

It is in the Parrot-tribe alone that the horny mandibles perform the functions of a proper instrument of mastication; for, as a rule, they are adapted only for seizing and retaining the food within their grasp. The peculiar degree of mobility of which the superior maxillary arch is capable in Birds, has been already alluded to in speaking of their skeleton. The jaws are moved by several muscles (see Muscular System) analogous to those of the Mammalia.

In place of the velum palati, we find near to the opening of the posterior nares within the faucial cavity, tubercular elevations of epithelium, or dentated ridges similar to those upon the root of the tongue and the margins of the glottis, and behind these are situated glandular follicles, which have been regarded by some as analogous to the *amygdalæ* or *tonsils*. These follicles are frequently aggregated into a thick glandular layer, provided with numerous excretory openings, as in the Birds of Prey, while in others of the class Aves *e. g.* the Cormorant (*Carbo*) they are altogether wanting.

The *Œsophagus* is always very muscular, slightly plicated internally, and expands in many Birds usually below its middle and in front into a sacciform pouch called the *crop*, *craw*, or *ingluvies*. This is commonly of a thin membranous texture, provided internally with small mucous glands, and when distended with food hangs down in the neck in front and between the branches of the furcula, and, as in the Gallinæ, is there supported by a special muscle. The crop is found in all the Diurnal birds of Prey, but it is only feebly indicated in the nocturnal Rapaces or Owls; it is of large size in the Parrots, particularly so in the Gallinæ and Pigeons, and more rarely in the Grallæ and Palmipedes, as in the Flamingo (*Phænicopterus*). The *craw* is extremely large in the Pigeons, and during the period of incubation obtains in both sexes a remarkable degree of vascularity, its lining membrane becoming, at the same time, developed into a network of folds and cells, which form two large laminiform layers, that secrete and pour out into the crop a creamy or lacteal fluid; with this alone, discharged from the crop of the parents, the young are at first fed, but at a later period of their existence it is mingled with grain, that has been macerated in the ingluvial secretion. The *craw* is generally wanting in the Struthionidæ, with the exception of the Cassowary, and also in the Scansores and Passeres, where the *œsophagus* is frequently much expanded and even wider than the *proventriculus*. In rare instances, as in the Pelican, there occurs an additional expansion of the gullet which is situated between the rami of the lower jaw, and being provided with muscular arches,

serves as a bag for carrying food. It may be compared to the cheek pouches of the Rodentia. A very singular peculiarity occurs in *Pala-medea cornuta*, which consists in the presence of a craw-like dilatation between the *proventriculus* and gizzard.

At the extremity of the gullet there is found very generally occurring throughout the class of Birds a first division of the stomach, called the *proventriculus* or *bulbus glandulosus*, the walls of which, as the latter name implies, are thickly studded with a layer of simple or divided glandular follicles, that pour out their secretion by separate mouths upon the internal surface of the stomach. The *proventriculus* is in general, *e. g.* in the Gallinæ, Geese, and Ducks of a smaller size than their very largely-developed gizzard, but frequently the reverse is the case to a striking degree, as in the genus *Thalassodroma* or Storm-petrel, and the Puffin. In the Pigeons long slender strips of glands are sent upward from the *proventriculus* over the *œsophagus* as far as the crop, and between these the *œsophagus* is thin and membranous. More rarely, as in the Northern Divers, the commencement of the *proventriculus* is indicated by a narrow chaplet of glandular follicles situated at the termination of the gullet, or it is not recognisable externally by any expansion, as in *Euphonia violacea*; its cavity, however, is provided throughout its entire extent with follicles. The gastric follicles are usually simple *cæca* of very small size, as in the carnivorous Birds, and frequently also in the granivorous Birds, as the Peacock and Cassowary, but they are larger and divided at the extremity in the Common Fowl, or even slightly racemoid, as in the Ostrich. The *proventriculus* is distinctly separated by a constriction from the gizzard in all cases where the latter is very fleshy, but when it is more membranous, both stomachs communicate with each other by a wide aperture.

