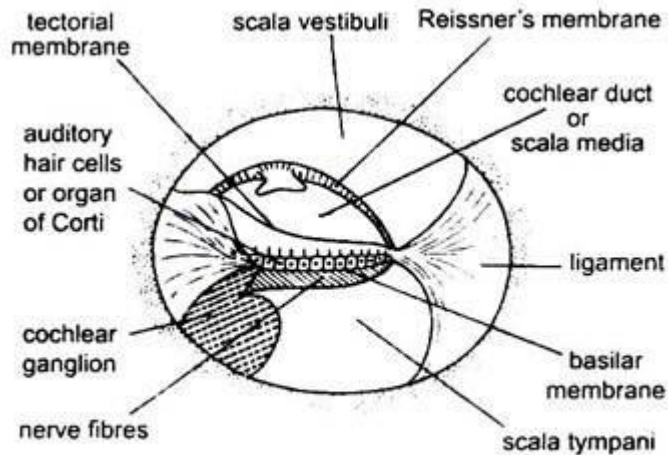
The organ of Corti is sensitive to sounds of higher frequencies. The free ends of the auditory cells bear hairs, which are embedded in a tectorial membrane, lying above the organ of Corti. From the basal ends of the cells arise nerve fibres which unite to form the cochlear branch of the auditory nerve. The cochlear duct at its apical end has another set of auditory hair cells, their hairs embedded in a gelatinous cupola terminalis having minute calcareous otoliths.



**Fig. 26.42.** Pigeon. Internal ear (membranous labyrinth).

At the tip of the cochlear duct is the lagena. Groups of auditory cells are called cristae and maculae. Those present in the ampullae of three semicircular canals are called cristae ampullares which possess the sense of direction and equilibrium. One macula is

present in utricle and one in saccule. One macula is present in the lagena (tip of cochlear duct). Macula lagena is separated from the other maculae by a long cochlear duct. It perceives low frequency sounds.



**Fig. 26.43.** Pigeon. Cochlea in T.S.

### **Middle Ear:**

A circular external ear opening lies on each side of the head, behind the eyes concealed beneath auricular feathers. It leads into a short canal, the external auditory meatus, at the base of which lies a thin, transparent, vibrating septum, called tympanum or ear-drum.

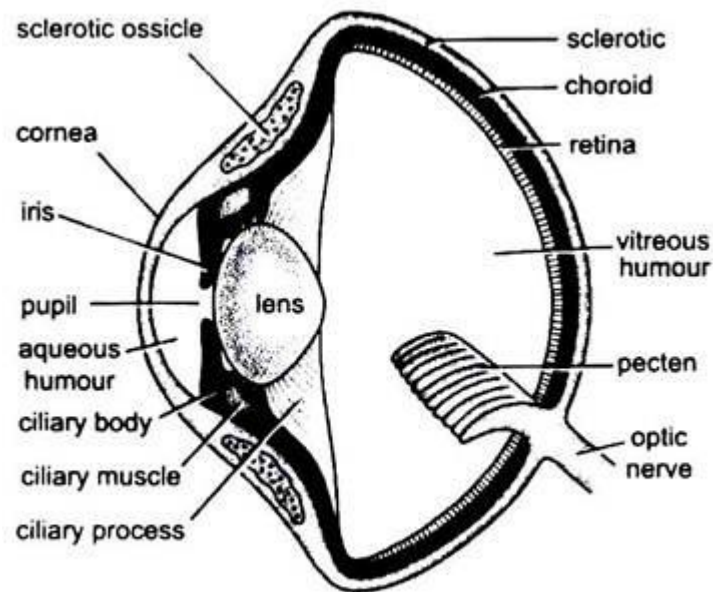
The ear-drum is followed by the cavity of middle ear or tympanic cavity. From the tympanic cavity arises a eustachian tube which unites with its fellow to open by a common aperture in the pharynx. The eustachian tube serves to equalise the air pressure on both sides of the tympanum.

Across the tympanic cavity lies a single rod-like bone, the columella auris, which transmits sound waves from tympanum across the tympanic cavity to the fenestra ovalis of the inner ear. The outer end of columella auris has three rayed cartilaginous processes called extra columella connected to the inner surface of tympanic membrane, and its inner disc-like bony part, the stapes, is wholly occluded the fenestra ovalis.

Columella auris (stapes) is derived from the hyoid arch. Sound is transmitted from the tympanum by the columella auris (stapes). Extra columella reduces the amplitude and increase the force of vibrations. There is single middle ear muscle attached to columella

and tympanum and innervated by facial nerve. Acoustic vibrations are transmitted to an oval window and so around cochlea to a round window, as in mammals.

The equilibratory and auditory parts of ear of pigeon are well developed. Ability to localise sound in birds is high. Owls and other birds probably find their prey largely by ears. For the purpose of direction-finding they have developed very long cochleas and an asymmetrical arrangement of ear cavities (*Strix*) or asymmetrical external ears (*Asio*). Cave birds have the power of avoiding obstacles by echolocation, *Steatornis* (oil bird), *Collocalia* (swiftlet). These birds emit clicks.



**Fig. 26.44.** Pigeon. Eye in sagittal section.