The second fleshy muscular stomach or *Gizzard* is very highly developed in the Granivorous birds, as in the Fowls and Pigeons, and also in many Grallæ and Palmipedes, as the Swan, Goose, Duck, Coot, and Flamingo. The thick muscular layers upon either side are here divided in the middle by a tendinous disc, into two halves. The cavity of the gizzard is of but small extent, owing to the projection internally of its strong muscular parietes, and is invested by a hard, pergamentaceous or even horny epithelium, which can be readily detached. Occasionally corneous tubercles project from the epithelium, as in the Puffin. The gizzard is frequently also of very small size, not very muscular, and provided only with a flat thin disc of radiating tendinous fibres. In the Pelican and Gannet

the œsophagus is much wider than the gizzard; the latter is very thin and membranous, as in the Divers. It is very rarely, as in *Euphonia violacea*, that all traces of a muscular stomach or gizzard are wanting. On the contrary, there occurs occasionally, as in the Herons and Pelican, though not in the genus *Sula*, so nearly allied to the latter, a third always smaller gastro-pyloric dilatation, which is tolerably distinct, and conducts by a narrow pyloric opening into the duodenum.

The *Intestinal Canal* always makes a number of convolutions upon itself that are retained in their place by mesenteric folds of peritoneum; the latter membrane does not, however, develop true omenta. The duodenum forms at its commencement a long loop, within which the pancreatic gland is situated, while the small intestine is continued at its lower extremity into a large intestine not much wider, but shorter, and passing downward in front of the vertebral column, its commencement being usually indicated by a symmetrical pair of short or longer cœca coli. The large intestine terminates by opening into a wide sacciform or rather bladder-shaped compartment of the urethro-sexual cavity, the cloaca. The villi of the small intestine are generally much elongated, and extend also occasionally as far as the extremities of the cœca, *e. g.* in *Fulica*, but this is not the case in the Gallinæ and Owls. The villi are, however, frequently wanting, or rather, there occur instead zigzag folds of the lining membrane, as in *Corvus*, *Euphonia*, *Turdus*, and perhaps in the Passeres generally.

Many varieties occur in reference to the two cœca just alluded to. They are, for example, completely wanting in nearly all the Scansores and Picariæ, as *Picus*, *Psittacus*, *Rhamphastos*, *Alcedo*, *Upupa*, *Cypselus*; they are very short in the Pigeons, Owls, most Passeres, and many Grallæ, *e. g.* the Stork and Spoon-bill, somewhat longer generally in the Diurnal birds of Prey, while they attain, on the other hand, a considerable development in most of the Natatores, as the Geese, Ducks, &c., where they are frequently also asymmetrical, being longer upon one side than the other. The cœca are of surprising length and width in the Gallinæ, as in *Tetrao*, where they each measure a yard in length; in the Ostrich the cœca are upward of two feet long, provided internally with a spiral valve, and blend, at their inferior extremity, into a single cavity; the large intestine is here also, as an exception, much longer than the small intestine. It is very rarely that, as in the Mammalia, a single, and in such

cases invariably shorter, cœcum is present, as in the whole genus of Herons.

There is not unfrequently found, about the middle of the small intestine, a small cœcum or diverticulum, which indicates the former place of entrance of the vitelline duct into the intestine. This persistent remnant of an embryonic structure is remarkably constant and normal in many of the Grallæ and Palmipedes, as the Goose, while it is scarcely ever to be perceived in the orders Rapaces, Passeres, and Scansores.

The whole intestinal canal is of very variable length, being scarcely double as long as the body in *Mormon fratercula*, while in the Penguin it is fifteen times its length.

The *Salivary Glands* vary greatly in number and development throughout the several orders and even genera of birds, in accordance with their mode of life. In general four pairs of these glands are to be met with, namely, a pair of sublingual glands situated upon either side beneath the tongue, two submaxillary glands divided each into an anterior and posterior, which lie the one behind the other, and open by special ducts in front of the lingual organ, and a gland that may be compared to the parotid, which is placed close beneath the skin upon the angle of the mouth, and frequently extends into the orbital cavity. Occasionally one or the other pair of the above glands are wanting, and in *Sula*, *Carbo*, *Phœnicopterus*, they appear to be all of them absent, or, as in the Grallæ and Palmipedes generally are but slightly developed. In the Geese and Ducks all the pairs, however, are met with, and in the Goose the sublingual gland is of particularly large size. The Herons possess only the sublingual gland. In the Watercoot (*Fulica*), and still more so in *Hirundo esculenta*, the parotid gland is very much developed, and in the latter bird its secretion serves for the preparation of their edible nests; in the Rapaces, Passeres, and Gallinæ, the salivary glands are generally all present. In the Woodpecker and Wryneck (*Yunx*) the anterior and posterior submaxillary glands are constantly blended into a large, white, and flattened gland, which secretes a very viscid salivary fluid.

The *Liver*, which is of a brownish red color, is divided always into two halves or lobes, of equal or else very unequal size. In the Rapaces, many Grallæ and Palmipedes, both lobes of the liver are of equal magnitude, while in the Passeres the left lobe is generally much smaller than the right. The *Gall-bladder* is absent only in a few genera, as in the Ostrich, the Pigeons, and many of (though

not all) the Parrots. As a rule, two hepatic ducts are met with (in the Ostrich however there is only one, and a single cystic duct), which open generally near to (more rarely apart from each other, as in the Pigeons) the extremity of the duodenal loop. Other slight varieties occur in these parts, thus the gall-bladder is very long and intestinoid in the Toucan, and in the Flamingo the short hepatic duct dilates into a bladder-like receptacle after its exit from the liver.

The *Spleen* is in general small and exhibits manifold diversities of form, being elongated and cylindrical in the Passeres and in Rhamphastos, disc-shaped in the Bustard, rounded and broad in many Palmipedes. It is unusually small in the Cuckoo. In the Struthionidæ a small accessory spleen is frequently observed.

The *Pancreas* is almost always a gland of considerable size, invariably lodged within the loop formed by the duodenum and of a white or yellowish white color; it is small and single in the Heron and Cuckoo, and frequently double, consisting of two lobes united by a very slender isthmoid portion, as in the Gallinæ, Pigeons, many Rapacious and Natatorial birds; it is even tri-lobed, as in the Woodpecker. It has mostly two, though frequently three excretory ducts, as in the Rapaces, Pigeons, Ducks, &c., but more rarely only a single one, as in the Ostrich and Cassowary.

ORGANS OF CIRCULATION.

THE Heart of birds is highly muscular, and of very large size in proportion to the bulk of the body. It presents but a few trifling diversities of form, such as being more elongated than usual in the Passeres and Grallæ, or broader, as in the Parrots. The whole organ is situated, enveloped by a thin pericardium, in the middle line of the body resting upon the sternum, its apex being directed straight backward, and lodged between the two lobes of the liver. It consists of two auricular and two ventricular chambers, which are not however portioned off, as in the Mammalia, by a well-defined circular groove, nor are the appendices of the auricles so distinct. The cavity of the right ventricle is wider, but its walls are much thinner and shorter than the left, so that the apex of the heart is formed by the left ventricle alone, which is much stronger, being furnished with walls three times as thick as those of the right. The usual valves are found in front of the openings of the venæ cavæ into the right auricle, and between the latter and the right

ventricle there is found a peculiar valve of very great strength, and formed of longitudinal muscular bundles, which pass obliquely from the right wall of the ventricle to the interventricular septum, and serves obviously to bring into forcible approximation the opposite parietes of the ventricle, and thus to drive out the blood more effectually into the pulmonary artery. The septum ventriculorum is directed convexly toward the right, concavely toward the left ventricle. In the inter-auricular septum the fossa ovalis is found always completely closed, and surrounded by a strong muscular ring (*annulus ovalis*). The left auricle is smaller, but more muscular than the right, and the openings within it of the two pulmonary veins are commonly provided with valves. Three semilunar valves, provided in the middle of their margin with a small ossified nodule, are found at the commencement of the pulmonary artery and aorta.

The trunk of the systemic circulation, the *Aorta*, is extremely short; from its root two coronary arteries arise to be distributed to the heart, and it then divides at once into three main branches, one of which forms the descending aorta; the two others, a right and left arteria innominata, giving off their corresponding carotid and subclavian arteries. The carotids, which are of small proportional size, exhibit many remarkable varieties, that are frequently characteristic of the several orders. As a general rule, in the Rapaces, Gallinæ, most of the Grallæ and Palmipedes, the Ostrich, and a few Scansorial birds, *e. g.* Kakadus, *Psittacus bullarius*, passerinus, &c., the two carotids traverse the canal formed by the transverse processes of the cervical vertebræ. On the other hand, in all the Passeres without exception, and many Scansores, *e. g.* *Picus*, *Sitta*, *Merops*, and some of the Parrot-tribe, as also the genus *Podiceps*, and the Rhea or American Ostrich, there is only a single, and that the left, carotid present; it is much more rare, as in the Flamingo and Pelican, for the right carotid to exist and the left be absent. In a few instances the two carotids adhere so closely together as to appear like a single trunk, as in the Bittern. A lesser degree of variety is found in most of the Parrots where both the carotids are present, but the left mounts upward, without entering the canal of the cervical vertebræ, by the side of the jugular vein. The subclavian artery runs beneath the furcular bones in the direction outward, gives off the brachial artery to the wing, and a still larger thoracic artery to the pectoralis major muscle. The descending aorta curves over the left instead of the right bronchus, as in Mammalia, passes along and in front of the vertebral column be-

tween the two lungs, and gives off large visceral trunks within the thoraco-abdominal cavity to the stomach, liver, spleen, and mesentery, a superior and inferior artery passing transversely to the kidneys, and a small anterior or femoral with a much larger posterior ischiadic artery to the leg; the aorta is then continued along the spine, as the arteria sacra media, and gives branches to the contents of the pelvis. Several of the arteries, as the anterior tibial in the Goose, Heron, and Crested Grebe, form here and there beautiful retia mirabilia or vascular plexuses.

The *Veins* of the body, as in Mammalia, have but few valves. The blood of the superior half of the body is poured into the right auricular sinus from the two distinct mouths of a pair of superior venæ cavæ. They are formed by the junction of a jugular and subclavian vein, of which the right jugular is generally three to four times thicker and stronger than the left. The inferior or posterior vena cava collects the blood from the posterior moiety of the body, and receives especially the large renal veins. The inferior vena cava is very broad, especially in the Diving-birds. The *Pulmonary artery*, single at its commencement, divides into two main trunks for the two lungs; in a similar manner, also, the pulmonary veins enter the left auricular sinus by a single trunk. The vena porta receives principally the blood from the viscera, but some also from a large branch of the caudal vein and the veins of the posterior extremities. The blood of Birds has the highest temperature of all the Vertebrate animals (about 110° Fahr.), and the blood corpuscles are always of an elliptical form, and of very uniform diameter, throughout all the orders.

The *Chyliferous* or *Lymphatic Vessels* are numerous, and provided with valves, but do not form any conglobate glands upon the mesentery, though in the neck these glands often occur, and are of considerable size, as in the Heron, where there are from five to six pairs. A receptaculum chyli is situated upon the origin of the celiac artery, and the lymph of the body, as well as the chyle, is collected into two lymphatic trunks, which enter the angles formed by the junction of the superior venæ cavæ with the jugular and subclavian veins. Lymphatic hearts have not as yet been satisfactorily demonstrated to exist in Birds; still, however, in the Cassowary a lymphatic sinus has been found, situated beneath the integument, upon the transverse processes of the second sacral vertebra, and which, reasoning from the analogy of its position with that of the Frog, may perhaps be regarded as a lymph-propelling organ.

ORGANS OF VOICE AND RESPIRATION.

THE air during the act of inspiration in Birds passes through the nasal openings to the *Rima glottidis*, the opening and closing of which aperture may be very well observed in the expanded mouths of young birds while they are being fed. The rima glottidis forms a longitudinal fissure in the superior larynx, and is generally provided with pointed or obtuse epithelial papillæ more or less strongly developed, and frequently arranged in rows that would appear in some measure to supply the place of the epiglottis, which is wanting in the present class; they offer varieties in the several genera, and are wanting only in the Struthionidæ. Occasionally there is found behind the tongue a membranous valve-like fold, as in many Ducks and in the Ostrich; in some cases this fold has a median lappet, as in *Scelopax gallinula*, while a thicker dentated fold is found as a rudiment of the epiglottis in *Fulica atra*. A true epiglottic cartilage appended to the superior border of the thyroid cartilage occurs however in a few Birds, as the Swan and some other Natatores and Grallæ.

The *Superior Larynx* consists of several cartilaginous pieces, which admit of being compared with analogous parts in the human subject, and are constantly ossified in adult Birds. The largest of these pieces is a single bony plate, which forms the anterior part of the larynx, and abuts posteriorly and inferiorly against two lesser elongated and narrow cartilaginous pieces, not united in the median line, which appear at first sight in adult Birds to be separated from the anterior bony plate, but are blended with it at an early period in young birds. These three bony pieces are the conjoined representatives of the thyroid cartilage; the anterior plate is usually interrupted by several transverse intervals, that indicate its original formation from the coalescence of a short series of tracheal rings, these last being distinctly perceptible in many cases. Two to four of these rings are generally to be recognised, except in the Parrots, where there is no visible trace of their fusion. Posteriorly and internally the thyroid plate presents a more or less elevated ridge, dividing incompletely the cavity of the superior larynx into two symmetrico-lateral halves. Another process (*processus epiglotticus Henle*) arises from it superiorly, and in many Birds, as *Larus*, *Alca*, from its soft and slender condition approaches in character to the epiglottis of the mammiferous animal. Posteriorly, between

and above the two posterior thyroid pieces, there is situated a small rounded, cordiform or quadrangular plate, which must be viewed as the cricoid cartilage. In the Cassowary and Parrot, the posterior surface of the cricoid cartilage lies perfectly free, but is partly concealed in many Birds, as the Gallinazo, and in others can not be seen upon an external view of the larynx. The narrow elongato-triangular arytenoid cartilages are somewhat similar to those of the Mammalia, and bound the fissure of the glottis.

Three pairs of *Laryngeal Muscles* varying only in their size may be distinguished in all Birds. Upon the anterior surface of the thyroid cartilage there is situated, particularly in the Rapaces, a strong muscular fasciculus, which arises from the lingual bone, descends the trachea to a greater or less distance, and is attached to the inferior margin of the thyroid cartilage; it serves to draw up the larynx as well as the trachea, and correspond thus in action with the *hyo-thyreoides* and *crico-thyreoides* muscles of the higher animals. A *thyrio arytenoideus posticus*, the function of which is to open the rima glottidis, is situated upon the uppermost part of the dorsal surface of the larynx, takes a broad origin from the lower margin of the lateral posterior pieces of the thyroid cartilage, and passes to the extreme apex of the arytenoids. Upon removing this pair a broader thinner muscle will be brought into view, which constantly arises from the superior margin of the arytenoid cartilage and unites posteriorly and anteriorly with that of the opposite side. It acts as a sphincter contracting the fissure of the glottis, and is called *thyreoides lateralis s. compressor laryngis*. There are no chordæ vocales in the superior larynx.

The *Trachea* of Birds is usually of great length, and consists of a large number of rings, the fewest 20 to 70 occurring in the Passeres, while among the Grallæ and Natatores the Ducks present above 100, the Heron, Pelican, and Ostrich, above 200, and the Crane and Flamingo the surprising number of upward of 300 rings. These rings are for the most part complete, approximated very closely together and remain often partly membranous as in Tetrao. In many Birds the rings, at least at their commencement, are fissured, *e. g.* in the Woodpecker. In the Scansores and Picariæ, many Gallinæ, Rapaces and Grallæ, the rings continue cartilaginous throughout the whole of their existence, while in the majority of cases, as in the Passeres, the Ostrich, many Grallæ and Natatores, they are completely ossified, so that the trachea becomes a hard cylindrical tube, as in the Goose. The trachea generally descends straight

down the neck from the superior to the inferior larynx, and then divides at the commencement of the thoracic cavity into two bronchi. It is very rare for the trachea to divide higher up, namely, in the neck, as in the Humming-bird. The bronchial tubes are mostly short, and usually narrower than the trachea, though occasionally they are wider and dilated at their origin, as in the Pelican and Merganser. They are usually composed of a series of half-rings completed by an elastic membrane; more rarely, as in the Stork, of perfect rings which are occasionally continued some distance into the lungs.

Two pairs of muscles are generally found which draw down the trachea, one of which is frequently arrested in its development, or wanting altogether. The superficial pair, which is particularly well-developed in the Natatores, as the Merganser and Duck, but absent in the smaller birds, *e. g.* the Passeres, Scansores, and Picariæ, lie upon the sides of the whole length of the trachea, and arise from the upper part of the inferior larynx, and the internal surface of the furcula, whence their name of *m. cleido* or *ypsilo-tracheales*. The second pair, which are generally present, yet appear to be wanting along with the first in the Parrots, are called the *m. sterno-tracheales*, arise from the external part of the anterior margin of the sternum, are attached likewise to the lateral surfaces of the trachea and the upper part of the inferior larynx, and ascend more or less upward covered by the preceding pair of muscles. In the Pigeons the last two muscles or sterno-tracheales arise as usual from the sternum, but pass both asymmetrically to the right side of the trachea.

In addition to the normal peculiarities of structure already noticed, the trachea exhibits singular dilatations and convolutions, which appear however to occur only in some orders, as the Natatores, Grallæ, and Gallinæ, and what is remarkable, are frequently absent in closely allied genera, or even species of the same genus, and often constitute characteristic sexual distinctions, occurring in many cases only in the male, and being either entirely absent, or exhibited under a lesser degree and with particular modifications in the female, or else being met with in the same conditions in both sexes.

Claiming our attention in the first place are those elongated dilatations which are situated commonly about the middle of the trachea, and provided with cartilaginous and bony rings; they are usually single, but are double in the Drake and male Merganser. *Anas leucocephala* and *Mergus serrator* have a single dilatation of the

trachea, which is more strongly developed in *Anas fusca* and in *Clangula*. Feeble traces of a double widening of the tube occur in *Anas crecca* and *tadorna*; there are elongated dilatations in *Anas rufina*, *glacialis* and *Mergus merganser*, and a single one in *Pala-medea cornuta*. In the Emeu a peculiar structure is observed, for in that bird an elongated slit, several inches long, is found above the bifurcation of the trachea, and communicates with a large cellular air-sac situated in the neck.

In other Birds from the orders just mentioned convolutions occur of the lower part of the trachea, and are situated either free beneath the integument at the commencement of the thoracic cavity, or are enclosed to a greater or less degree of depth within the sternal keel. Thus in *Platalea*, *Penelope*, the Cock of the Woods, the Corn-crake, and some Pheasants, especially in the males of these species, and in *Anas semipalmata* (where it makes the most complex convolutions of all), the trachea descends beneath the skin to beneath the level of the anterior border of the sternum, ascends and having made a second curve upon itself, bifurcates into the bronchi for the lungs. In both the male and female of *Grus virgo* and *cinerea*, with however certain sexual modifications, the trachea penetrates the keel of the sternum, is enclosed within it as in a bony capsule, and there makes several spiral convolutions upon itself which extend in the male as far as the posterior extremity of the keel. In both the sexes of *Cygnus musicus* and *Bewickii*, a loop-shaped coil of the trachea lies within the keel of the sternum; in the Black Swan however this structure is more feebly developed, and does not exist at all in the mute Swan (*Cygnus olor*). It is most strongly indicated in the Trumpeter Swan (*C. buccinator*), where the tracheal convolution descends as deeply as in the male Crane. In *Numida cristata* a coil of the trachea is situated between the shafts of the furcular bone. A well-marked sexual difference is observable in the Black Stork, where in the male the bronchi, long and having complete-rings, are always curved in the shape of the letter S; this is the case also, though in a lesser or scarcely noticeable degree, in the male of the White Stork. A peculiar condition of the trachea is met with in the Penguin, by the ridge upon the inner wall of the thyroid cartilage forming a septum, which is prolonged throughout the whole of that tube. A similar structure is found at the inferior extremity of the trachea in *Procellaria glacialis*.

The existence of an *Inferior or Bronchial Larynx*, in which the

voice is produced, constitutes a special peculiarity of the class of Birds. It is situated in the upper part of the thoracic cavity at the extremity of the trachea, where that divides into the two bronchi. The length of the inferior larynx is mostly greatest from before backward, and its interior forms a quadrangular cavity, which is generally divided inferiorly (at its outlet) by a *cross-bone* passing from before backward, into two lateral halves, that receive the two openings of the bronchi, which are to be viewed as forming a double rima glottidis. The cross bone consists of the last tracheal ring increased in size, or else of several rings which have become firm and rigid, approximated and even blended together, so as to form a firm bony drum of variable size. The commencement of the bronchial tubes is also to be regarded as forming part of the inferior laryngeal apparatus, since their first rings and the membranes which unite them must exert the greatest influence upon the production of the voice.

As might be expected from the great variety of character which the voice of Birds presents, the structure of the inferior larynx in the several genera and species offers for our study a very extensive series of modifications. In some cases this larynx appears to be entirely absent, there being neither expansions of the trachea nor vibratory membranes to produce, by combining in action with the lingual apparatus, any kind of sound, so that voice may be said to be totally deficient. These conditions are exemplified in both the Black and White Stork. The rings are very soft and cartilaginous throughout the whole extent of the trachea, and there are no indications whatever of a larynx at its bifurcation; and as little of an internal and external tympanic membrane, or even of a single pair of muscles. The bronchi are long, and formed, like the trachea, of numerous (about 50) entire rings, the intervals between which are cartilaginous, so that the bronchi form soft but elastic cylindrical tubes, which become membranous so soon as they enter the substance of the lungs. The storks, as is known, with the exception of a clattering noise produced by the bill, give utterance to no distinct tone, but only a feeble hiss. The muscles of the inferior larynx are wanting in the Struthious birds, several *Grallæ* and *Natatores*, and in the *Gallinæ* and *Owls*; the bronchi are partially surrounded by segments of rings, and completed by membrane on their internal side.

From the preceding examples we pass to those Birds, as the true Vultures, which have been also stated, though incorrectly, to possess